OE/EIS-0024

## Final Environmental Impact Statement

(Final Statement to FEA-DES 77-9)

# STRATEGIC PETROLEUM RESERVE

## Capline Group Salt Domes

Iberia, Napoleonville, Weeks Island Expansion
Bayou Choctaw Expansion, Chacahoula,

## Iberia, Iberville, and Lafourche Parishes, Louisiana

## U.S. DEPARTMENT OF ENERGY

JULY 1978
VOLUME 1 OF 4

DOE/EIS-0024
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Responsible Official:

James L. Liverman
Acting Assistant Secretary for Environment

**U.S. DEPARTMENT OF ENERGY**
Washington, DC 20545

**JULY 1978**
VOLUME 1 OF 4

Volume I

## SUMMARY

STATEMENT TYPE: ( ) Draft (X) Final Environmental Statement

PREPARED BY: The Strategic Petroleum Reserve Office, Department of Energy, Washington, D.C. 20461

1. Type of Action: ( ) Legislative (X) Administrative

2. Brief Description of The Proposed Action:

This document is a site specific Environmental Impact Statement (EIS) for five (5) candidate sites comprising the Capline Group of salt domes located in the Gulf Coast region of south central Louisiana. The primary site for Strategic Petroleum Reserve (SPR) development in this group is the Napoleonville salt dome located in Assumption Parish, Louisiana. Of the other four (4) sites, two (2) are expansions of Early Storage Reserve facilities, and two (2) are new sites. The early storage expansions include Bayou Choctaw salt dome in Iberville Parish, and Weeks Island salt dome in Iberia Parish. The new sites are Chacahoula salt dome in Lafourche Parish and Iberia salt dome in Iberia Parish. One or a combination of these five (5) sites could be developed in addition to the Weeks Island and Bayou Choctaw early storage facilities to provide the approximately 300 MMB of storage which is projected for the Capline group.

This project is part of the Strategic Petroleum Reserve (SPR) program currently being planned by the Department of Energy (DOE). Creation of the SPR was mandated by Congress in Title I, Part B of the Energy Policy and Conservation Act of 1975, P.L. 94-163 (the Act) for the purpose of providing the United States with sufficient petroleum reserves to minimize the effects of any future oil supply interruption.

3. Summary of Environmental Impacts and Adverse Environmental Effects:

This site specific EIS analyzes the environmental impacts which could occur during site preparation and operation at each of the five (5) locations.

The construction necessary to develop or expand storage cavities, terminal facilities, and pipelines required for the Capline group of SPR sites would result in topographical modification of the site areas due to onsite fill, excavation, and grading; erosion due to such surface activities; degradation of water quality due to increased sediment load, dredging activity, suspension of particulate, heavy metals, pesticides, and other pollutants; degradation of air quality due to fugitive dust, vehicle emissions, and paint vapors; and impact to the aquatic and terrestrial floral and faunal species which would be disturbed by the construction activities. These impacts are expected to be short term and terminate soon after completion of project construction.

The most significant impacts of project operation would be impact on air quality from hydrocarbon emissions associated with tanker loading and offloading; impact of brine disposal to the Gulf of Mexico; impact on water quality from possible oil and brine spills; and resultant impact to the flora and fauna which would be affected by such oil or brine spills.

Most of these impacts are expected to result regardless of which of the sites are expanded or developed. However the extent of the impacts may vary with the size of the storage facility, length of the pipelines, and other such factors.

## 4. Alternatives Considered

In the Capline region, five (5) salt domes are being considered as potential SPR storage sites: a proposed site, Napoleonville development, with four (4) alternatives. The four (4) alternatives are expansion of Weeks Island early storage facility, expansion of Bayou Choctaw early storage facility, development of Iberia dome, or development of the Chacahoula dome.

Alternative Facility Components

Napoleonville

Alternative Raw Water System

Weeks Island Expansion

Alternative Raw Water System
Alternative Brine Disposal System

Bayou Choctaw Expansion

Alternative Raw Water System
Alternative Brine Disposal System

Iberia

Alternative Raw Water System
Alternative Brine Disposal System
Alternative Oil Distribution System

Chacahoula

Alternative Raw Water System
Alternative Brine Disposal System

5. Comments on the Draft EIS were received from the following agencies, companies and organizations

Federal

U.S. Army Corps of Engineers
U.S. Department of Agriculture
U.S. Department of Commerce, National Oceanic and
 Atmospheric Administration
U.S. Environmental Protection Agency
U.S. Nuclear Regulatory Commission
Advisory Council on Historic Preservation

State

Department of Urban and Community Affairs,
 State of Louisiana

Local

No comments were received from local government agencies.

Other

Morton - Norwich Products, Inc.

6. Date Final EIS made available to EPA and the Public

This final EIS was made available to the Environmental Protection Agency and the public June, 1978.

# VOLUME I-TABLE OF CONTENTS

Page

Page

Page

## VOLUME II-TABLE OF CONTENTS



## VOLUME III-TABLE OF CONTENTS



## VOLUME IV-TABLE OF CONTENTS

LIST OF TABLES

Page

Page

Page

LIST OF FIGURES

# CHAPTER 1.0

# BACKGROUND

## 1.1 INTRODUCTION

This document is a site specific Environmental Impact Statement (EIS) for five (5) proposed candidate sites from the Capline Group of salt domes located in the Gulf Coast region of southcentral Louisiana. This project is part of the Strategic Petroleum Reserve (SPR) program currently being implemented by the Department of Energy (DOE), formerly the Federal Energy Administration (FEA). Creation of the SPR was mandated by Congress in Title I, Part B of the Energy Policy and Conservation Act of 1975, P.L. 94-163 (the Act) for the purpose of providing the United States with sufficient petroleum reserves to minimize the effects of any future oil supply interruption.

On February 16, 1977, DOE transmitted the SPR Plan to Congress as Energy Action No. 10. The plan described the manner in which the Program was to be implemented. As an amendment to the plan, an acceleration of the development schedule became effective under FEA Energy Action No. 12 on April 18, 1977. Whereas the Act required the attainment of an Early Storage Reserve volume of 150 million barrels (MMB) of oil in storage by the end of 1978 and an SPR volume of 500 MMB of oil in storage by the end of 1982, the present accelerated schedule has established new targets of attaining 250 MMB by the end of 1978 and 500 MMB by the end of 1980. In addition, a second amendment to the Plan proposing expansion of the SPR to one billion barrels was presented to Congress as Energy Action-DOE No. 2, which became effective on June 12, 1978. These initiatives are an integral part of the President's National Energy Plan and represent a major effort to provide the U.S. with protection against the consequences of a severe petroleum supply interruption as soon as practicable.

A final programmatic environmental impact statement (FES 76-2) addressing the effects of the SPR program as a whole was filed with the Council on Environmental Quality and made available to the public on December 16, 1976. That statement considers several different types of storage facilities, including the use of existing solution-mined cavities in salt formations and conventional mines, the use of existing and the construction of new conventional surface tankage, and the use of surplus tanker ships. The programmatic EIS should be consulted for a description of each of these storage methods and the potential impacts which might result from its use. The programmatic EIS also assesses the cumulative impacts which could be expected from use of various combinations of the different facility types.

DOE has identified a total of nine (9) sites as candidates for the Early Storage Reserve program by means of a screening process involving the application of six (6) criteria.* Five (5) of these alternative sites were considered for the purpose of selecting ESR storage sites to supply oil to refineries on the Gulf Coast, on the East Coast, and in the Caribbean. They include the West Hackberry salt dome (Cameron Parish, Louisiana), the Bayou Choctaw salt dome (Iberville Parish, Louisiana), the Bryan Mound salt dome (Brazoria County, Texas), the Cote Blanche salt mine (St. Mary Parish, Louisiana, and the Weeks Island salt mine (Iberia Parish, Louisiana). Final Environmental Impact Statements on all five (5) candidate sites (FES 76/77-4 through FES 76/77-8, December 1976, January 1977) and four (4) final supplements addressing design changes for all five (5) of these sites; (April, May, August and December, 1977) have been filed with the Council on Environmental Quality and made available to the public so that the environmental impacts associated with the possible use of these sites may be compared with one another. A sixth candidate Gulf Coast site, the Sulphur Mines salt dome (Calcasieu Parish, Louisiana) was identified to provide additional existing storage capacity when the requirements of the accelerated schedule became known. The final EIS (DOE/EIS-0010) was made available March, 1978. The other three (3) candidate sites, Central Rock Mine (Fayette County, Kentucky), Ironton Mine (Lawrence County, Ohio), Kleer Mine (Van Zandt County, Texas) were considered for distribution to inland refineries. Final

*These criteria are existing storage capacity (or potential storage capacity for SPR), distribution accessibility, technical feasibility, potential environmental concerns, ease of acquisition and cost. Section II.E.I of the programmatic EIS describes in detail how the criteria were applied to approximately 300 salt domes and approximately 300 existing mines to select 32 candidate sites, including the eight (8) candidate early storage sites.

EISs for these sites (FES 76/77-9 and FES 76/77-10, July 1977, and FES 77-2, September 1977) have also been made available. To date, five (5) sites (West Hackberry, Bayou Choctaw, Bryan Mound, Weeks Island and Sulphur Mines) have been selected for use in the SPR. By the same selection criteria, three (3) groups of candidate sites are being considered for the purpose of selecting SPR storage sites. Most of the sites are centered around three (3) major inland pipeline terminals which transport U.S. and foreign crude oil from the Gulf Coast region to the upper mid-west area refineries. These distribution centers include the Seaway Pipeline Terminal (Freeport, Texas), the Texoma Pipeline Terminal (Nederland, Texas), and the Capline Pipeline Terminal (St. James, Louisiana). The candidate sites of each group would use the particular pipeline terminal associated with that group as the proposed location of an SPR terminal for distribution of strategic oil. A portion of the stored oil would be distributed through the pipeline to the upper midwest markets while the remainder would be distributed to local refineries and loaded onto tankers at the terminal for distribution to the East Coast and the Caribbean.

The primary site for development within the Capline Group is the Napoleonville salt dome located in Assumption Parish, Louisiana. The development of Napoleonville is proposed in addition to the sites which can provide existing storage capacity and which have already been selected (i.e., Bayou Choctaw salt dome in Iberville Parish, Louisiana, and Weeks Island salt dome in Iberia Parish, Louisiana). There are four (4) other candidates for possible development of additional capacity in the Capline group. Two (2) of these possibilities are new sites and include Chacahoula salt dome in Lafourche Parish, Louisiana, and Iberia salt dome in Iberia Parish, Louisiana. The other two (2) possibilities include expansion of Bayou Choctaw or Weeks Island. One or a combination of these four candidates may be developed as an alternative to development of Napoleonville.

Together the five (5) proposed candidate sites included in this document provide the potential total of 750 MMB of storage space. DOE presently projects that between 300 MMB and 500 MMB will be needed for the Capline system, as a result of the expansion of the SPR. Energy Action DOE No. 2 provides that at least 750 MMB of the 1 billion barrel system will be stored in underground facilities. The decision has not yet been made regarding the type of storage facilities for the final 250 MMB. That decision will affect size of the Capline Group. The capacity ultimately required will be derived through development of various combinations of the five (5) candidate sites.

## 1.2 PRESENTATION FORMAT

This EIS for the Capline Group is in four volumes. Volume I contains the text of the EIS and includes summary descriptions of the project (Chapter 2.0), of the environment (Chapter 3.0), and of the project's probable impacts (Chapter 4.0). Chapter 5.0 is a review of mitigative measures and unavoidable adverse impacts. The relationship between local short-term uses of the environment and long-term productivity is discussed in Chapter 6.0. Those commitments of resources which are irreversible and irretrievable are discussed in Chapter 7.0. Chapter 8.0 is a summary of the proposed and alternative actions, and Chapter 9.0 lists the agencies contacted, the various permits and licenses required and presents responses to comments received on the draft EIS.

Volumes II through IV contain the appendices. Appendices A and B (Volume II) provide details concerning the project description and the environment (regional and site specific) which were summarized in Chapter 2.0 and 3.0 respectively. Appendix C (Volume III) provides details concerning the potential impacts which may result from the proposed and alternate actions, as summarized in Chapter 4.0. Appendices D through K are contained in Volume IV. Technical Appendices D through J contain backup data and methodology used in compiling the statement, and Appendix K contains comments on the DEIS from Federal, State and local agencies.

# CHAPTER 2.0

# DESCRIPTION OF PROJECT

## 2.1 INTRODUCTION

Five salt domes in southeastern Louisiana - Napoleonville in Assumption Parish, Chachaoula in Lafourche Parish, Bayou Choctaw in Iberville Parish, and Weeks Island and Iberia in Iberia Parish - are under consideration for development for the SPR program for the Capline Group (Figure 2.1-1). They were selected from among many potential salt domes on the basis of capacity, technical feasibility of development, environmental concerns, and ease of access to distribution facilities. Cote Blanche Island salt mine in St. Mary Parish described in FES 76/77-7 remains an alternative site for the Capline Group. Should that site be selected for development, it could obviate the need to develop 27 million barrels (MMB) of new storage space at one of the sites assessed herein. This document describes the results of an environmental anaylsis of the five sites in the Capline Group.

The project is presently planned to provide approximately 300 MMB of crude oil storage. This capacity will be developed by use of one of several possible combinations of existing and newly developed storage facilities; the actual total capacity could range from about 270 MMB to 380 MMB. Storage site capacities used in this study are engineering estimates for assessment purposes and actual cavern sizes or storage site capacities may vary slightly. Likewise, site combinations may vary by the inclusion of 27 MMB at Cote Blanche to those site combinations with total capacities under 300 MMB. As part of the early storage phase, as much as 94 MMB of storage will be available in caverns at Bayou Chactaw and 89 MMB at an existing conventional salt mine at Weeks Island - or a total of as much as 183 MMB of available storage. The necessary 117 MMB of additional storage can be accomplished by the creation of new storage capacity at one or more of the five sites.

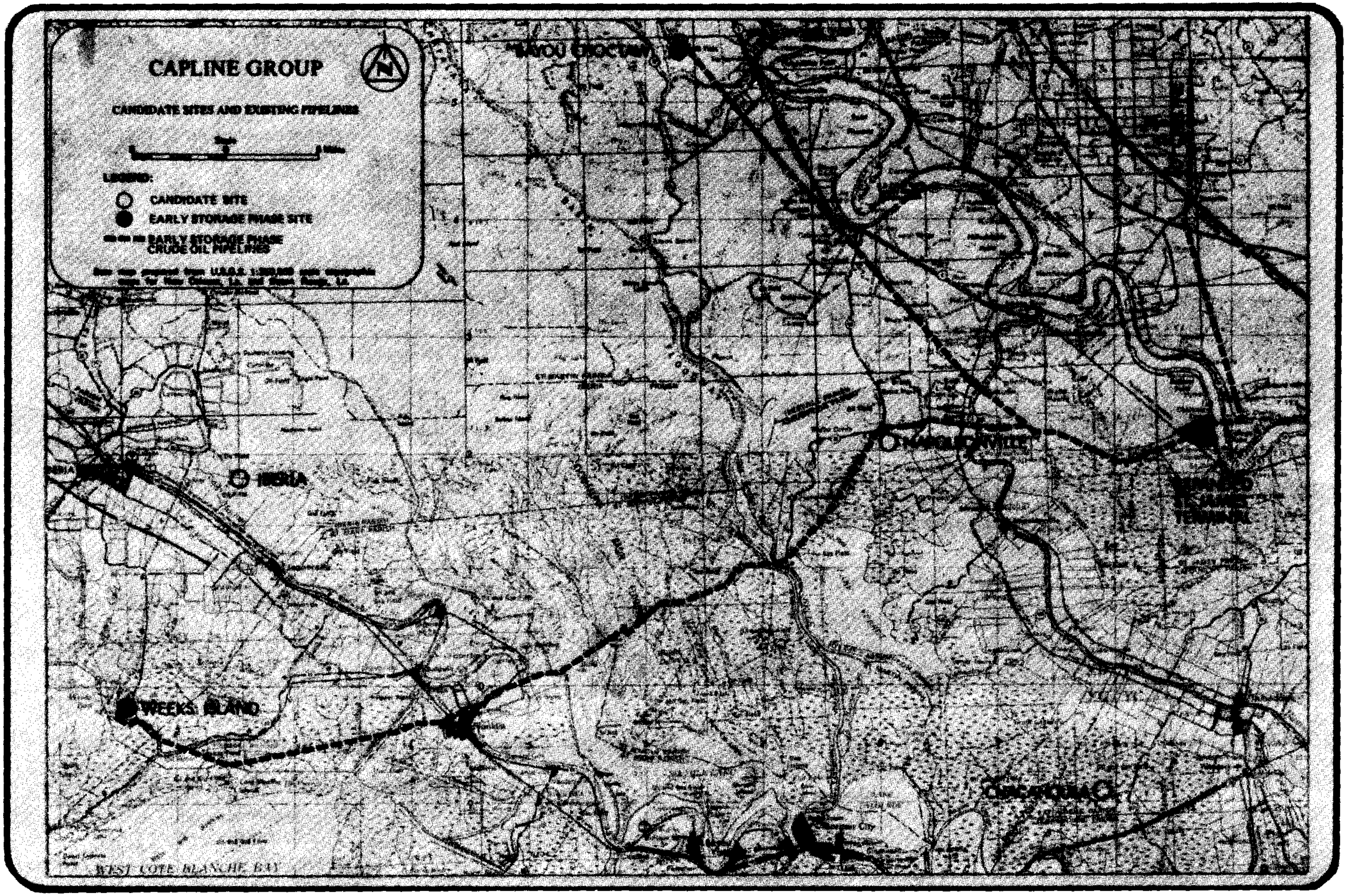


FIGURE 2.1-1 Capline Group - alternative sites and existing pipelines.

1) Use of early storage facilities plus expansion of Weeks Island to an additional 91 MMB for a group total of 274 MMB (Section 2.4).

2) Use of early storage facilities plus expansion of Bayou Choctaw to an additional 56 MMB plus development of 50 MMB at Iberia - or a group total of 289 MMB (Section 2.5).

3) Use of early storage facilities plus development of 200 MMB of storage at Chacahoula for a group total of 383 MMB (Section 2.6).

It is the purpose of this EIS to assess each of these alternatives in sufficient detail so that it may be selected in place of, or in addition to, the proposed action if program requirements and objectives so dictate.

The stored oil would be distributed to inland refineries by the CAPLINE Inc., Pipeline system, and to East Coast, Caribbean, and Gulf Coast refineries by tankers from dock facilities on the Mississippi River. Terminal points are the St. James terminal of CAPLINE and docks on the Mississippi River at St. James and Sunshine, Louisiana.

This chapter discusses the concept of cavern storage, the general engineering principles involved and the physical requirements for development of the possible sites. Details of site development for the early storage phase of the SPR are presented in the Final EIS and supplements for Bayou Choctaw (FES 76-5) and Weeks Island (FES 76/77-8) and in Appendix A to this report.

## 2.2 CRUDE OIL STORAGE IN SALT DOMES

### 2.2.1 Introduction

Salt domes are attractive sites for petroleum storage caverns because of the relative low cost of construction, the geologic stability of caverns, and because salt is highly impermeable (making it a suitable material in which to store petroleum products). The domes which occur along the Gulf Coast of the United States are particularly desirable storage cavern sites. They are commonly in areas of previous industrial development for oil or gas wells or drilling operations, with readily available pipeline distribution systems, and many of them are within 2000 feet of the earth's surface, reducing costs of drilling required to construct the caverns.

Caverns for proposed storage may be of any one of three types. They may be developed by conversion of conventional room and pillar salt mines, or of existing solution-mined caverns, or they may be constructed by solution mining of new caverns. The first two types will be utilized during the early storage phase, while new solution-mined caverns will be required to complete the storage requirements of the SPR program.

New caverns are constructed by injecting raw (unsaturated) water into the salt mass and allowing the water to leach (or dissolve) the salt. As raw water is injected, brine is forced out of the salt mass and a cavern is formed. The brine produced will exceed industry's needs for feedstock and will be disposed of either by injection into deep salt water bearing sands or by diffusion in the Gulf of Mexico. Crude oil would be stored by injecting it into the caverns under pressure to displace the brine. During an oil-supply interruption, the stored oil would be forced out of the caverns by displacing it with raw water and distributed to refineries via the CAPLINE Pipeline or tankers from docks on the Mississippi.

Although storage of crude oil in salt dome caverns does not present major technical problems, the technique has been more extensively utilized in other countries. In the United States, such caverns have primarily been used for storage of fuel oil and LPG products such as propane and ethylene.

Other petroleum hydrocarbons such as fuel oil, diesel oil and crude oil have been stored in caverns in salt deposits for several years in Germany and France. Over 30 MMB of West Germany's strategic crude oil stock is in leached storage caverns. Some of these caverns have been filled for seven (7) years and continue to provide safe and economic storage.

### 2.2.2 General Construction Techniques

The new storage to be developed at each site will be a series of leached caverns of about 10 MMB capacity each. (Drilling difficulties may reduce the volume of 10 to 20 percent of the caverns.) An oil storage cavern is basically a large subterranean pressure vessel connected to the surface by two vertical concentric casing strings (pipes) (Figure 2.2-1). Because oil will float on brine the oil line must connect to the top of the cavern and a brine/raw water line to the bottom.

Control of cavern construction and oil withdrawal operations would be established at a central pumping plant area, and each cavern would be linked to the central plant by water, brine, and oil pipelines. Raw water for each site would be supplied via pipeline from an offsite source, which could include nearby streams or lakes, subsurface aquifers, or the Gulf of Mexico.

Both cavern leaching and crude oil injection require disposal of the displaced brine. It would be piped to the Gulf of Mexico or to injection wells for subsurface disposal. Depending on proximity to potential users and other factors, such as the chemical constituents of the salt, some brine might also be sold as feedstock to nearby chemical plant operators.

Oil distribution would be handled through the terminal facilities (including docks and storage tanks) and pumped via pipeline to and from each storage site. Crude oil entering cavern storage would be received from the terminal facilities. During crude oil withdrawal, the oil

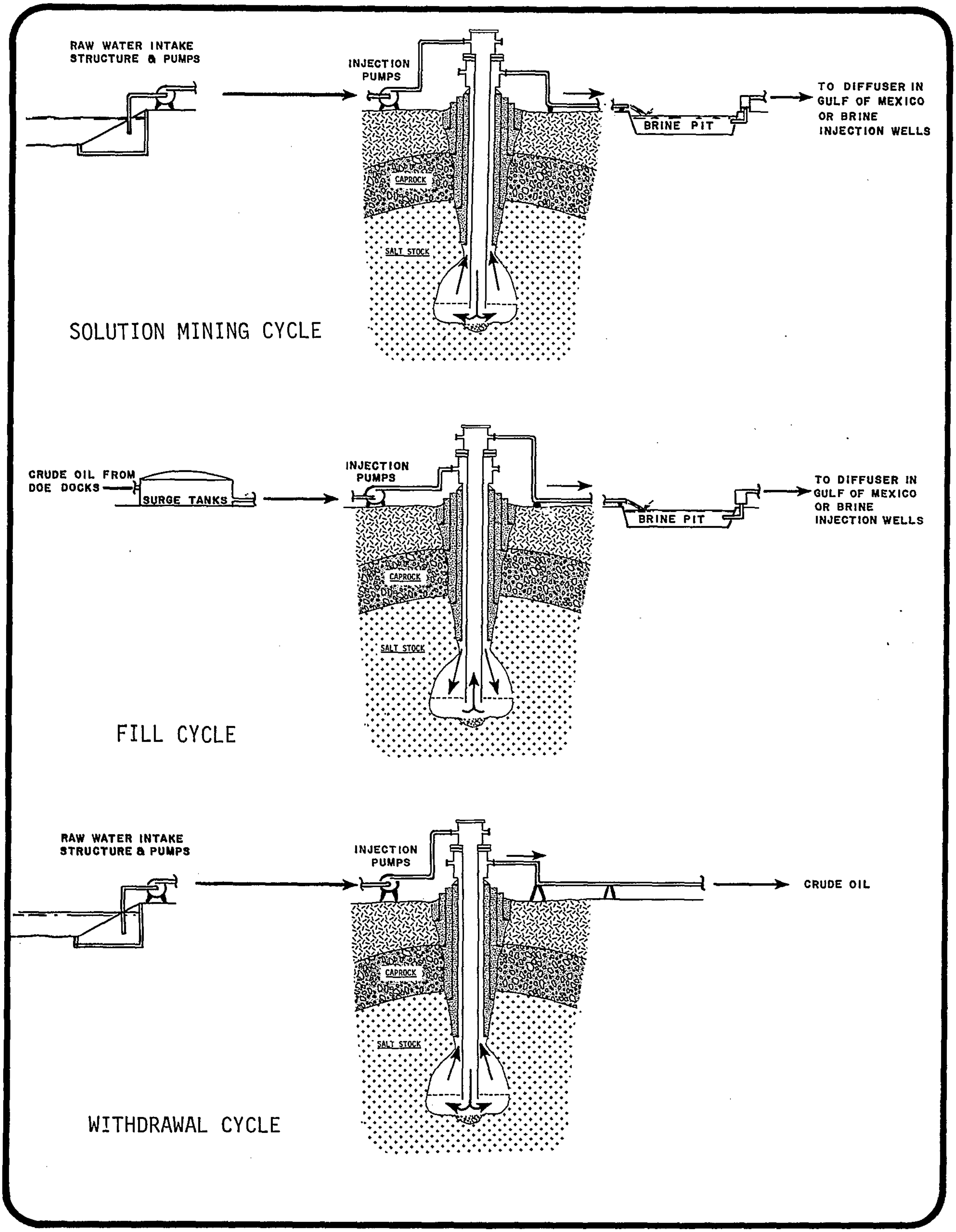


FIGURE 2.2-1 Schematic representation of SPR facility operation

would be pumped to the terminal facilities for transfer to tankers docked on the Mississippi or to the CAPLINE Pipeline.

An 800-foot design spacing of storage cavities has been selected which would allow a minimum of 400 feet between adjacent caverns after all fill cycles. A distance of 600 feet would be allowed from any cavity to the estimated extremity of the dome flanks. A minimum salt barrier of 500 vertical feet would be provided between the ceiling of each storage cavity and the caprock. Caverns would be approximately 1000 feet in height and, for a 10 MMB capacity, would be initially leached to 275 to 300 feet in diameter.

Before leaching operations can begin, an entry well must be drilled, usually with conventional oil well drilling rigs. Well diameters are determined by the desired leaching and oil withdrawal rates (caverns are leached at a rate of about 15,000 barrels per day per well, and SPR oil withdrawal requirements call for the ability to empty each cavern in 150 days). After the drilled hole penetrates the dome caprock, at least 500 additional feet are drilled into the salt before the final casing is placed and grouted. The bottom of this casing defines the top of the cavern to be developed. Drilling then proceeds to the bottom of the sump (a space below the cavern itself where insoluble material may settle out and not impair operation of the storage cavern).

Drilling equipment is then removed and the leaching string inserted. This consists essentially of two pipes of different diameters, the smaller of which fits concentrically into the larger.

Leaching a storage cavern of the desired size and shape is accomplished by varying both the rate of raw water input and the positions of the two casings within the well. Blanket oil is used to prevent the ceiling of the cavity from being leached away from the bottom of the outer string. (Blanket oil is any noncorrosive, lighter-than-water substance used to occupy the space in the topmost portion of the cavern. Blanket oil or, more correctly, blanket material - gas, propane, butane, diesel oil or crude oil - prevents leaching of the cavern roof around the outer casing and can be adjusted to control the shape of the cavern roof.) It usually requires about 24 months to leach a cavern of the required 10 MMB capacity. Two significantly different methods of cavern development may be used in the SPR program: leach-then-fill and leach/fill.

The fundamental technique of cavern development with the leach-then-fill method is to expose the salt in a drilled hole, inject raw water into the hole, allow time for the water to dissolve the salt, and displace the resulting brine by injecting more raw water. The hole enlarges as the salt dissolves, eventually forming a cavern. Blanket oil is used to protect the roof of the cavern as noted previously. Once leaching is complete, crude oil is then injected.

By using crude oil as blanket material, and employing appropriate combinations of direct/indirect circulation and intermittent adjustment of casings, it is possible to store crude oil during the leaching period. This method of cavern development is called leach/fill. With it, the cavern is developed from the top down. Initially, about 10 percent of the cavern design cavity is leached; crude oil is then added as blanket material and leaching continues. When the cavern reaches the 10 MMB design capacity, 9 MMB of crude oil is already in storage. The leach/fill process is still an untried technology in this country, and DOE plans to verify it through a test well before it is implemented for the general program. This technology is being used successfully in West Germany for the creation of a storage facility.

Average oil injection and water supply rates over the course of the cavern construction phase for the simultaneous leach/fill process would be somewhat less than those required for the separate leach-then-fill process. Therefore, average brine disposal rates during cavern filling using the leach/fill process would be less than when using the leach-then-fill process. Average brine disposal rates for either process during cavern leaching would essentially be the same. Because of the higher exchange rates of raw water and brine, the separate leach-then-fill process would present the worst-case for environmental impact consideration, and it is this more extreme case which is assumed in the document for environmental impact assessment purposes.

Pipelines would transport raw water, brine, and crude oil to and from the storage site. Pipeline construction techniques would depend on the type of terrain to be crossed and would include conventional dry land, push-ditch and flotation canal methods. Conventional dry land construction methods would be used through portions of pipeline routes where heavy construction equipment can be supported. The push-ditch method of construction would be used in freshwater swamp portions of pipeline routes where the ground can support marsh buggy-mounted excavating and backfilling equipment, but cannot support conventional dry land pipeline construction equipment.

### 2.2.3 Operation

Crude oil to fill the SPR storage cavities will arrive at terminals on the Mississippi River by tanker. Docks on the river can handle ships up to 80,000 DWT (about 450,000 barrels). Surges in the oil distribution system would temporarily be stored in surge tanks near the docks. The oil would be metered at the dock and also at the storage site for leak detection purposes.

All SPR storage sites are designed to accommodate five (5) fill and withdrawal cycles. This assumption was made to establish engineering and safety criteria in absence of any method to predict the actual usage of the SPR over the lifetime of the project. For leached cavity facilities the cavern capacity enlarges during each cycle, due to the introduction of fresh water; however, only the original design capacity for each cavity would be refilled. The fact that a smaller percentage of fresh water would be introduced into the cavern during successive fill operations reduces somewhat the continued leaching process.

The fill rate for the Capline system during the first fill cycle would be variable, depending on timing of the availability of storage capacity at the site or sites selected. This will depend on the fill schedules for the Bayou Choctaw and Weeks Island early storage facilities, and also on whether the leach/fill construction method would be used for the new facilities. However, it is not anticipated that the first cycle fill rate would ever exceed the assumed system refill rate of 525,000 barrels per day (175,000 barrels per day average at three sites).

When the storage facility at each site has been completed and the crude oil is in storage, there would be an interim period during which the only activities at the site would be security and maintenance checks. Readiness for activation during an emergency, however, requires keeping personnel available.

During that standby storage period, all equipment would be serviced and tested on a regular basis to insure proper working order. Maintenance crews would be on duty on a 24-hour basis.

It is possible that certain national emergencies could occur before the planned total reserve capacity of the SPR is met. In order to prepare for such a contingency, the facilities are designed to provide for oil return bypass valves to allow immediate recovery of oil already stored.

The SPR program plan calls for an emergency delivery of stored oil over a minimum 5-month period. The Capline group has a design capacity of 2 MMB per day. The facility's systems would be designed to handle this maximum capacity.

Crude oil stored in every cavity would be withdrawn by injecting raw water into the bottom of the cavity, displacing the oil through the annular space at the top of the cavity. The oil would leave each site at a pressure capable of transporting the oil via pipeline to the distribution terminals. After an oil supply interruption has ended, refill of the SPR storage facility is planned. The rate of fill would depend on the availability of crude, but would require at least 1.4 to 2.0 years (depending on the alternative developed) at the 525,000 barrel-per-day rate discussed above. Refill is assumed to begin six (6) months after the end of the supply interruption.

The refill process is the reverse of the recovery process. The crude oil is injected into the top of the storage cavity, thus displacing the brine, which, in turn, goes to the brine disposal system. The brine disposal system and oil distribution system are designed for cavern leaching and oil withdrawal, respectively. These capacities are in excess of requirements during refill periods.

### 2.2.4 General Safety Measures

Safety measures common to the oil industry will be employed during all phases of the project. Protective control devices will be installed on wellheads and on all major pumping equipment. Fire pumps and extinguishers will be available at critical points. Buried pipelines will be coated with a protective coating. The main storage facility acreage will be enclosed with a security fence. These and other precautions will serve to protect the employees, the public, and the environment.

### 2.2.5 Termination and Abandonment

When the oil storage capacity would no longer be needed, it is intended that the facilities continue to serve a beneficial use. Storage of light petroleum products, LPG, or other industrial products is a possibility. If no users can be found for the short term, the facility could be mothballed for later use.

Ultimately, the facility would be abandoned. Surface equipment would be removed and sold offsite. Brine injection wells and cavity access would be sealed with concrete, a common oil field procedure. No long-term surveillance or maintenance is anticipated.

## 2.3 CAPLINE GROUP - PROPOSED DEVELOPMENT

The proposed development for approximately 300 MMB storage in the Capline Group of salt domes requires use of facilities, developed for the early storage phase, at Bayou Choctaw (up to 94 MMB) and Weeks Island (89 MMB) and the construction of a 150 MMB storage facility at Napoleonville (Figure 2.3-1). The facilities at Bayou Choctaw and Weeks Island have been described in detail on the EISs and supplements for the early storage phase of the SPR program. Details of the planned development at Napoleonville are presented in Section A.3.4 of Appendix A. The following sections summarize the most significant aspects of this development.

### 2.3.1 Oil Distribution Facilities

Crude oil to be stored in the proposed development would be imported in Very Large Crude Carriers (VLCCs) to the Gulf of Mexico. There, the crude would be loaded onto conventional tankers (up to 80,000 DWT) and transported up the Mississippi River to terminal systems which are in turn connected to the storage sites by pipeline. During withdrawal, the crude oil would be transferred from the storage sites to the terminal systems. From the terminal, about 60 percent would be shipped to inland refineries through the CAPLINE Pipeline and 40 percent would be loaded into tankers for shipment to Gulf of Mexico, Caribbean, or Atlantic Coast refineries.

#### 2.3.1.1 Terminal Systems

Terminal systems would transfer the crude oil from conventional tankers. Tankers would moor at docks along the Mississippi River and transfer the crude oil through pipelines, valves, meters, etc. to surge tanks located near the docks. The combination of docks and tanks along with the connecting facilities make up a terminal system.

DOE has made the decision to build an early storage phase terminal system on the west bank of the Mississippi River immediately south of the CAPLINE Terminal at St. James, Louisiana (Figure 2.3-2). Construction and use of this terminal to serve Bayou Choctaw, Weeks Island, and Cote Blanche early storage sites were addressed in the May 1977 supplement to the Bayou Choctaw EIS (FES 76-5), and in the August 1977 supplement to the Cote Blanche and Weeks Island EISs (FES 76/77-7 and 8). The

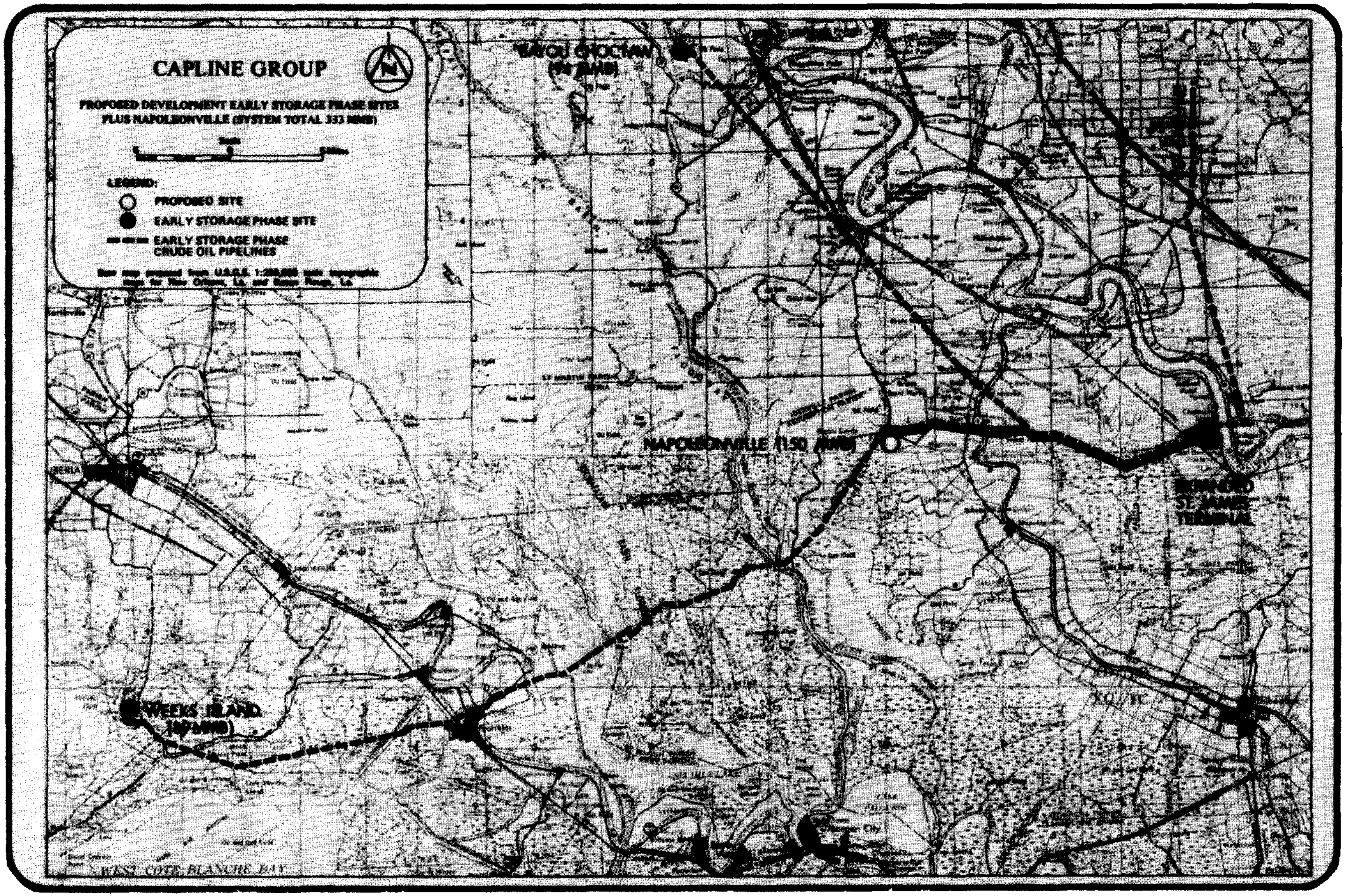


FIGURE 2.3-1 Capline Group - primary development alternative - early storage sites plus Napoleonville.

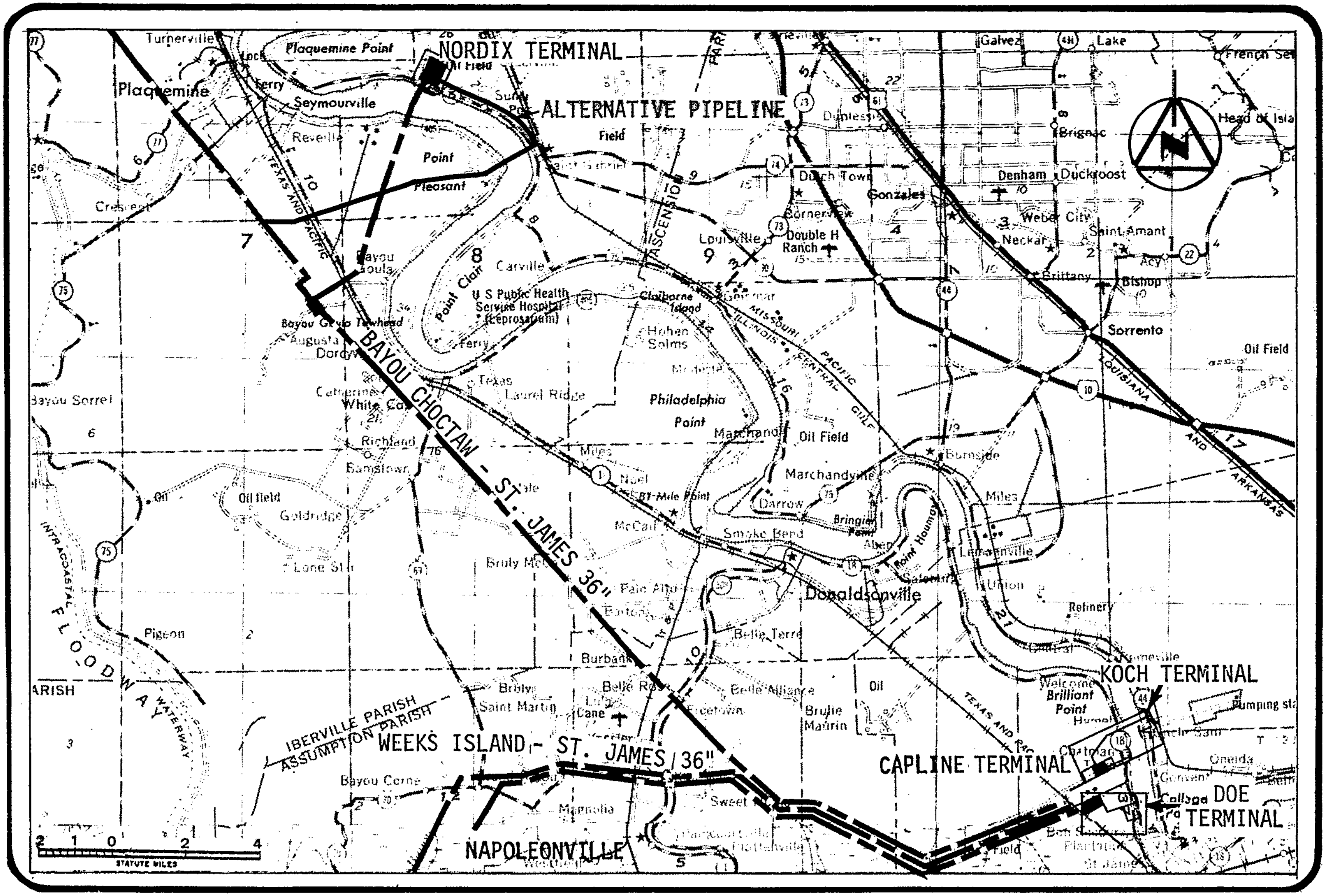


FIGURE 2.3-2 Capline Group oil distribution terminal facilities.

terminal will include two (2) tanker docks and eight (8) 200,000 barrel storage tanks. However, to meet the increased oil handling requirements of the Capline Group expansion to approximately 300 MMB, the DOE terminal would be expanded and additional terminal facilities may be needed at either of two nearby commercial terminals. Expansion of either of these two commercial terminals as a result of SPR activity would depend on program needs and the ability to reach an agreement with the terminal owners. However, the construction and use of these facilities as part of the SPR Program is assessed in this EIS so that a worst-case analysis of the potential impacts is presented.

The two terminal systems that could be available for the proposed development in addition to the DOE terminals are:

| Terminal System | Location | Docks | Tanks[b] |
|---|---|---|---|
| Koch | St. James, La. | 2[a] | 3 - 500,000 bbl |
| Nordix | Sunshine, La. | 2[a] | 10 - 150,000 bbl |

A terminal combination consisting of either DOE/Koch or DOE/Nordix could be utilized for the Capline system. Possible new terminal facilities at St. James include one dock and three 500,000 bbl tanks to be constructed and operated by Koch Oil Company for DOE, and four (4) 200,000 bbl tanks to be constructed and operated by DOE at St. James as part of the DOE terminal. At Sunshine, new terminal facilities could include one dock and up to ten (10) 150,000 bbl storage tanks (Figure 2.3-2). Each dock at the three terminals would be capable of handling light-loaded 80,000 DWT tankers.

The new Koch dock would be constructed on the east bank of the Mississippi River across from the other terminal facilities at St. James (Figure 2.3-2). A pipeline would cross under the river to three (3) new 500,000 bbl tanks that would also be constructed and operated by Koch for DOE. These storage tanks would be connected to the DOE tank farm at St. James.

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[a]One of these is existing and would be available to DOE on a part-time basis; the other is proposed.

[b]All tanks are proposed.

The Nordix terminal at Sunshine would also be located on the east bank of the river. A 7-mile pipeline would connect the terminal to the Bayou Choctaw-St. James pipeline which is part of the early storage phase development. An alternative route to this 7-mile pipeline would be the use of an existing 12-inch pipeline across the Mississippi River. The location of this pipeline would be approximately 16,900 feet downstream of the proposed pipeline crossing (Figure 2.3-2). The connecting pipeline on the east side of the river from the Nordix Terminal to the alternative crossing would follow State Highway 75. On the west side of the river, the alternative pipeline would connect with the Bayou Choctaw-St. James pipeline by following an existing electrical transmission and pipeline corridor a distance of 35,900 feet.

At this time, it is anticipated that those terminal facilities constructed by DOE at St. James would be reserved solely for the SPR program. The surge tanks would be left partially full of oil and would be maintained in a state of readiness in a manner similar to the pipeline. However, the tanker dock, and possibly the tank farm, could be leased to private industry if a sufficient demand should occur, and if all applicable regulatory requirements were met.

The Nordix Terminal facilities would be built by private industry and leased by the Federal government. During standby storage, Nordix, Inc., would have full use of the dock and tank farm facilities, consistent with any Federal, state, and local requirements or restrictions which regulatory bodies would impose upon the use of any such new industrial facility.

### 2.3.1.2 Capline Pipeline System

The Capline Pipeline system transports crude oil from the St. James Terminal to refineries in the upper Midwest. Crude oil from southern Louisiana and other producing areas is transported to St. James by pipelines, tankers, and barges and is introduced into the 40-inch diameter pipeline. Expansions of the CAPLINE system now in progress will increase the carrying capacity of the system from its present 900,000 barrels per day to 1.2 million barrels per day. The proposed Louisiana Offshore Oil Port (LOOP) supertanker facility would connect with CAPLINE by construction of a large-diameter pipeline to the St. James terminal.

### 2.3.2 Bayou Choctaw Early Storage Site

Bayou Choctaw dome, the northernmost site of the Capline Group, is 12 miles southwest of Baton Rouge, Louisiana, and about 4 miles west of the Mississippi River. Development of this site as part of the early storage phase is discussed in FES 76-5 and its Supplement of May 1977.

Portions of the dome are presently leased by Allied Chemical Company for the production of brine feedstock by solution mining. DOE has acquired a tract of land on the dome for purposes of developing the storage facility described in FES 76-5. As many as twelve existing solution-mined caverns could be made available for up to 94 MMB of crude oil storage. Preliminary testing has indicated that some of these caverns may need refurbishing in order to hold pressure. It is not certain at this time how many of the caverns would ultimately be used. Initial crude oil fill has begun via existing barge docks on Bull Bay, with concurrent construction of an oil pipeline to St. James for permanent use (Figure 2.5-2).

A centrally located plant area will be constructed to control the operations at the site. Approximately 120 acres of land over the dome will be used, including 8 acres for buildings and 83 acres for a brine holding pond. The oil storage wells will be diked and fenced (104 acres).

Water for displacement of stored oil during withdrawal operations will be pumped from an intake at the onsite lake. During operation of the facility, brine displaced by oil pumped into the caverns will be pumped to a system of 10 injection wells located off the southern flank of the dome and injected into deep sand formations.

A 36-inch diameter, 38-mile-long, reversible pipeline will be constructed between the site and the Weeks Island-St. James pipeline. A pipeline from the terminal at Sunshine will connect to the Bayou Choctaw-St. James pipeline 10 miles southeast of the site. The alternative pipeline from the terminal at Sunshine would connect to the Bayou Choctaw-St. James pipeline 7.5 miles southeast of the site. The Bayou Choctaw-

St. James pipeline will be used for crude oil fill and withdrawal and will be constructed with pumping facilities at each terminus (no intermediate pump stations will be required). The route will parallel the west bank of the Mississippi River levee, passing near the towns of Plaquemine, White Castle, Annadale, and Freetown, Louisiana (Figure 2.3-1).

Conversion of the Bayou Choctaw site is scheduled such that oil deliveries will begin via barges at the existing Bull Bay terminal in 1977. Construction of the new oil distribution facilities to the DOE terminal will begin in the fall of 1977 and be completed by mid-1978. Oil fill would be complete in early 1981.

### 2.3.3 Weeks Island Mine Early Storage Site

The Weeks Island salt mine is a conventional underground mine in the Weeks Island salt dome, Iberia Parish, Louisiana, about 14 miles south of New Iberia, Louisiana. Development of this site as part of the early storage phase is discussed in FES 76/77-8 and its Supplement of August 1977.

The existing salt mine is presently operated by Morton Salt Company using the room and pillar (dry) method at a depth of approximately 700 feet below mean sea level (MSL). Large underground areas have been excavated and capacity is available for storage of 89 MMB of crude oil.

A pump station requiring about 4 acres of land will be constructed adjacent to the pump shaft. Oil pumps will be connected via a pipeline to the DOE Terminal. Oil fill is anticipated at an average of 190,000 barrels per day.

Initial fill of the Weeks Island facility will be conducted using a pipeline connection to the DOE terminal. The planned route (Figure 2.3-1), is about 65 miles in length and will extend east from Weeks Island to Franklin, then northeast to the DOE terminal. The route will cross within 1 mile of the Napoleonville dome.

Construction and initial fill of the Weeks Island site is scheduled for the early portion of the SPR. Construction of the facility is scheduled from late 1977 to mid 1978. Storage would then commence and is scheduled for completion in late 1979.

### 2.3.4 Napoleonville Salt Dome

Napoleonville dome is near the northern edge of Assumption Parish, about 30 miles south of Baton Rouge (Figure 2.3-1). The community of Napoleonville is about 7 miles to the southeast, the small village of Grand Bayou overlies the north-central portion of the dome. From Baton Rouge the site is accessible by State Highway 1 to State Highway 70. The dome itself is crossed by a network of roads constructed in connection with brine and sulfur production. The north-south trending Grand Bayou bisects the western end of the dome. Although Grand Bayou connects to Lake Verret, the bayou is not considered navigable.

The land area over the -2000-foot salt contour consists of about 1760 acres. The land area, in addition to that devoted to residential and commercial development, consists primarily of farmland, bottomland forest, and deciduous swamp forest.

Mineral extraction associated with the dome includes oil and gas production from 8900 to 12,000 feet, primarily on the northeast flank of the dome; sulfur extraction from the caprock, and solution mining for brine. In all, 26 caverns have been constructed by brining operations. Some of these are no longer used for brine and have been converted to LPG (Liquid Petroleum Gas) storage.

#### 2.3.4.1 Proposed Facilities

The total storage volume of approximately 150 MMB will utilize 7 existing solution-mined caverns with a present capacity of 30 to 45 MMB, which will be increased by additional solution mining to approximately 60 MMB. The leaching of 10 new caverns will provide the additional 90 MMB.

Raw water for leaching will be obtained from Bayou Lafourche, 5 miles to the east. Additional water will be supplied to Bayou Lafourche from an existing pumping station on the Mississippi River at Donaldsonville. The intake structure would be sized to meet EPA intake design standards of a maximum velocity of 0.5 feet per second to reduce fish impingement on the intake screen. Brine disposal will be to salt-water bearing sands at depths of 5000 to 8000 feet, through a well field about 2 miles southeast of the site.

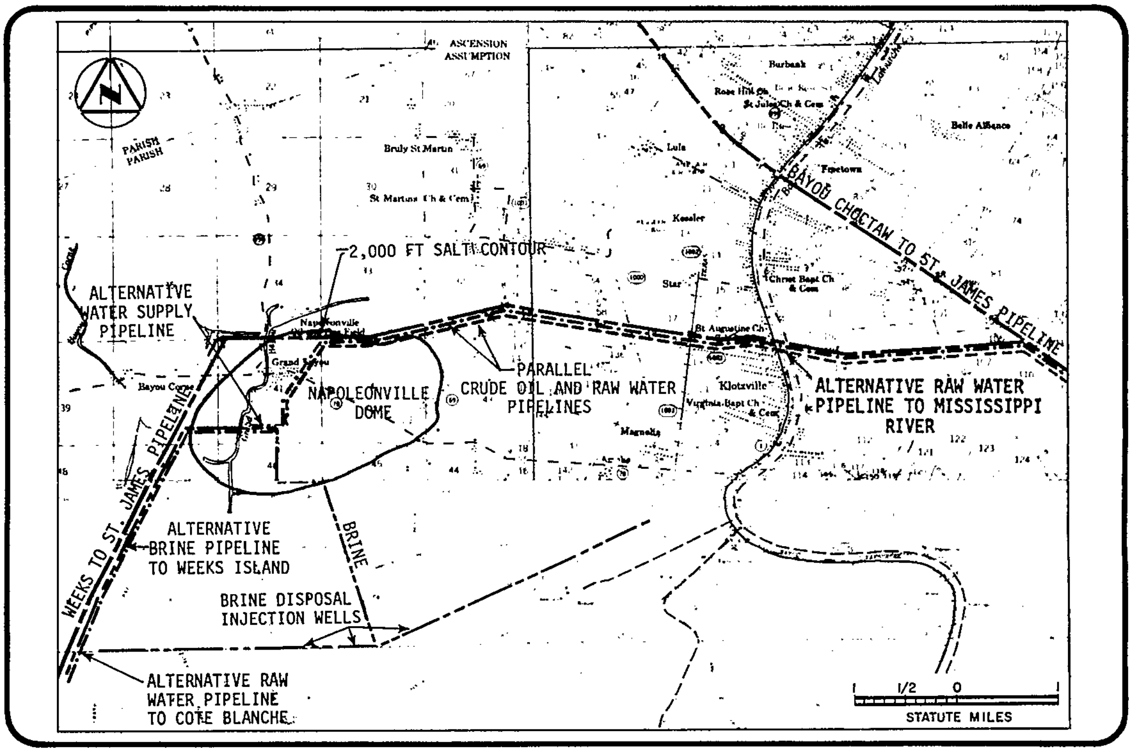
The distribution of oil stored at Napoleonville is planned via a new 19.1 mile pipeline parallel to the Weeks Island-St. James pipeline, which passes near the west and north flanks of the Napoleonville dome. The connection to the dome would be approximately 0.5 mile in length and would cross freshwater swamps. The remainder of the pipeline would be located within the Weeks Island-St. James pipeline right-of-way and would cross 10.6 miles of agricultural land and 8.0 miles of freshwater swamp. During oil recovery operations, the maximum design flow rate of oil would be 1.0 MMB per day for withdrawal.

The storage site would cover approximately 437 acres and would be enclosed by a fence. The central plant area would include the main pump building, control building, warehouses, laboratory, and office. A brine surge pond, blanket oil tank, raw water tank, and oil metering area would be adjacent to the central plant area. A system of roadways would also be required, as would pipelines for oil distribution, brine disposal, and raw water. Locations of caverns and facilities are shown on Figure 2.3-3. The acreages of different ecosystems to be affected and the miles of pipeline and cubic yards of fill for proposed and alternate systems are given in Tables 2.3-1 and 2.3-2. The development timetable is presented in Figure 2.3-4.

#### 2.3.4.2 Alternative Facilities

Grand Bayou, located immediately to the west of the site, would be an alternative source of raw water. The ability of Grand Bayou to meet water demands has not been established. If nearby surface water sources could not be developed, alternative supplies include ground water from wells near the site, or water from the Gulf of Mexico via pipeline. Another alternative would be to pump raw water from the Mississippi River near St. James. This system may also include a certrifugal desander for clearing excess sediment from the water. Effluent from the desander would be returned to the Mississippi River; a desilting pond may be constructed if needed to prevent silt buildup in the caverns.

An alternative method of brine disposal would be to pump it to the Gulf of Mexico near Cote Blanche.



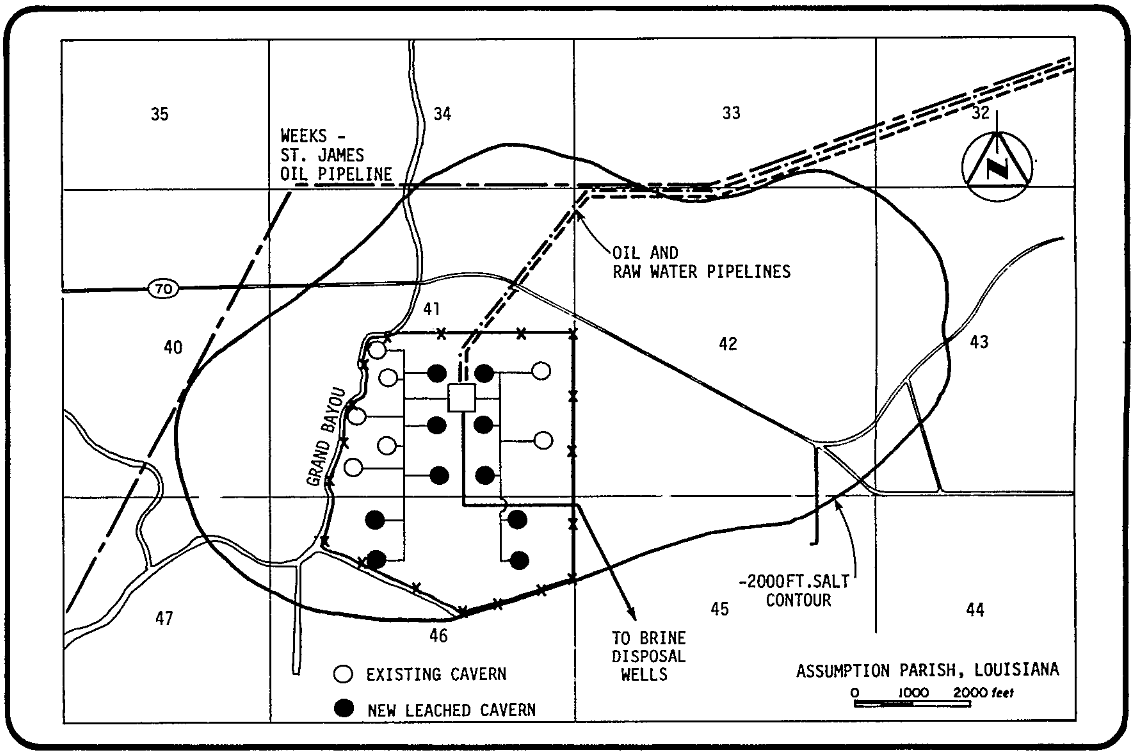




FIGURE 2.3-3 Vicinity and site map - Napleonville dome.

# TABLE 2.3-1 Proposed physical facilities - Napoleonville - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage | | | | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cleared Land Constr/Maint | Bottomland Forest Constr/Maint | Deciduous Swamp Constr/Maint | Marsh Constr/Maint | | | |
| A. SPR Facilities - Napoleonville - Fenced Area - 437 acres | | | | | | | | | | |
| 1) Storage Site | | | | | | | | | | |
| a) Central Plant Area | --- | --- | 80,000 | --- | --- | 10/10 | --- | --- | --- | 10/10 |
| b) Brine Surge Pond | --- | --- | 28,000 | --- | --- | 4/4 | --- | --- | --- | 4/4 |
| c) Roadways to Cavern Wellheads (3 miles) | --- | --- | 65,000 | --- | --- | 12/5 | --- | --- | --- | 12/5 |
| d) Cavern Wellhead Pads | --- | --- | 74,000 | --- | 7/4 | 3/2 | --- | --- | --- | 10/6 |
| e) Containment Dikes at Cavern Wellheads | --- | --- | 12,000 | --- | 5/2 | 3/1 | --- | --- | --- | 8/3 |
| f) Distribution Pipelines Within Plant Area | 9.0 | 144,000 | --- | --- | 12/8 | 6/4 | --- | --- | --- | 18/12 |
| g) Blanket Oil Tank Containment Dike | --- | --- | 2,000 | --- | --- | 1/1 | --- | --- | --- | 1/1 |
| 2) Offsite | | | | | | | | | | |
| a) Brine Disposal (Wells) | | | | | | | | | | |
| 1. Pipeline Excavation | 6.7 | 106,000 | --- | 16/10 | --- | 49/31 | --- | --- | --- | 65/41 |
| 2. Roadways to Brine Disposal Wellheads (5.1 mi) | --- | --- | 110,000 | --- | --- | --- | --- | --- | --- | --- |
| 3. Brine Disposal Wellhead Pads | --- | --- | 85,000 | --- | --- | 11/7 | --- | --- | --- | 11/7 |
| b) Raw Water Supply (from Bayou Lafourche) | | | | | | | | | | |
| 1. Pump Station | --- | --- | 5,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |
| 2. Pipeline Excavation | 4.6 | 74,000 | --- | 10/6 | --- | 2/1 | --- | 2 | 1 | 13/7 |
| c) Crude Oil Distribution (to Terminal) | 19.1 | 300,000 | --- | 39/24 | --- | 22/14 | --- | 4 | 1 | 62/38 |
| 3) St. James Terminal (DOE) | | | | | | | | | | |
| a) 4 -200,000 bbl Tanks with Dikes | --- | --- | 96,000 | 24/24 | --- | --- | --- | --- | --- | 24/24 |
| b) Roads and Miscellaneous | --- | --- | 16,000 | 12/12 | --- | --- | --- | --- | --- | 12/12 |
| 4) Koch Terminal | 3.2 | 760,000 | --- | 57/47 | --- | --- | --- | 1 | 10 | 67/47 |
| 5) Nordix Terminal | 7.0 | 798,000 | 82,000 | 68/53 | 55/25 | --- | --- | 15 | 16 | 139/78 |
| Sub-Total (SPR Facilities-Napoleonville) | 49.6 | 2,182,000 | 655,000 | 227/177 | 79/39 | 123/80 | --- | 22 | 28 | 457/296 |
| B. Early Storage Facilities | | | | | | | | | | |
| 1) Weeks Island | | | | | | | | | | |
| a) Storage Site | --- | --- | --- | 4/4 | --- | --- | --- | --- | --- | 4/4 |
| b) Crude Oil Distribution | 64.4 | 1,069,000 | --- | 145/90 | 40/25 | 307/191 | 60/37 | 24 | 71 | 623/343 |
| c) St. James Terminal | --- | 30,000 | 54,000 | 15/15 | --- | --- | --- | --- | --- | 15/15 |
| Sub-Total (Early Storage Weeks Island) | 64.4 | 1,099,000 | 54,000 | 164/109 | 40/25 | 307/191 | 60/37 | 24 | 71 | 642/362 |

TABLE 2.3-1 continued.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 2) Bayou Choctaw | | | | | | | | | | |
| a) Storage Site | 7.0 | 37,000 | --- | 120/120 | --- | --- | --- | 4 | 2 | 122/120 |
| b) Brine Disposal | 2.9 | 46,000 | 95,000 | --- | --- | 31/20 | --- | 7 | 1 | 32/20 |
| c) Raw Water Supply | --- | --- | 5,000 | --- | --- | --- | --- | --- | --- | --- |
| d) Crude Oil Distribution | 38.0 | 383,000 | --- | 268/167 | 35/22 | 64/40 | --- | 13 | 1 | 368/229 |
| e) St. James Terminal | 1.0 | 35,000 | 54,000 | 40/34 | --- | --- | --- | --- | --- | 40/34 |
| Sub-Total (Early Storage-Bayou Choctaw) | 48.9 | 501,000 | 154,000 | 428/321 | 35/22 | 95/60 | --- | 24 | 4 | 562/403 |
| Sub-Total (Early Storage-Weeks Island plus Bayou Choctaw) | 113.3 | 1,600,000 | 208,000 | 592/430 | 75/47 | 402/251 | 60/37 | 48 | 75 | 1204/765 |
| Total (Early Storage at Weeks Island and Bayou Choctaw plus Napoleonville Dome) | 162.9 | 3,782,000 | 863,000 | 819/607 | 154/86 | 525/331 | 60/37 | 70 | 103 | 1661/1061 |

TABLE 2.3-2 Alternative physical facilities - Napoleonville - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage | | | | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cleared Land Constr/Maint | Bottomland Forest Constr/Maint | Deciduous Swamp Constr/Maint | Marsh Constr/Maint | | | |
| 1) Brine Disposal | | | | | | | | | | |
| a) Pipeline (Napoleonville dome to Gulf near Cote Blanche | 74.4 | 1,129,000 | --- | 17/11 | 5/3 | 45/28 | 25/15 | 25 | 849 | 941/57 |
| b) Backup Brine Injection Wells | 3.7 | 20,000 | --- | 6/4 | --- | --- | --- | --- | --- | 6/4 |
| 2) Raw Water Supply | | | | | | | | | | |
| a) Grand Bayou | 0.4 | 2,100 | 5,000 | --- | --- | 4/3 | --- | --- | --- | 4/3 |
| b) Wells (along oil line east of Napoleonville dome) | 4.9 | 78,000 | 110,000 | 26/17 | --- | --- | --- | 2 | 1 | 27/17 |
| c) Gulf near Cote Blanche | 44.3 | 653,000 | 5,000 | 17/11 | 5/3 | 45/28 | 25/15 | 25 | 120 | 212/57 |
| d) Mississippi River at St. James | 19.1 | 300,000 | 5,000 | 39/24 | --- | 22/14 | --- | 4 | 1 | 62/38 |
| 3) Nordix Terminal and alternative pipeline | 10 | 123,300 | 82,000 | 74/56 | 21/15 | --- | --- | 4 | 1 | 96/71 |

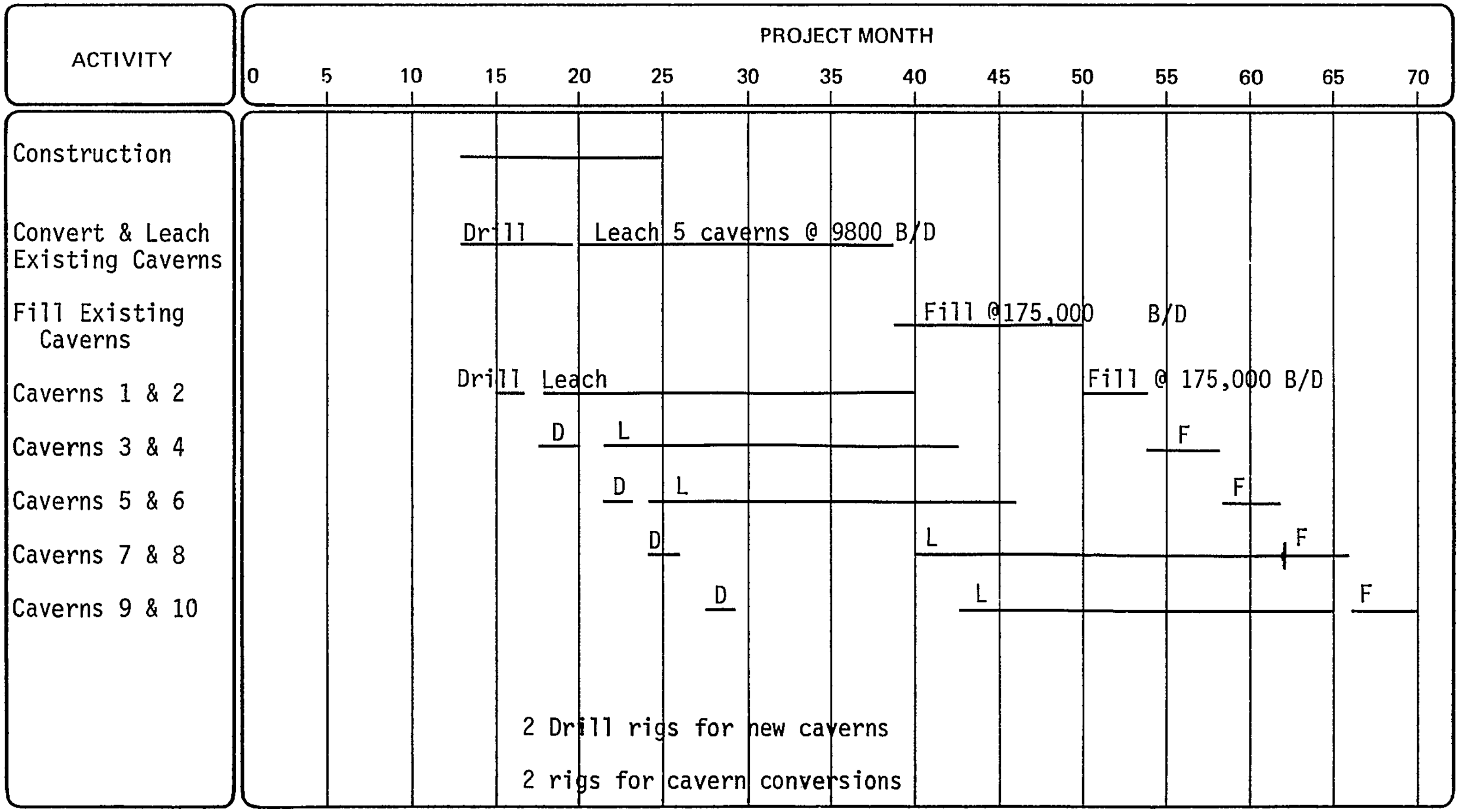



FIGURE 2.3-4 Development timetable - Napoleonville.

## 2.4 ALTERNATIVE GROUPING NO. 1 - EARLY STORAGE SITES PLUS EXPANSION OF WEEKS ISLAND

### 2.4.1 Group Description

The first alternative grouping for development of storage for the Capline Group would utilize early storage of approximately 183 MMB at the Bayou Choctaw and Weeks Island sites plus construction of 91 MMB of additional storage in leached caverns at the Weeks Island site (Figure 2.4-1) for a total storage capacity approximately 274 MMB. The addition of Cote Blanche to the site grouping, if program requirements and objectives so dictate, would increase total storage capacity by 27 MMB to 301 MMB. Development at Weeks Island would be in two stages. The existing underground salt mine operated by Morton Salt Company would be converted to crude oil storage during the early storage phase of the SPR Program (see Section 2.3.3 and FES 76/77-8). Leached caverns would then be constructed to provide additional storage under the long-range provision of the program. Section 2.4.2 describes the proposed expansion and relates it to previously existing and early storage facilities at the site. Details of the planned expansion are presented in Section A.5.2 of Appendix A. The expanded capacity could be developed without construction of a new crude oil distribution pipeline to the terminals, as only increased usage of the existing Weeks Island-St. James pipeline (early storage) would be necessary. Terminal facilities for oil distribution are described in Section 2.3.1.

### 2.4.2 Weeks Island Expansion

The Weeks Island salt dome is in Iberia Parish about 95 miles southwest of New Orleans and 14 miles south of New Iberia, Louisiana (see Figures 2.4-1 and 2.4-2). The former town of Weeks overlies a portion of the island. Vehicle access to the site is by State Highway 83 which crosses the east side of the island. Paved roads then lead into the remainder of the island. The Southern Pacific Railroad has a spur line to the island from the south.

The island is surrounded on all sides by brackish and intermediate marsh and swamp forest; the Intracoastal Waterway passes just to the

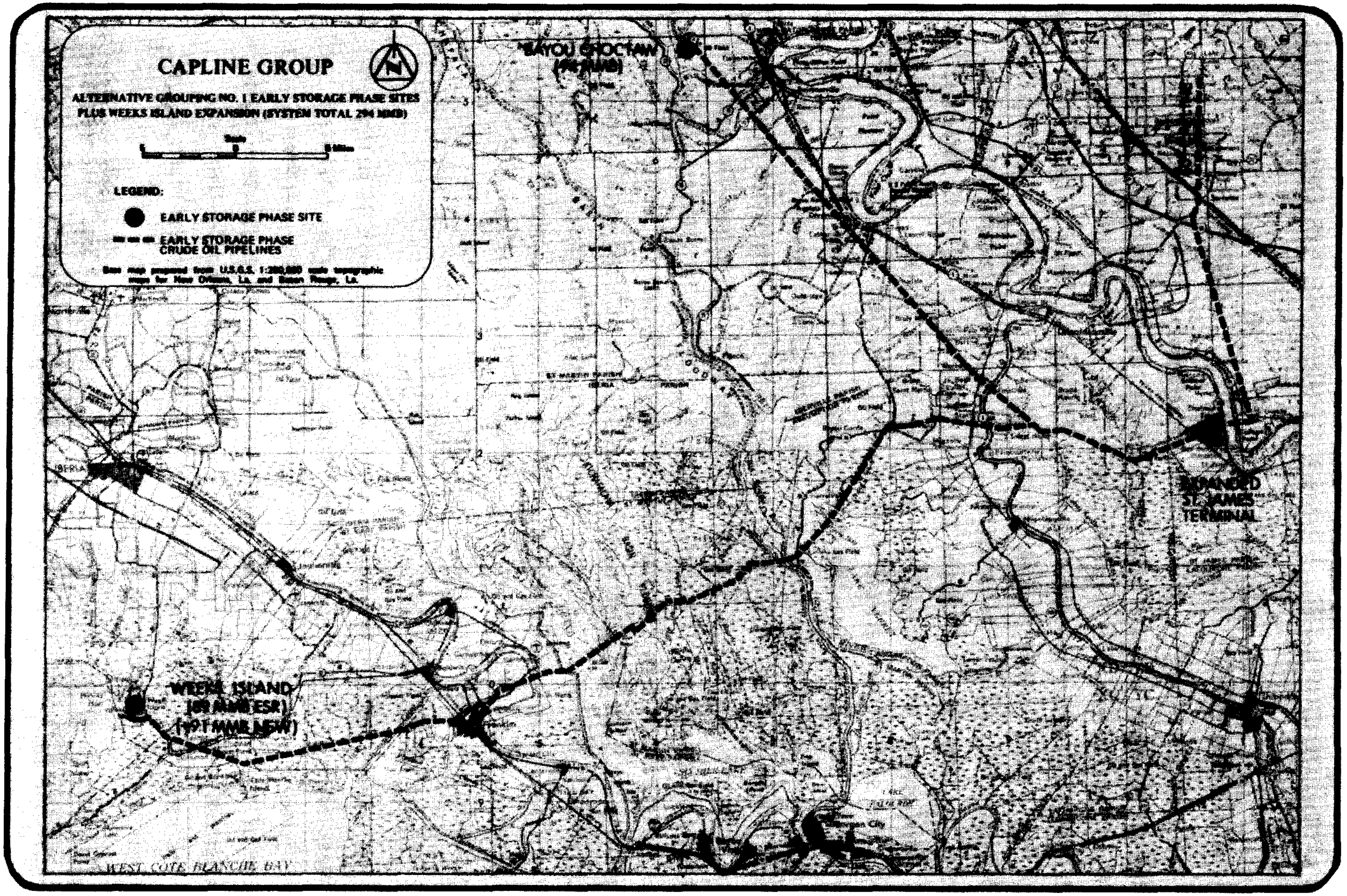



FIGURE 2.4-1 Capline Group alternative no. 1 - early storage sites plus Weeks Island expansion.

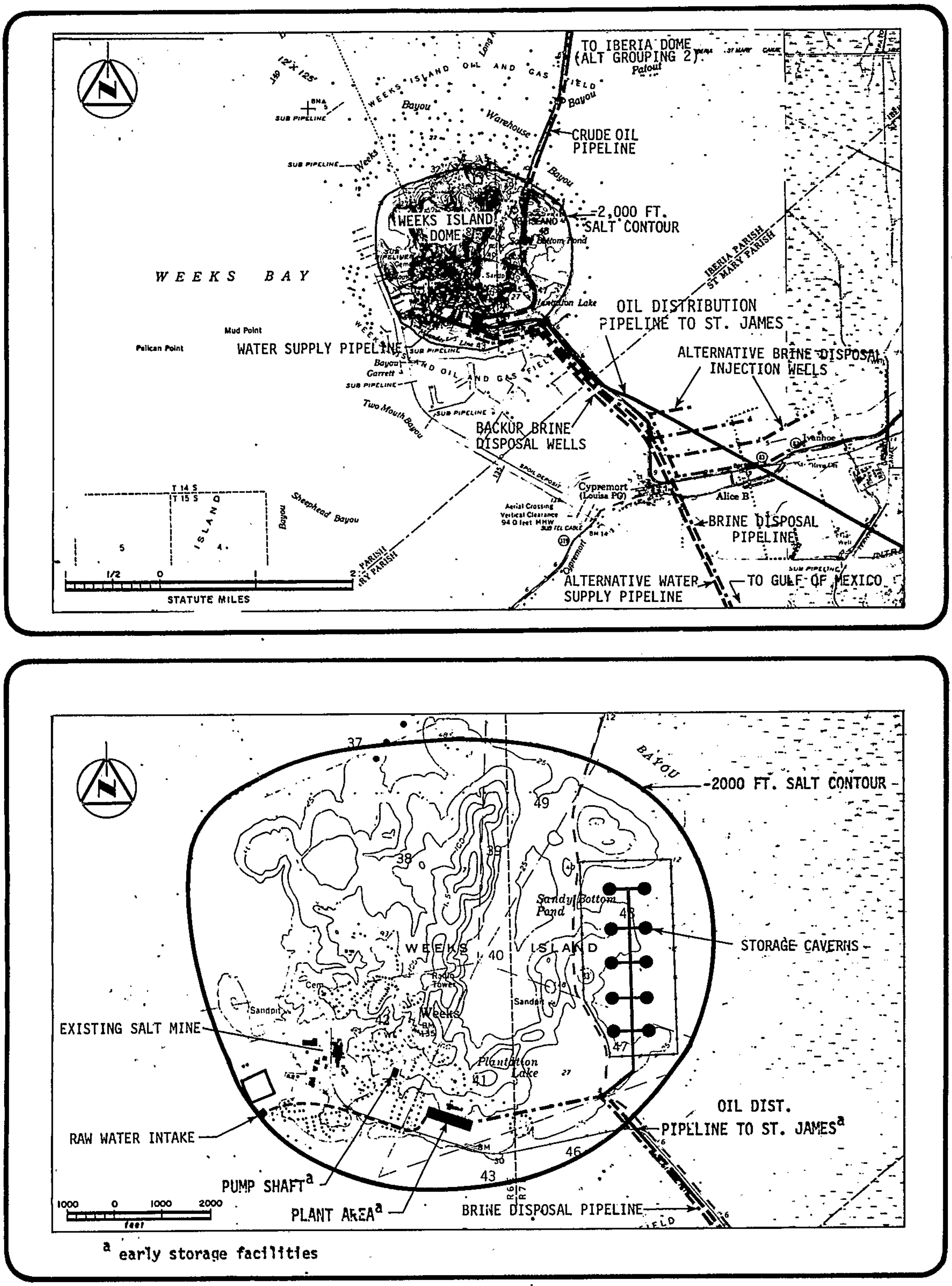



FIGURE 2.4-2 Vicinity and site map - Weeks Island dome.

west. The eastern shore of Weeks Bay lies farther to the west. The area has been extensively explored for oil and gas with numerous wells on all sides of the island. Small access channels have been dredged to many of these wellheads.

Weeks Island is the topographic expression of one of a series of salt domes on the Louisiana coast known as the Five Islands. It is approximately circular with a diameter of two miles; the highest point on the island is about 170 feet above sea level. About 2000 acres are located within the area defined by the -2000 foot salt contour (Figure 2.4-2), of which about 95 percent is dry land. Approximately 100 acres for the storage site would be enclosed by a fence.

The island is characterized by gently rolling slopes, covered with second growth deciduous forest. Farming is limited to a few hundred acres leased from Morton Salt Company along Louisiana 83 on the eastern flank of the island. A Shell Oil Company oil and gas production facility is at the north edge of the island, and the Morton Salt Company mine is confined to the southwest corner of the island.

The existing underground salt mine facilities operated by Morton Salt Company will be converted to storage of 89 million barrels of crude oil utilizing existing mine space only (early storage phase) and no expansion of that capacity by conventional mining methods would be anticipated for later stages of SPR.

2.4.2.1 <u>Proposed Facilities</u>

Expansion of the Weeks Island site as part of alternative grouping no. 1 is assumed to consist, for analysis purposes, of 6 solution-mined cavities of 10 MMB capacity each, two with a capacity of 7.3 MMB, and two of 8.2 MMB capacity. This 91 MMB of additional storage plus the 89 MMB of early storage would yield a design storage capacity at Weeks Island of approximately 180 MMB.

Acreages, fill volumes, and ecosystems crossed for the proposed and alternate developments are indicated on Tables 2.4-1 and 2.4-2. The storage area layout is shown on Figure 2.4-2. The development timetable is given in Figure 2.4-3.

TABLE 2.4-1 Proposed physical facilities - Weeks Island - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage | | | | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Cleared Land Constr/Maint | Bottomland Forest Constr/Maint | Deciduous Swamp Constr/Maint | Marsh Constr/Maint | | | |
| A. SPR Facilities - Weeks Island - Fenced Area - 100 acres | | | | | | | | | | |
| 1) Storage Site | | | | | | | | | | |
| a) Brine Surge Pond | --- | --- | 24,000 | 2/2 | --- | --- | --- | --- | --- | 2/2 |
| b) Roadways to Cavern Wellheads | --- | --- | 16,000 | 2/2 | 1/1 | --- | 1/1 | --- | --- | 4/4 |
| c) Cavern Wellhead Drill Pads | --- | --- | 60,000 | 2/2 | 1/1 | --- | 1/1 | --- | --- | 4/4 |
| d) Cavern Wellhead Containment Dikes | --- | --- | 7,000 | 8/5 | 3/2 | --- | --- | --- | --- | 11/7 |
| e) Blanket Oil Tank Containment Dike | --- | --- | 6,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |
| f) Raw Water Surge Pond | --- | --- | 23,000 | 2/2 | --- | --- | --- | --- | --- | 2/2 |
| g) Raw Water, Oil, and Brine Pipelines to Cavern Wellheads | 6.6 | 35,000 | --- | 5/3 | 2/1 | --- | --- | --- | --- | 7/4 |
| h) Miscellaneous | --- | --- | 1,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |
| 2) Brine Disposal | | | | | | | | | | |
| a) Pipeline to Gulf of Mexico | 37.6 | 575,300 | --- | 28/18 | --- | 13/8 | 13/8 | 6 | 778 | 832/34 |
| b) Back-up Brine Wells | 2.3 | 12,000 | 13,300 | 3/2 | --- | 2/1 | --- | --- | --- | 5/3 |
| 3) Raw Water Supply (from ICW) | 0.9 | 5,000 | 5,000 | 9/6 | --- | --- | --- | --- | --- | 9/6 |
| 4) St. James Terminal | | | | | | | | | | |
| a) 4 - 200,000 bbl tanks | --- | --- | 96,000 | 24/24 | --- | --- | --- | --- | --- | 24/24 |
| b) Roads and Miscellaneous | --- | --- | 16,000 | 12/12 | --- | --- | --- | --- | --- | 12/12. |
| 5) Koch Terminal | 3.2 | 760,000 | --- | 57/47 | --- | --- | --- | 1 | 10 | 67/47 |
| 6) Nordix Terminal | 7.0 | 798,000 | 82,000 | 68/53 | 55/25 | --- | --- | 15 | 16 | 139/78 |
| Sub-Total (SPR Facilities-Weeks Island) | 57.6 | 2,185,300 | 349,300 | 224/180 | 62/30 | 15/9 | 15/10 | 22 | 804 | 1120/229 |
| B. Early Storage Facilities | | | | | | | | | | |
| 1) Weeks Island | | | | | | | | | | |
| a) Storage Site | --- | --- | --- | 4/4 | --- | --- | --- | --- | --- | 4/4 |
| b) Crude Oil Distribution | 64.4 | 1,069,000 | --- | 145/90 | 40/25 | 307/191 | 60/37 | 24 | 71 | 623/343 |
| c) St. James Terminal | --- | 30,000 | 54,000 | 15/15 | --- | --- | --- | --- | --- | 15/15 |
| Sub-Total (Early Storage-Weeks Island) | 64.4 | 1,099,000 | 54,000 | 164/109 | 40/25 | 307/191 | 60/37 | 24 | 71 | 642/362 |

TABLE 2.4-1 continued.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 2) Bayou Choctaw | | | | | | | | | | |
| a) Storage Site | 7.0 | 37,000 | --- | 120/120 | --- | --- | --- | 4 | 2 | 122/120 |
| b) Brine Disposal | 2.9 | 46,000 | 95,000 | --- | --- | 31/20 | --- | 7 | 1 | 32/20 |
| c) Raw Water Supply | --- | --- | 5,000 | --- | --- | --- | --- | --- | --- | --- |
| d) Crude Oil Distribution | 38.0 | 383,000 | --- | 268/167 | 35/22 | 64/40 | --- | 13 | 1 | 368/229 |
| e) St. James Terminal | 1.0 | 35,000 | 54,000 | 40/34 | --- | --- | --- | --- | --- | 40/34 |
| Sub-Total (Early Storage-Bayou Choctaw) | 48.9 | 501,000 | 154,000 | 428/321 | 35/22 | 95/60 | --- | 24 | 4 | 562/403 |
| Sub-Total (Early Storage-Weeks Island plus Bayou Choctaw) | 113.3 | 1,600,000 | 208,000 | 592/430 | 75/47 | 402/251 | 60/37 | 48 | 75 | 1204/765 |
| Total (Early Storage at Weeks Island and Bayou Choctaw plus Expansion of Weeks Island) | 170.9 | 3,785,300 | 557,300 | 816/610 | 137/77 | 417/260 | 75/47 | 70 | 879 | 2324/994 |

TABLE 2.4-2 Alternative physical facilities - Weeks Island - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Raw Water Supply (from Gulf of Mexico) | 7.5 | 98,500 | 5,000 | 7/5 | --- | 3/2 | 3/2 | 6 | 49 | 62/9 |
| 2) Brine Disposal (Wells) | | | | | | | | | | |
| a) Pipeline Excavation | 8.8 | 151,000 | --- | 87/55 | --- | 19/12 | --- | --- | --- | 106/67 |
| b) Roadways to Brine Disposal Wellheads | --- | --- | --- | 6/4 | --- | --- | --- | --- | --- | 6/4 |
| c) Brine Disposal Well-head Pads | --- | --- | --- | 13/9 | --- | --- | --- | --- | --- | 13/9 |
| 3) Brine Disposal to Alternative Diffuser | 53.1 | 820,800 | --- | 28/18 | --- | 13/8 | 13/8 | 6 | 1154 | 1208/34 |
| 4) Crude Oil Distribution To Gulf of Mexico (SPM) | 61.5 | 1,027,500 | --- | --- | 16/10 | --- | 15/9 | 1 | 1428 | 1459/19 |
| 5) Nordix Terminal and Alternative Pipeline | 10.0 | 773,000 | 82,000 | 74/55 | 21/15 | --- | --- | 4 | 1 | 96/71 |

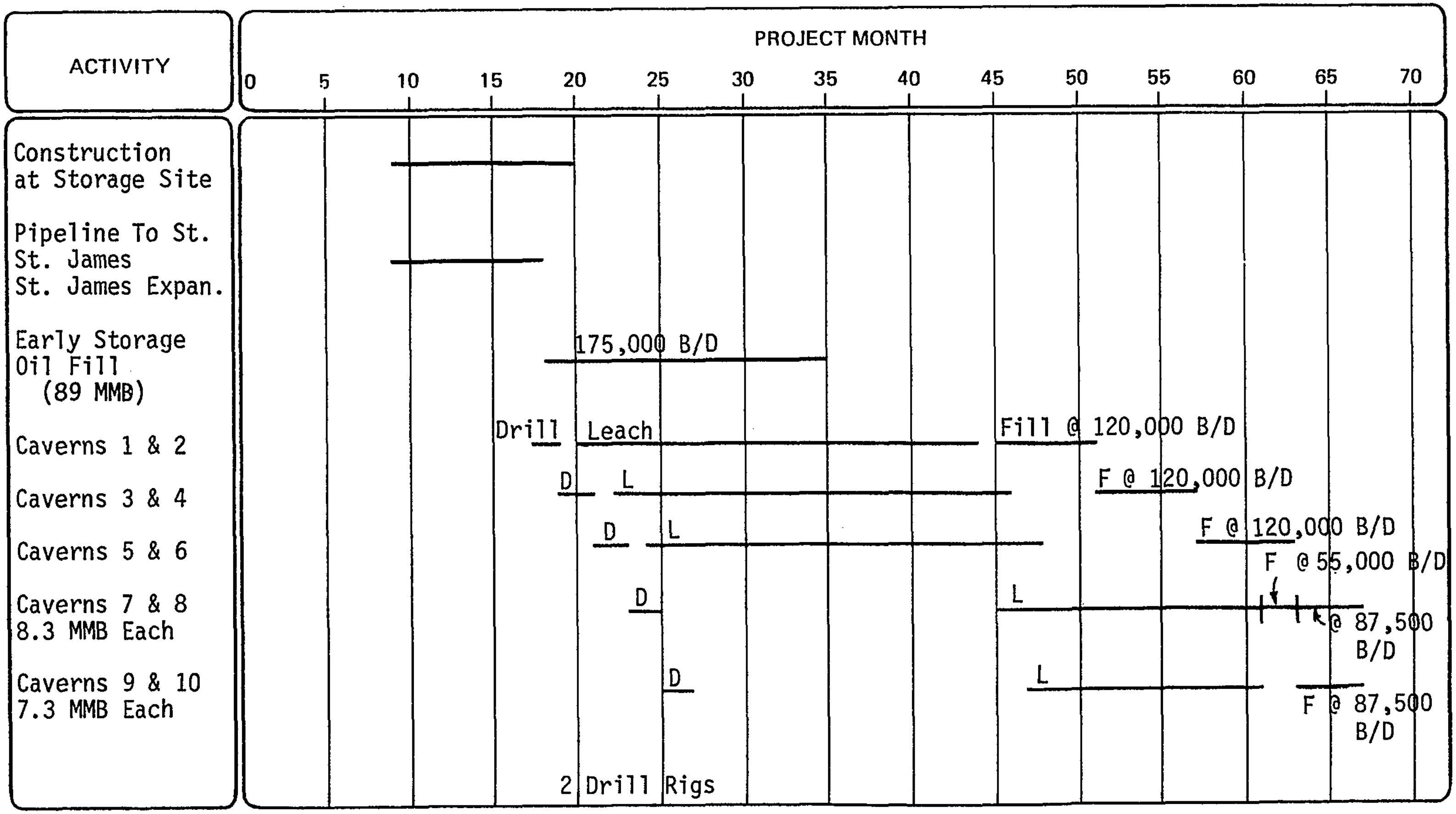



FIGURE 2.4-3 Development timetable for Weeks Island expansion.

The proposed leached cavern storage area would be located away from existing mine works and early storage facilities but would utilize the existing, though expanded, plant area. The caverns, which would be constructed in the grid as shown in Figure 2.4-2, would require about 100 acres and would be enclosed by a fence. They would be connected by pipeline to the main plant area. All flows would be directed through the main plant. A series of roadways and pipelines would be required.

Raw water would be provided through a short pipeline to the Intracoastal Waterway (ICW) west of the mine site. Brine disposal would be accomplished by construction of a pipeline to the Gulf of Mexico. The pipeline would extend about 37.6 miles south of the site. The proposed pipeline route runs offshore 5.5 miles southeast of the plant area, then extends offshore across West Cote Blanche Bay in a southeasterly direction, then south across East Cote Blanche Bay and into the Gulf of Mexico. An underwater pipeline length of 32.1 miles would be required to extend to the 20 foot water depth. The final 2000 feet of the brine disposal pipeline would be constructed as a diffuser, which would consist of thirty-four 3-inch risers stemming from the top of the buried pipeline. Risers would be spaced on 60-foot centers over the 2000 foot long diffuser area. Each riser would be 5 feet above the mudline. The rate of disposal would be 33,000 barrels per hour. During periods of reduced brine disposal, the brine would be retained in the on-site brine pond for short periods, then discharged at the design disposal rate.

To supplement the offshore disposal system, a series of three deep injection wells would be constructed off the southeast flank of the dome, along the brine disposal pipeline. These wells would be valved into the pipeline and would be operated for brine disposal when conditions preclude disposal to the Gulf of Mexico (see Figure 2.4-2).

Crude oil storage would commence with the completion of cavern leaching, or during leaching if concurrent Leach/Fill is utilized. Oil supplies, withdrawals, and subsequent refills are planned utilizing the pipeline connection to the Mississippi River terminals (see Figure 2.4-1). The maximum design flow rate of oil would be 1.0 MMB per day for withdrawal.

#### 2.4.2.2 Alternative Facilities

An alternative raw water source would be the Gulf of Mexico. The pipeline to the Gulf would parallel the primary brine disposal line. Deep well injection could be utilized as an alternative brine disposal method. A possible well field is shown on Figure 2.4-2. An alternative brine diffuser site would require a 53.1 mile pipeline along the DOE right-of-way on land and extending into the Gulf south of the proposed diffuser site.

An alternate method of crude oil distribution would be via pipeline to an offshore loading area in the Gulf of Mexico. This loading area would be constructed at a point in the Gulf with a minimum water depth of 60 feet.

## 2.5 ALTERNATIVE GROUPING NO. 2 - EARLY STORAGE SITES PLUS EXPANSION OF BAYOU CHOCTAW DOME PLUS IBERIA DOME

### 2.5.1 Group Description

Development of the second alternative group would utilize approximately 183 MMB at the Bayou Choctaw and Weeks Island sites. The expansion of Bayou Choctaw from approximately 94 MMB to 150 MMB would increase total storage to approximately 239 MMB, which is about 60 MMB short of the desired 300 MMB total. The further addition of Iberia dome to the alternative grouping yields a total potential storage of up to 289 MMB, which approximates the 300 MMB goal. The addition of Cote Blanche to the site grouping, if program requirements and objectives so dictate, would increase total storage capacity by 27 MMB to 316 MMB. This alternative grouping therefore contains a combination of Bayou Choctaw early storage (see Section 2.3.3), Weeks Island early storage (Section 2.3.4), Bayou Choctaw expansion (Section 2.5.2) and Iberia (Section 2.5.3), to obtain the required total storage (Figure 2.5-1). Details of the planned expansion of Bayou Choctaw and development of Iberia are presented in Sections A.6.2 and A.6.3, respectively, of Appendix A.

Oil distribution for the Iberia site would utilize the Weeks Island-St. James Pipeline constructed for early storage development of the Weeks Island site. The early storage pipeline between Bayou Choctaw and St. James would accommodate expansion of Bayou Choctaw. The terminal facilities for oil distribution are discussed in Section 2.3.1.

### 2.5.2 Bayou Choctaw Dome Expansion Alternative

The Bayou Choctaw salt dome is in east central Iberville Parish and extends slightly into West Baton Rouge Parish, Louisiana. The site is about 12 miles southwest of Baton Rouge, 3.4 miles southwest of the town of Addis and 4 miles northwest of Plaquemine (Figure 2.5-2).

A 4-mile paved parish road provides access to the northern edge of the dome from Louisiana State Highway No. 1. A network of improved gravel lease roads services the existing brine production and surrounding oil production wells.

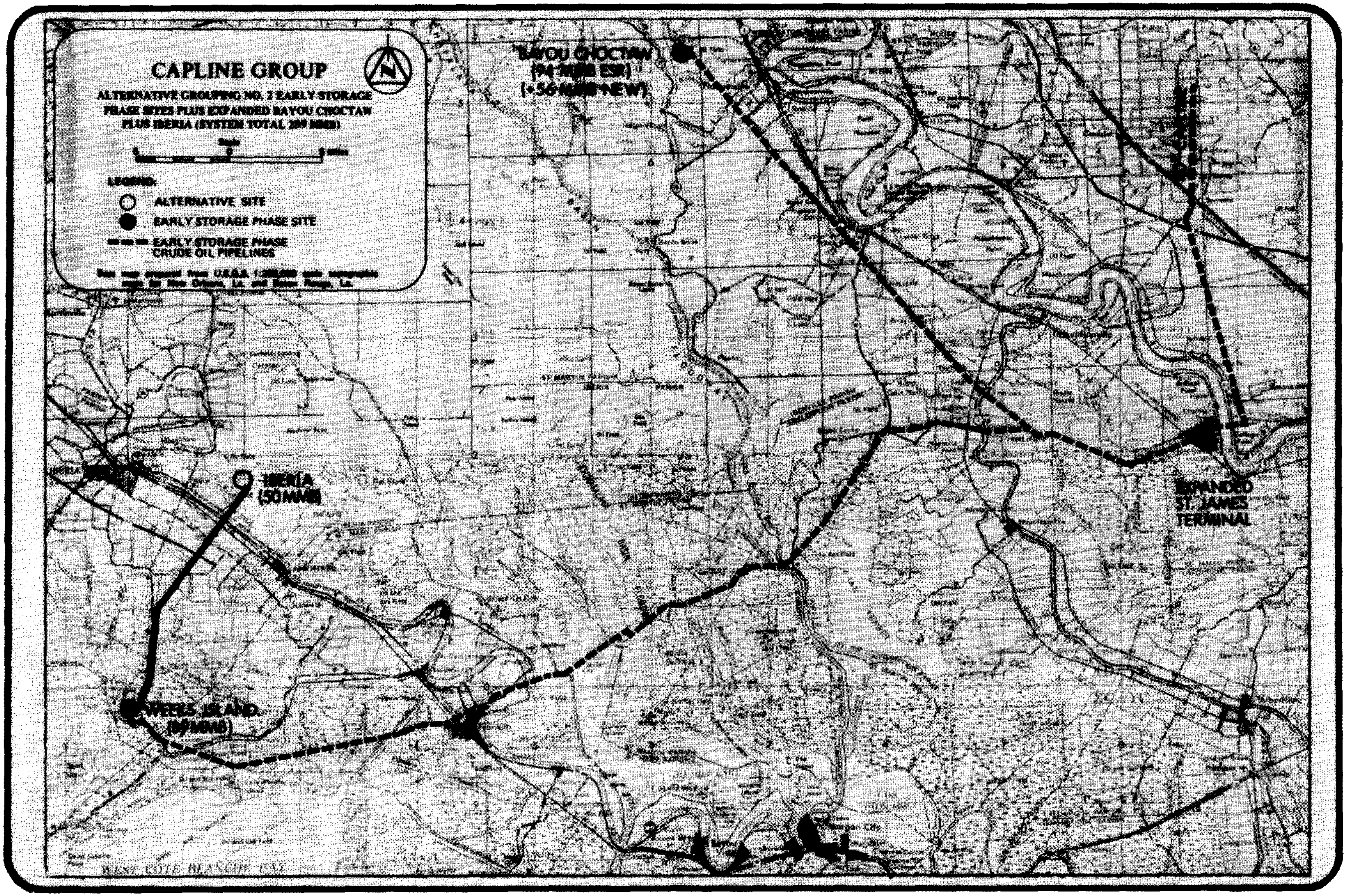
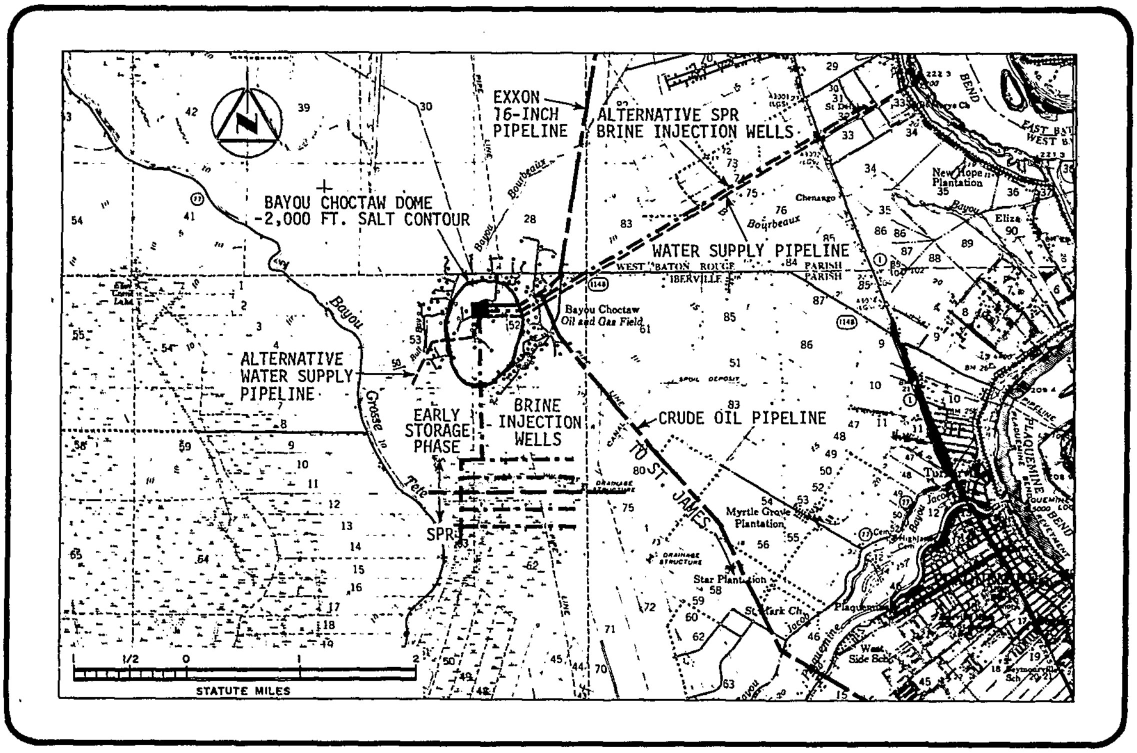



FIGURE 2.5-1 Capline Group alternative no. 2 - early storage sites plus expanded Bayou Choctaw plus Iberia.



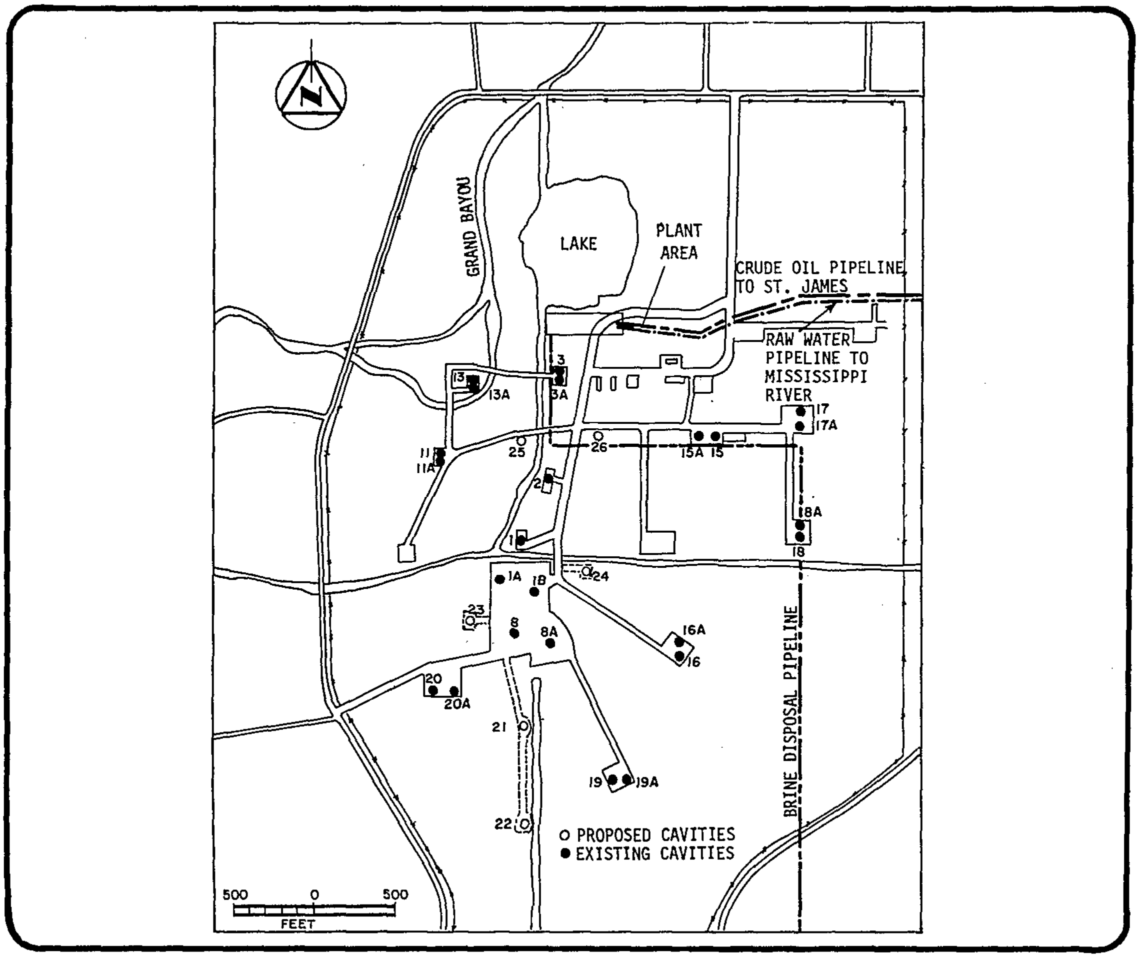




FIGURE 2.5-2 Vicinity and site map - Bayou Choctaw dome.

The Bayou Plaquemine and Port Allen Canal portions of the Intracoastal Waterway (ICW) provide a waterway over 100 feet wide and 9 feet deep to within 2000 feet of the western edge of the salt dome. The ICW, Bull Bay, and an unnamed canal could provide barge access to the central, north, and eastern portions of the dome. A barge terminal, adjacent to the site, could be used during construction. At present, all construction is planned to utilize land-based transportation.

Exxon operates two 16-inch crude oil pipelines within 1 mile of the dome, transporting crude oil from the port at St. James and from southern Louisiana to their refinery at Baton Rouge. Oil distribution from the site via a pipeline to St. James would parallel portions of the Exxon right-of-way.

The general area surrounding the site is swampy with an elevation ranging from less than 5 feet to more than 10 feet above sea level, with no clearly positive topographic expression of the Bayou Choctaw salt mass. Major surface subsidence has occurred due to the collapse of a solution cavity in 1955 during uncontrolled leaching, resulting in the formation of a 12-acre lake (see Figure 2.5-2).

The surface area within the -2000-foot salt contour is about 330 acres. In addition to the area already developed for early storage facilities, an area of about 27 acres would be fenced for the storage site. Portions not acquired by DOE are presently leased by Allied Chemical Corporation for the production of brine feedstock. Six of the existing caverns are subleased for hydrocarbon product storage. No sulfur mining has taken place in the caprock.

#### 2.5.2.1 Proposed Facilities

The planned expansion of the Bayou Choctaw site would principally include the leaching of six new cavities and construction of access roads, pads, protective diking, and pipelines for connection of the new cavities to the initial storage facilities. As part of the initial storage phase, existing brine cavities will be converted to crude oil storage, and construction of oil distribution systems, a displacement water source, and a brine field will be completed. Modifications to existing systems would be required to handle increased oil, water, and brine flows resulting from the approximately 60 percent enlargement of crude oil storage capacity. The principal addition to the existing facilities would be the construction of a water supply pipeline to a new intake on the Mississippi River. Tables 2.5-1 and 2.5-2 indicate acreages, amounts of fill, and ecosystems crossed by proposed and alternative facilities. Figure 2.5-3 is a development timetable.

The Mississippi River would provide displacement water for expansion requirements, through a 5-mile pipeline to an intake east of the site. At the increased storage capacity of 150 MMB, the rate of withdrawal would be 1 million barrels per day (29,200 GPM). (Maximum raw water requirements during cavern leaching would be 18,700 GPM.) The Mississippi River pumps and pipeline would be sized to provide the total raw water requirement. The intake structure on the Mississippi would be sized to meet EPA intake design standards of a maximum velocity of 0.5 feet per second to reduce fish impingement on the intake screen.

A system of up to 10 deep-injection wells will be used for brine disposal during early storage operations. During the latter stages of the expansion, oil fill operations would be concurrent with leaching of new caverns. The combined brine disposal rate resulting from both oil fill and leaching would be on the order of 29,500 barrels per hour (20,700 GPM). The existing early storage well field located south of the plant area would be expanded to a total of 23 brine disposal wells.

The Mississippi River terminals would be used for all oil distribution during withdrawals from the Bayou Choctaw storage site. Plans for the facility as part of the early storage phase include a pipeline to St. James capable of handling a delivery rate of 1 MMB per day.

2.5.2.2 <u>Alternative Facilities</u>

The Port Allen Canal/ICW connects the Mississippi River near Baton Rouge with the Atchafalaya Basin Floodway at Bayou Sorrel, passing within 1 mile of the Bayou Choctaw dome. As an alternative to construction of a pipeline to the Mississippi River, increased pumpage from

TABLE 2.5-1 Proposed physical facilities - Bayou Choctaw and Iberia - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| I. SPR Facilities | | | | | | | | | | |
| A. Bayou Choctaw - Fenced Area - 27 acres | | | | | | | | | | |
| 1) Storage Site | | | | | | | | | | |
| a) Expansion of Cavern Wellhead Containment Dike | --- | --- | 11,000 | --- | --- | 6/6 | --- | --- | --- | 6/6 |
| b) Roadways to New Cavern Wellheads | --- | --- | 6,400 | --- | --- | 6/3 | --- | --- | --- | 6/3 |
| c) Cavern Wellhead Drill Pads | --- | --- | 45,000 | --- | --- | 6/4 | --- | --- | --- | 6/4 |
| d) Distribution of Raw Water, Crude Oil, and Brine | 2 | 19,000 | --- | 8/5 | --- | --- | --- | 1 | 1 | 9/5 |
| 2) Brine Disposal (Wells) | | | | | | | | | | |
| a) Pipeline Excavation | 3.9 | 70,000 | --- | 3/2 | --- | 25/18 | --- | 4 | 1 | 29/20 |
| b) Roadways to Brine Disposal Wellheads | --- | --- | 53,000 | --- | --- | --- | --- | | --- | --- |
| c) Brine Disposal Wellhead Pads | --- | --- | 58,000 | --- | --- | 7/5 | --- | --- | --- | 7/5 |
| 3) Raw Water Supply (from Mississippi River) | 5.4 | 29,000 | 5,000 | 53/33 | --- | --- | --- | 1 | 1 | 54/33 |
| 4) St. James Terminal | | | | | | | | | | |
| a) 4-200,000 bbl tanks | --- | --- | 96,000 | 24/24 | --- | --- | --- | --- | --- | 24/24 |
| b) Roads and Miscellaneous | --- | --- | 16,000 | 12/12 | --- | --- | --- | --- | --- | 12/12 |
| 5) Koch Terminal | 3.2 | 760,000 | --- | 57/47 | --- | --- | --- | 1 | 10 | 67/47 |
| 6) Nordix Terminal | 7.0 | 798,000 | 82,000 | 68/53 | 55/25 | --- | --- | 15 | 16 | 139/78 |
| Sub-Total (SPR Facilities-Bayou Choctaw) | 21.5 | 1,676,000 | 372,400 | 225/176 | 55/25 | 50/36 | 0 | 16 | 29 | 359/237 |
| B. Iberia | | | | | | | | | | |
| 1) Storage Site - Fenced Area - 160 acres | | | | | | | | | | |
| a) Central Plant Area (excludes acreage for brine surge pond and blanket oil tank) | --- | --- | 26,000 | 6/6 | 1/1 | --- | --- | --- | --- | 7/7 |
| b) Brine Surge Pond | --- | --- | 23,300 | 2/2 | --- | --- | --- | --- | --- | 2/2 |
| c) Roadways to Cavern Wellheads (1 mile) | --- | --- | 13,000 | 3/2 | --- | --- | --- | --- | --- | 3/2 |
| d) Cavern Wellhead Pads | --- | --- | 11,000 | 4/3 | --- | --- | --- | --- | --- | 4/3 |
| e) Containment Dikes at Cavern Wellheads | --- | --- | 4,200 | 3/2 | --- | --- | --- | --- | --- | 3/2 |
| f) Distribution within Plant Area | 3.0 | 16,000 | --- | 29/18 | --- | --- | --- | --- | --- | 29/18 |
| g) Blanket Oil Tank Containment Dike | --- | --- | 2,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |

TABLE 2.5-1 continued.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 2) Offsite | | | | | | | | | | |
| a) Brine Disposal (Wells) | | | | | | | | | | |
| 1. Pipeline Excavation | 4.4 | 23,000 | --- | 38/24 | 5/3 | --- | --- | --- | --- | 43/27 |
| 2. Roadways to Wellheads | --- | --- | 26,000 | --- | --- | --- | --- | --- | --- | --- |
| 3. Wellhead Pads | --- | --- | 37,000 | 10/7 | 2/2 | --- | --- | --- | --- | 12/9 |
| b) Raw Water Supply | | | | | | | | | | |
| 1. Pipeline from Bayou Teche | 1.5 | 8,000 | --- | 15/10 | --- | --- | --- | --- | --- | 15/10 |
| 2. Pumping Station | --- | --- | 5,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |
| c) Crude Oil Distribution (to Weeks Island) | 14.6 | 324,000 | --- | 90/56 | --- | 40/25 | 39/25 | 7 | 1 | 170/106 |
| Sub-Total (SPR Facilities-Iberia) | 23.5 | 371,000 | 147,500 | 202/132 | 8/6 | 40/25 | 39/25 | 7 | 1 | 290/188 |
| Sub-Total (SPR Facilities-Bayou Choctaw plus Iberia) | 45.9 | 2,047,000 | 519,900 | 427/308 | 63/31 | 90/61 | 39/25 | 23 | 30 | 649/425 |
| II. Early Storage Facilities | | | | | | | | | | |
| A. Weeks Island | | | | | | | | | | |
| 1) Storage Site | --- | --- | --- | 4/4 | --- | --- | --- | --- | --- | 4/4 |
| 2) Crude Oil Distribution | 64.4 | 1,069,000 | --- | 145/90 | 40/25 | 307/191 | 60/37 | 24 | 71 | 623/343 |
| 3) St. James Terminal | --- | 30,000 | 54,000 | 15/15 | --- | --- | --- | --- | --- | 15/15 |
| Sub-Total (Early Storage-Weeks Island) | 64.4 | 1,099,000 | 54,000 | 169/109 | 40/25 | 307/191 | 60/37 | 24 | 71 | 642/362 |
| B. Bayou Choctaw | | | | | | | | | | |
| 1) Storage Site | 7.0 | 37,000 | --- | 120/120 | --- | --- | --- | 4 | 2 | 122/120 |
| 2) Brine Disposal | 2.9 | 46,000 | 95,000 | --- | --- | 31/20 | --- | 7 | 1 | 32/20 |
| 3) Raw Water Supply | --- | --- | 5,000 | --- | --- | --- | --- | --- | --- | --- |
| 4) Crude Oil Distribution | 38.0 | 383,000 | --- | 268/167 | 35/22 | 64/40 | --- | 13 | 1 | 368/229 |
| 5) St. James Terminal | 1.0 | 35,000 | 54,000 | 40/34 | --- | --- | --- | --- | --- | 40/34 |
| Sub-Total (Early Storage-Bayou Choctaw) | 48.9 | 501,000 | 154,000 | 428/321 | 35/22 | 95/60 | --- | 24 | 4 | 562/403 |
| Sub-Total (Early Storage-Weeks Island plus Bayou Choctaw) | 113.3 | 1,600,000 | 208,000 | 592/430 | 75/47 | 402/251 | 60/37 | 48 | 75 | 1204/765 |
| Total (Early storage at Weeks Island and Bayou Choctaw plus Expansion of Bayou Choctaw plus Iberia) | 158.3 | 3,647,000 | 727,900 | 1019/738 | 138/78 | 492/312 | 99/62 | 71 | 105 | 1853/1190 |

TABLE 2.5-2 Alternative physical facilities - Bayou Choctaw and Iberia - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Brine Disposal | | | | | | | | | | |
| a) To Gulf of Mexico via Chacahoula | | | | | | | | | | |
| 1. Pipeline to Gulf | 119.9 | 1,643,100 | --- | 133/85 | 9/6 | 232/145 | 298/186 | 49 | 574 | 1246/422 |
| 2. Back-up Brine Wells | 2.2 | 11,500 | --- | 6/4 | --- | --- | --- | --- | --- | 6/4 |
| b) Brine Well Field along Raw Water Pipeline from Mississippi River | | | | | | | | | | |
| 1. Pipeline Excavation | 2.6 | 13,600 | --- | 6/4 | --- | --- | --- | --- | --- | 6/4 |
| 2. Roadways to Brine Disposal Wellheads | | --- | --- | 4/3 | --- | --- | --- | --- | --- | 4/3 |
| 2) Raw Water Supply | | | | | | | | | | |
| a) From Gulf of Mexico via Chacahoula | 98.3 | 1,301,000 | 5,000 | 133/85 | 9/6 | 232/145 | 298/186 | 49 | 51 | 723/422 |
| b) From ICW near Bayou Choctaw | 1.0 | 5,300 | 5,000 | 8/6 | --- | --- | --- | --- | --- | 8/6 |
| c) Ground Water Wells along Crude Oil Pipeline | 4.7 | 25,000 | --- | 12/8 | --- | --- | --- | 2 | 1 | 13/8 |
| 3) Nordix Terminal and Alternative Pipeline | 10.0 | 773,300 | 82,000 | 74/56 | 21/15 | --- | --- | 4 | 1 | 96/71 |

TABLE 2.5-2 continued - Iberia.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Brine Disposal (to Gulf of Mexico) | | | | | | | | | | |
| a) Pipeline Excavation | 52.2 | 742,000 | --- | 117/74 | --- | 66/41 | 13/8 | 8 | 778 | 974/123 |
| b) Back-up Brine Wells | 1.9 | 10,000 | --- | 5/3 | --- | --- | --- | --- | --- | 5/3 |
| 2) Raw Water Supply | | | | | | | | | | |
| a) From Lake Fausse Point | | | | | | | | | | |
| 1. Pipeline Excavation | 7.3 | 42,000 | --- | 68/42 | 3/2 | --- | --- | --- | --- | 71/44 |
| 2. Pump Station | --- | --- | 5,000 | 1/1 | --- | --- | --- | --- | --- | 1/1 |
| b) From Gulf of Mexico | | | | | | | | | | |
| 1. Pipeline Excavation | 22.1 | 265,000 | --- | 117/74 | --- | 66/91 | 13/8 | 8 | 49 | 245/123 |
| 2. Pump Station | --- | --- | 5,000 | --- | --- | --- | 1/1 | --- | --- | 1/1 |
| c) Groundwater Wells | 3.7 | 19,500 | --- | 9/6 | --- | --- | --- | 1 | 1 | 10/6 |
| 3) Crude Oil Distribution (to St. James via Napoleonville) | 39.0 | 449,000 | --- | 68/42 | 87/54 | 177/111 | --- | 26 | 116 | 448/207 |

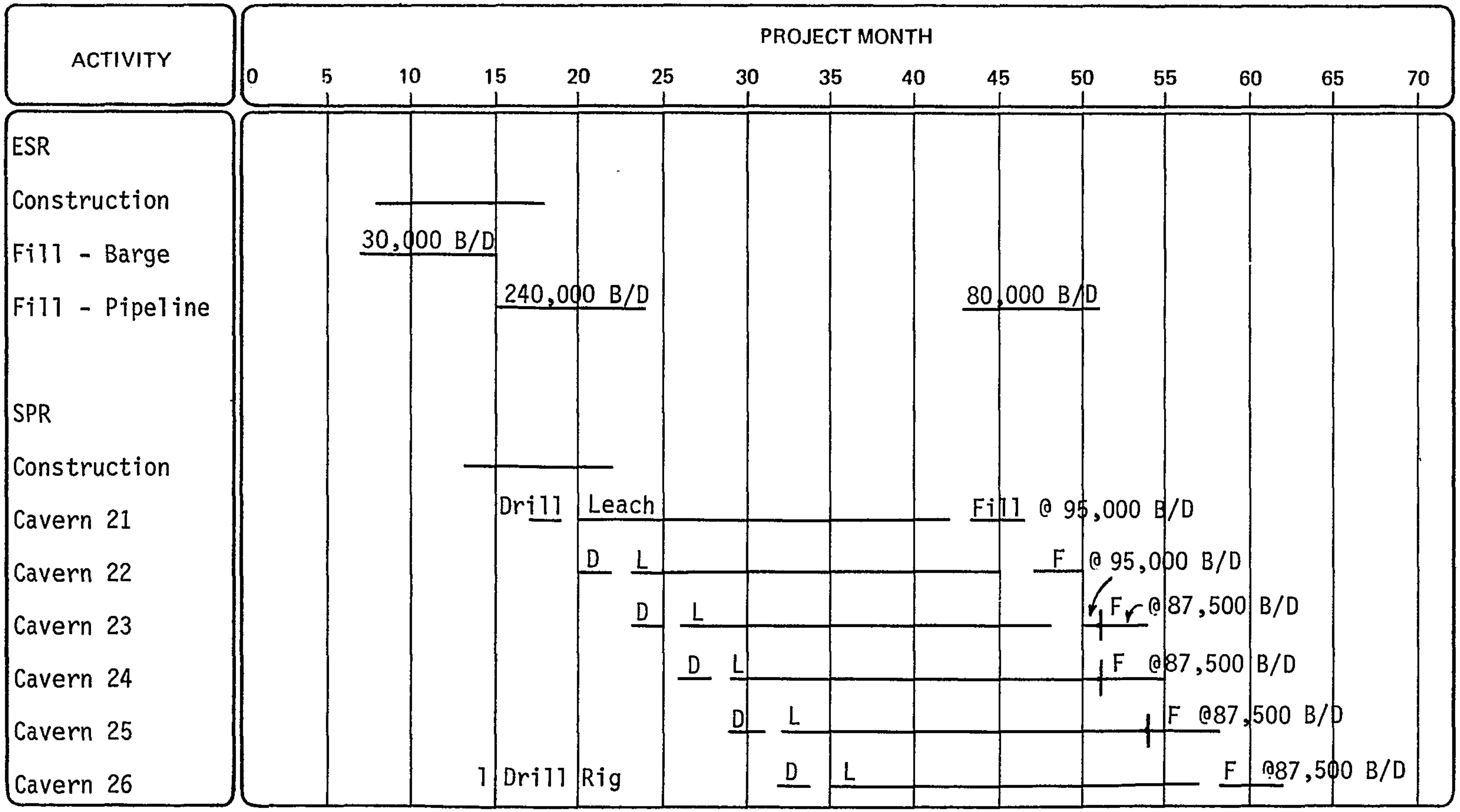



FIGURE 2.5-3 Development timetable for Bayou Choctaw dome.

the onsite lake may be feasible. The pumping facilities at the lake, which connects to the ICW, will be established as part of early storage phase construction.

Shallow subsurface aquifers are also an alternative water source. A well field would be located in the same pipeline right-of-way as the early storage brine disposal pipeline. The wells would tap the Plaquemine aquifer at depths between 100 and 450 feet. The aquifer is considered capable of providing the water quantities required during oil removal.

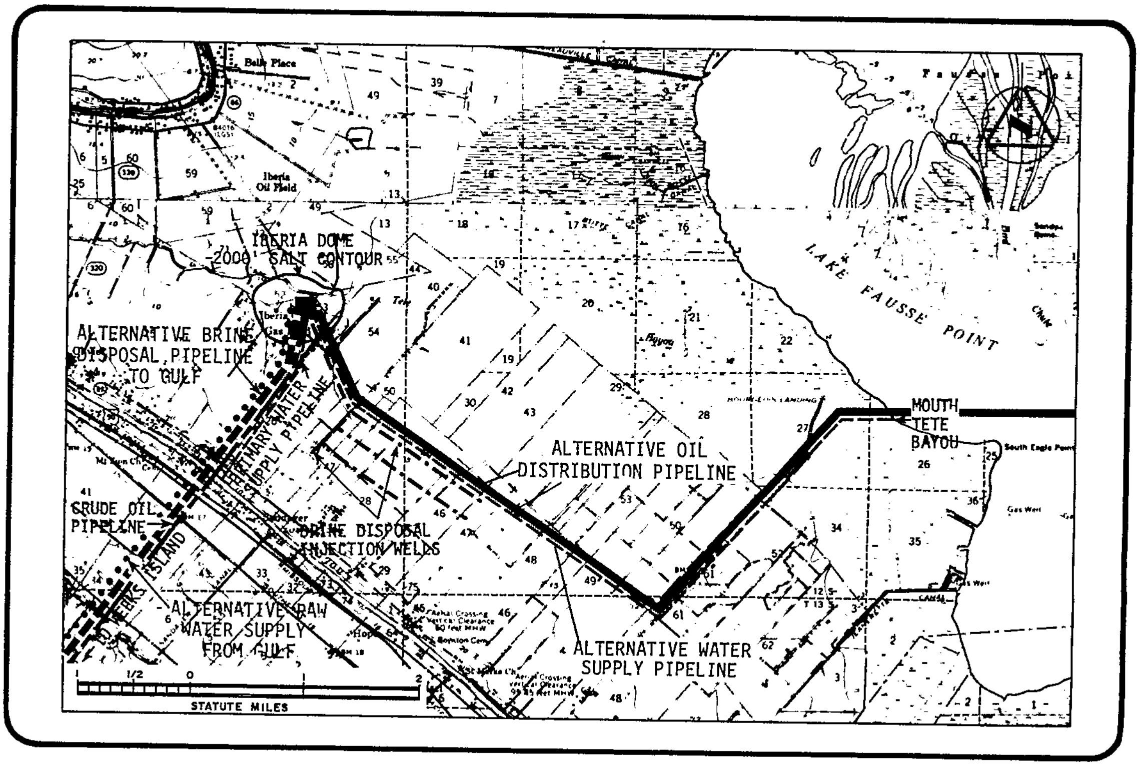
Use of water from the Gulf of Mexico as raw water would likely require that brine be removed to the Gulf as well. To provide the necessary economies in pipelaying, the right-of-way would extend southeast 55.9 miles to near the Chacahoula dome, then southwest the remaining 40.4 miles directly to the Gulf and 23.6 miles to the diffuser. Another alternative for brine disposal would be injection wells along the raw water pipeline from the Mississippi River.

### 2.5.3 Iberia Dome Alternative Site

The Iberia dome is in central Iberia Parish in an agricultural area 5 miles east of New Iberia, and 22 miles southeast of Lafayette, Louisiana (see Figures 2.5-1 and 2.5-4). Vermilion Bay and West Cote Blanche Bay lie 15 and 20 miles to the south, respectively.

The site is accessible via Highway 87/182 from New Iberia, or U.S. 90 from Lafayette. It is 1.5 miles northeast of State Route 182 (formerly U.S. 90) and the paralleling Southern Pacific Railroad line. The site may be reached by existing roads serving the petroleum activity which skirts the edge of the dome. Agricultural roads cross the site.

A meander of Bayou Teche lies approximately 1.5 miles to the south, and a similar distance to the north. The smaller, 50-foot-wide, Bayou Tete crosses the site from west to east and connects with Lake Fausse Pointe 4.2 miles east of the dome. Lake Fausse Pointe opens onto the Gulf of Mexico 50 miles south of the confluence of Bayou Tete and Lake Fausse Pointe.



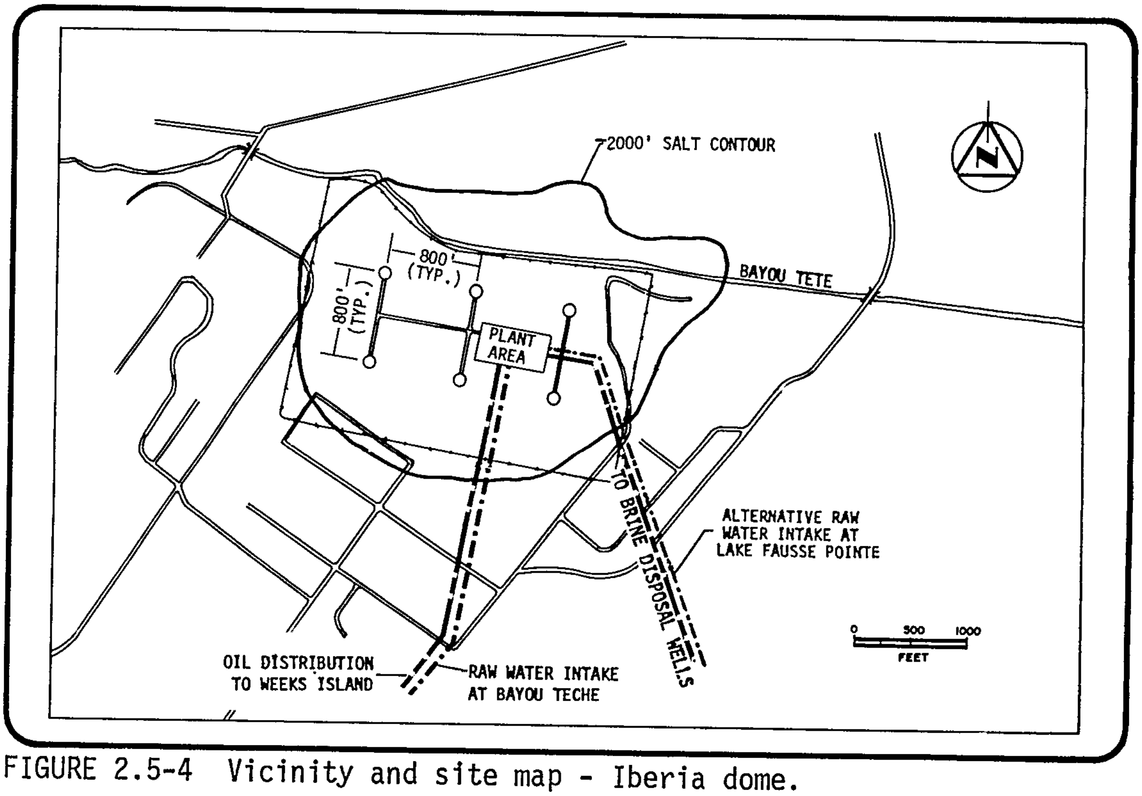




FIGURE 2.5-4 Vicinity and site map - Iberia dome.

The land area overlying the dome is small; about 160 acres are within the area defined by the -2000-foot salt contour. Approximately 160 acres would be fenced in around the storage site. Elevation of the surface area overlying the -2000-foot depth salt contour ranges from under 5 feet to about 10 feet above sea level. The southeast one-third of the dome is tree-covered and the remaining area is mostly agricultural (pasture) land. There is little marshy area or ponded water at the site and no surface expression of the dome. Development of the site will be limited to the area south of Bayou Tete (see Figure 2.5-4).

Oil and gas production has been in progress at the site for many years. The greatest drilling activity has been on the south and west flanks of the dome. The dome's salt resources are presently undeveloped. Four 10 MMB and two 5 MMB caverns would be leached for a total capacity of 50 MMB.

### 2.5.3.1 Proposed Facilities

The six planned storage caverns, along with the central pumping and control facilities would be located on an approximately 160 acre tract. Wellheads would be connected to the central pumping plant by a series of roadways and pipelines. The central pumping and control facilities would be located on an 8- to 10-acre tract near the center of the storage area. The plant area would contain the pump building, control building, offices, laboratory, warehouse, brine surge pond, a blanket oil tank, raw water tank, the oil metering equipment and a 5- to 6-acre material and equipment yard. Power for the facility would be supplied by a transmission line from local commercial sources. Acreages, amounts of fill, and ecosystems crossed by proposed and alternative facilities are indicated on Tables 2.5-1 and 2.5-2. A development timetable is given in Figure 2.5-5.

Bayou Teche is the planned source of raw water for the initial leaching of storage cavities and, later, displacement of stored oil. A 1.5-mile pipeline located in the oil distribution pipeline right-of-way would be constructed from the bayou to the site and would supply 18,700 GPM of water to the plant area. The intake structure at the bayou would

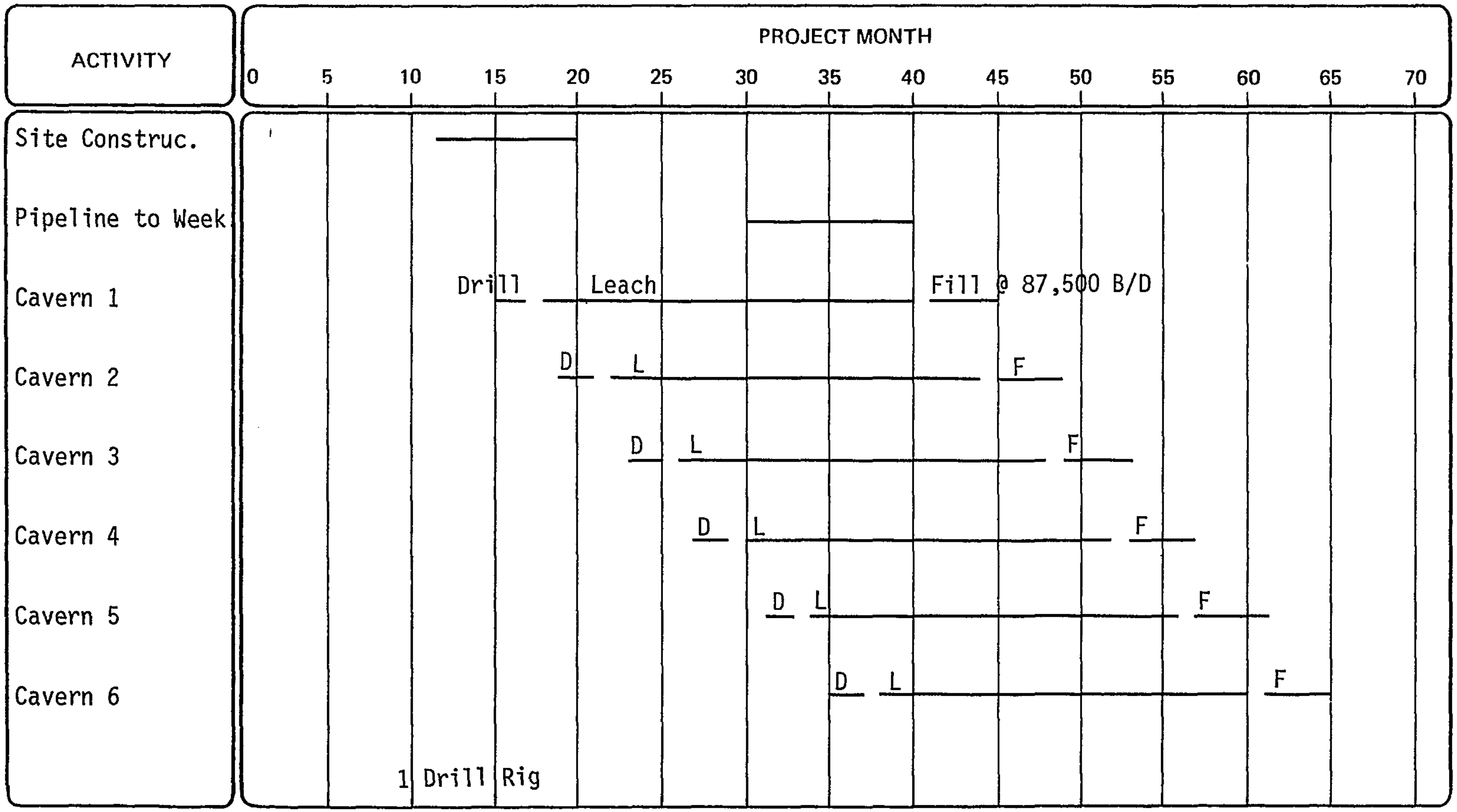



FIGURE 2.5-5 Development timetable for Iberia dome.

incorporate EPA intake design standards for a maximum velocity of 0.5 feet per second to reduce fish impingement on the intake screen.

The proposed method of disposal for the saturated brine is injection into deep sands through 21 injection wells located off the southern flank of the dome. The maximum rate of brine displacement from leaching would be 26,700 barrels per hour (18,700 GPM). The wells would be constructed in the 5000- to 7000-foot depth interval, in a linear well field (Figure 2.5-4).

Oil distribution is planned via a new pipeline connection with the early storage phase facility at Weeks Island, 14 miles southwest of the site (Figures 2.5-1 and 2.5-4). The oil would then be transferred to an existing pipeline and transported to the terminal facilities on the Mississippi River, 60 miles east of Weeks Island.

#### 2.5.3.2 Alternative Facilities

An alternative for oil distribution would involve the construction of a new 39-mile pipeline directly across the Atchafalaya Basin to connect to the Weeks Island-St. James pipeline near Napoleonville.

Alternative surface sources of raw water for displacement purposes would be Lake Fausse Pointe via a 7.3-mile pipeline, or via a pipeline from the Gulf of Mexico. Deep wells along the oil distribution pipeline route for providing a ground water source could also be considered.

Disposal of brine to the Gulf of Mexico is an alternative to deep well injection. The 52.2-mile brine pipeline to the Gulf of Mexico diffuser would parallel the alternative water supply pipeline.

## 2.6 ALTERNATIVE GROUPING NO. 3 - EARLY STORAGE SITES PLUS CHACAHOULA

### 2.6.1 Group Description

Development of Bayou Choctaw and Weeks Island storage reserves during the early storage phase will contribute approximately 183 MMB of crude oil storage to the Capline Group (see Sections 2.3.3 and 2.3.4). The Chacahoula salt dome could be utilized for 200 MMB of additional storage in leached caverns (see Figure 2.6-1). A new pipeline connection for crude oil distribution would be required between Chacahoula and the terminals, to supplement pipelines constructed in connection with the early development sites. Cooperative use of the terminals would be the only interaction among the three sites. Data specific to the Chacahoula site are presented in Section 2.6.2; detailed data are presented in Section A.7.2. Terminal facilities for oil distribution are described in Section 2.3.1 and Section A.4.2.

### 2.6.2 Chacahoula Dome

The Chacahoula dome is approximately 72 miles south of Baton Rouge; and 66 miles west of New Orleans. The Atchafalaya embayment of the Gulf of Mexico is 28 miles to the southwest.

The site is located off of State Highway 309, a paved road. From Thibodaux, the site is 3 miles west on State Highway 1, and 7 miles south on State Highway 309. From Chacahoula, a small unincorporated town, the site is north 2 miles on State Highway 309. Well-maintained lease roads service the oil operations on the south and northwest flanks of the dome. The only roads over the dome itself were built by Freeport Sulphur Company, which has also constructed numerous ditches and levees to restrain the swamp in the dome area.

Terrebonne-Lafourche drainage canal, which runs north-south about 2 miles east of the dome site, connects with Phillips canal to the north and Southern Pacific Railroad at a point approximately 3 miles southeast of the site. A similar north-south canal, Donner Canal, is located immediately west of the proposed storage facility. This canal can bring barge traffic to the Southern Pacific Railroad at a point about 2 miles to the southwest. The Donner Canal also connects with Bayou Black, an

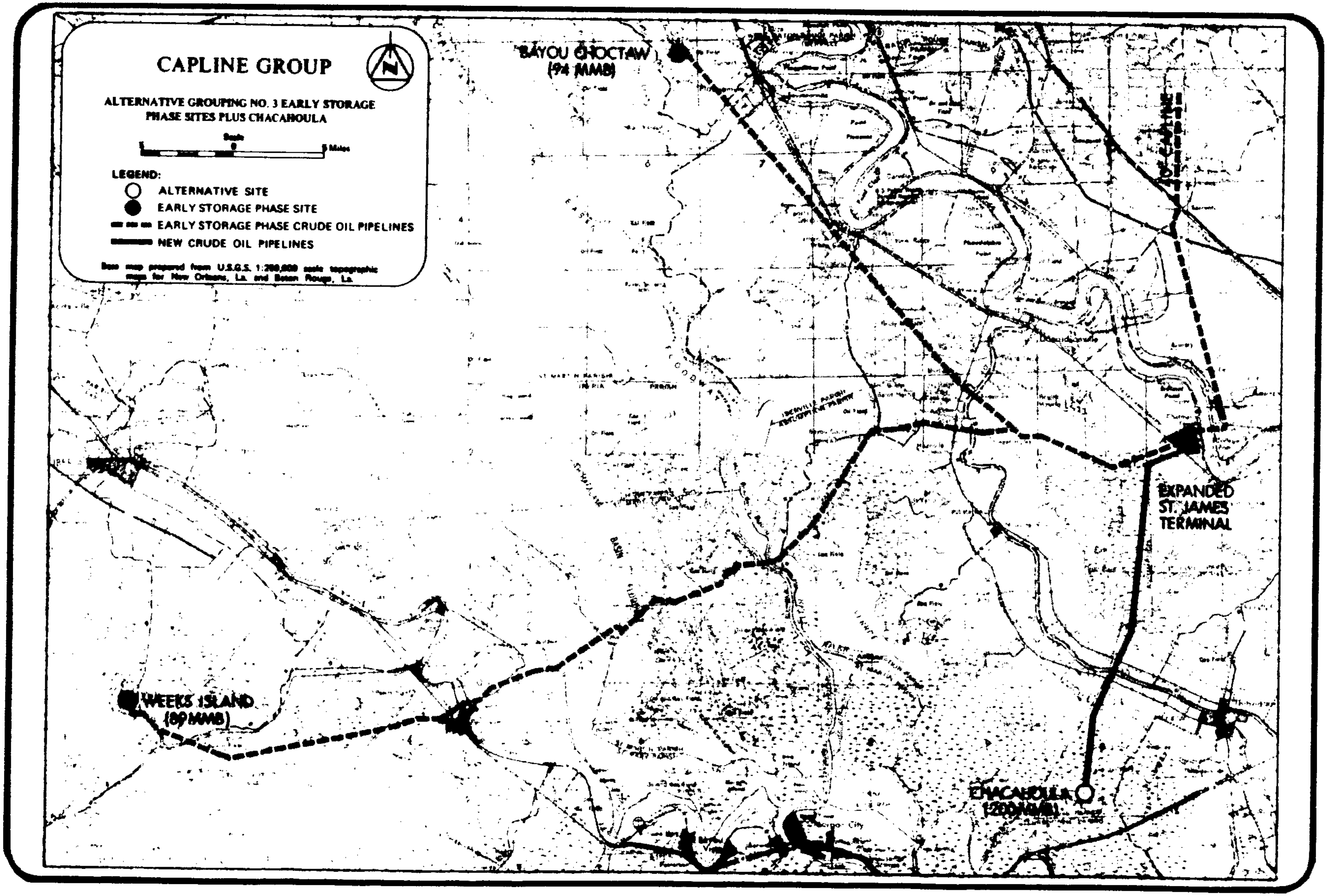



FIGURE 2.6-1 Capline Group alternative no. 3 - early storage sites plus Chacahoula.

important local waterway. Bayou Lafourche lies approximately 7 miles northeast of the site. Its water supply is regulated by a pumping station at Donaldsonville on the Mississippi River. The bayou is navigable from the Gulf of Mexico as far north as Thibodaux.

Exxon operates two 16-inch pipelines within 14 miles of the Chacahoula dome which transport crude oil from southern Louisiana to St. James and to their Baton Rouge refinery. Shell pipeline No. 258 crosses over the Chacahoula dome and carries oil from offshore oil production in the Gulf of Mexico to St. James.

There is no surface expression of the salt mass at Chacahoula. The site and surrounding area is uniformly swampy with an elevation about 6 to 7 feet above sea level. Ponded swamp water is present in the entire area and several feet of fill will be required for construction of roads and drill pads.

2.6.2.1 Proposed Facilities

A surface area of about 2 square miles could be utilized within the -2000 foot depth salt contour (see Figure 2.6-2). Of that area, about 700 acres were exploited by Freeport Sulphur Company in Frasch sulfur production in the caprock. Sulfur production ceased in 1962. Most of the remainder of the dome area can be utilized without affecting the Freeport property. The dome's salt resources are presently undeveloped. The facility would be designed as 24 cavities within an area extending from the Freeport property to the western edge of the dome. The development of a 450 acre fenced site would provide 200 million barrels of the Capline region storage requirement. Twenty four caverns would consist of sixteen 10 MMB caverns and eight 5 MMB caverns.

Brine disposal is proposed via a 64 mile pipeline extending to the Gulf diffuser. The alternative raw water pipeline from the Gulf would parallel this line. Salt water-bearing sands are located at rather deep levels in areas surrounding the site and could be utilized for brine disposal through deep well injection.

The 24 planned storage cavities along with the associated central pumping and control facilities would be located on an approximately 450 acre site just west of the Freeport Sulphur property (Figure 2.6-2).

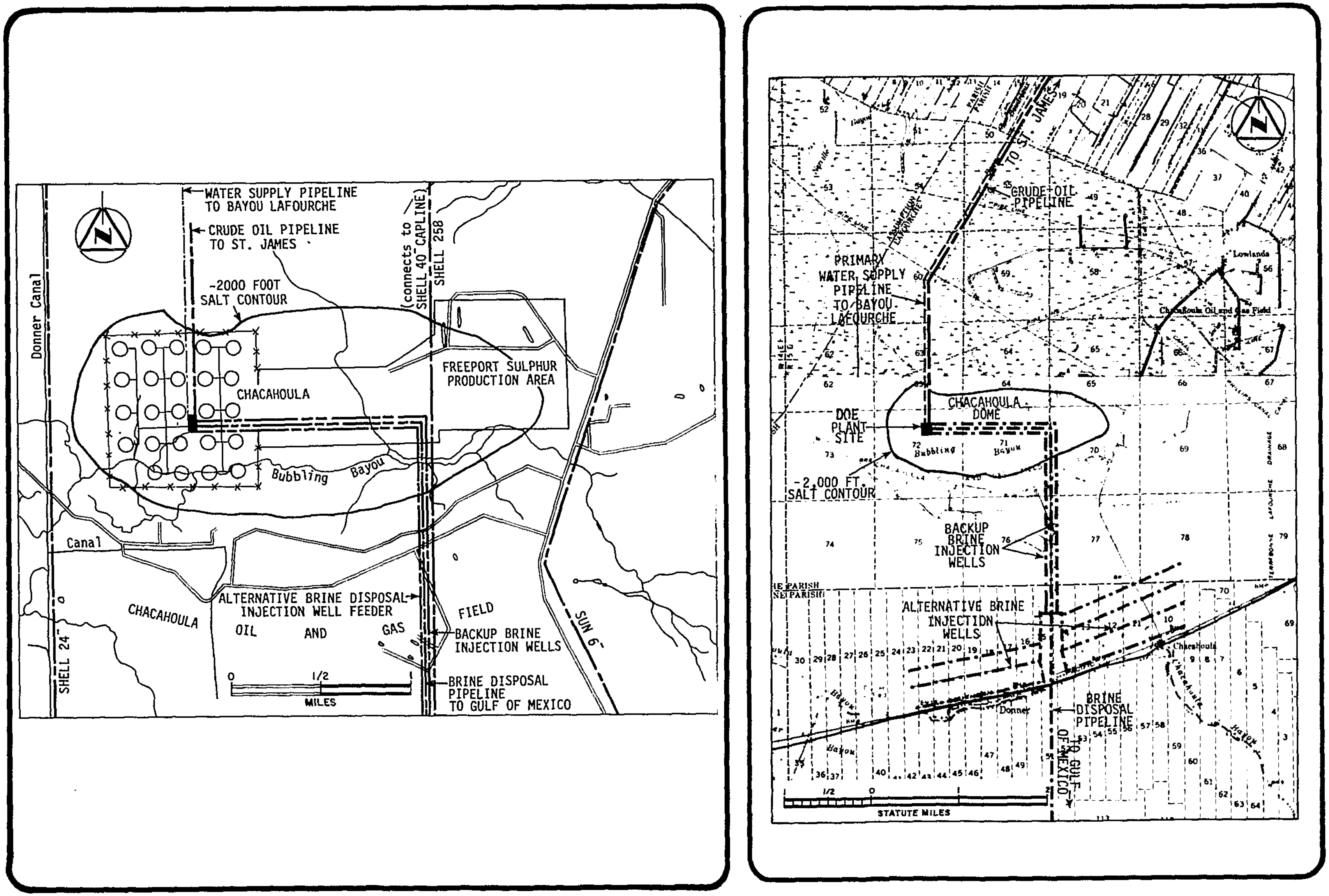



FIGURE 2.6-2 Vicinity and site map - Chacahoula dome.

Wellheads would be connected to the central pumping plant by a series of roadways and pipelines. The central pumping and control facilities would be located on an 8 to 10 acre tract near the center of the storage site. This area would contain the pump building, control building, offices, laboratory, warehouse, surge ponds, a blanket oil tank, the oil metering center, and a 5 to 6 acre material and equipment yard (Figure 2.6-2). Acreages required, fill volumes necessary, and habitats impacted by these and other proposed and alternate facilities are shown on Tables 2.6-1 and 2.6-2. The development timetable is presented in Figure 2.6-3.

Power requirements for all pumps would be provided by a new 5 mile line connecting to Louisiana Power & Light Company's main feeder line now under construction east of Chacahoula. A transformer bank at the storage site would be located adjacent to the electrical control building.

Bayou Lafourche is the proposed source of water for the initial leaching of the storage cavities, as well as for the subsequent displacement of the stored oil. It is a regulated stream which is supplied by a pumping station at Donaldsonville, on the Mississippi River.

Use of Bayou Lafourche requires the installation of an additional 54,000 gallons per minute of pumping capacity at the Donaldsonville pump station where water is lifted from the Mississippi River and discharged into the bayou channel. The intake structure would be sized to meet EPA intake design standards of a maximum velocity of 0.5 feet per second, to reduce fish impingement on the intake screen. The increased flow would be picked up approximately 25 miles downstream through an intake structure and pump station, then pumped through a 42-inch 6.5 mile-long pipeline to injection pumps located at the main facility pump building. Thus augmented, the bayou can supply the required quantities of water, a maximum of 49,000 gallons per minute. The proposed pipeline route parallels the oil distribution line running from the plant site to the terminals (see Figure 2.6-2).

TABLE 2.6-1 continued.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 2) Bayou Choctaw | | | | | | | | | | |
| a) Storage Site | 7.0 | 37,000 | --- | 120/120 | --- | --- | --- | 4 | 2 | 122/120 |
| b) Brine Disposal | 2.9 | 46,000 | 95,000 | --- | --- | 31/20 | --- | 7 | 1 | 32/20 |
| c) Raw Water Supply | --- | --- | 5,000 | --- | --- | --- | --- | --- | --- | --- |
| d) Crude Oil Distribution | 38.0 | 383,000 | --- | 268/167 | 35/22 | 64/40 | --- | 13 | 1 | 368/229 |
| e) St. James Terminal | 1.0 | 35,000 | 54,000 | 40/34 | --- | --- | --- | --- | --- | 40/34 |
| Sub-Total (Early Storage-Bayou Choctaw) | 48.9 | 501,000 | 154,000 | 428/321 | 35/22 | 95/60 | --- | 24 | 4 | 562/403 |
| Sub-Total (Early Storage-Weeks Island plus Bayou Choctaw) | 113.3 | 1,600,000 | 208,000 | 592/430 | 75/47 | 402/251 | 60/37 | 48 | 75 | 1204/765 |
| Total (Early Storage at Weeks Island and Bayou Choctaw plus Chacahoula Dome) | 231.3 | 4,599,700 | 816,000 | 853/630 | 130/72 | 824/522 | 358/223 | 103 | 675 | 2840/1447 |

TABLE 2.6-2 Alternative physical facilities - Chacahoula - grading requirements and land use.

| | Total Miles Pipeline | Excavation (c.y.) | Fill (c.y.) | Habitat Acreage: Cleared Land Constr/Maint | Habitat Acreage: Bottomland Forest Constr/Maint | Habitat Acreage: Deciduous Swamp Constr/Maint | Habitat Acreage: Marsh Constr/Maint | Water Crossings | Open Water Acreage | Total Acreage Impacted Constr/Maint |
|---|---|---|---|---|---|---|---|---|---|---|
| 1) Brine Disposal (Deep Well Injection) | | | | | | | | | | |
| a) Pipeline Excavation | 18.1 | 287,000 | --- | --- | --- | 176/110 | --- | 4 | 1 | 177/110 |
| b) *Roadways to Brine* Disposal Wellheads | --- | --- | 392,000 | --- | --- | --- | --- | | --- | --- |
| c) Brine Disposal Wellhead Pads | --- | --- | 365,000 | --- | --- | 45/30 | --- | --- | --- | 45/30 |
| 2) Brine Disposal to Alternative Diffuser | 62.7 | 989,100 | --- | 6/4 | --- | 88/55 | 298/186 | 26 | 541 | 933/245 |
| 3) Raw Water Supply | | | | | | | | | | |
| a) Wells (Shallow Aquifers) | | | | | | | | | | |
| 1. Pipeline Excavation | 10.2 | 103,000 | --- | 14/9 | --- | 11/7 | --- | 2 | 1 | 26/16 |
| 2. Roadways to Drill Pads | --- | --- | 100,000 | 22/8 | --- | 18/7 | --- | | | 40/15 |
| 3. Drill Pads | --- | --- | 45,000 | 17/12 | --- | 5/3 | --- | --- | --- | 22/15 |
| b) Gulf of Mexico Pipeline | 42.4 | 667,600 | 5,000 | 2/1 | --- | 22/14 | 75/47 | 26 | 49 | 148/62 |
| c) Mississippi River at St. James | 21.9 | 255,000 | 5,000 | 22/14 | --- | 32/20 | --- | 10 | 1 | 55/34 |
| 4) Nordix Terminal and Alternative Pipeline | 10.0 | 773,300 | 82,000 | 74/56 | 21/15 | --- | --- | 4 | 1 | 96/71 |

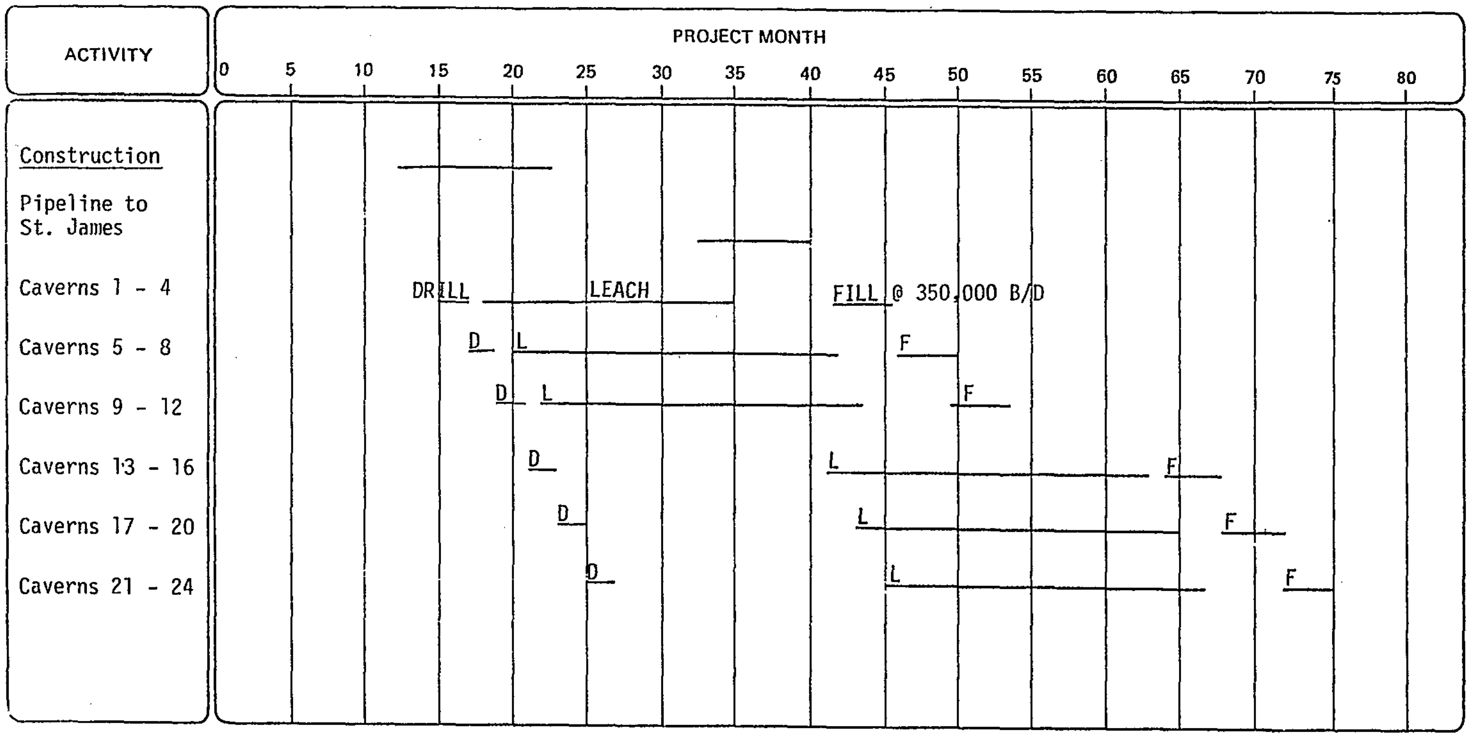



FIGURE 2.6-3 Development timetable for Chacahoula dome.

In addition to supplying water directly to the injection pumps, the 42-inch pipeline would be connected to an 40,000 barrel raw water reservoir. Controls would be provided so that raw water would flow into the reservoir only if the water level in the reservoir is low and the pipeline pressure is high. Three charge pumps at the reservoir would enable high pressure injection pumps to be started with water from the reservoir. After start up, the charge pumps would be shut down, and the injection pumps would take suction directly from the raw water supply pipeline.

The proposed means of disposing of brine from the Chacahoula facility is via pipeline to the Gulf of Mexico at the rate of 70,000 barrels per hour (49,000 gallons per minute). During periods of reduced brine disposal, the brine would be retained in the on-site brine pond for short periods, then discharged at the design disposal rate. A three-well backup injection field would be constructed south of the site, along the proposed brine disposal pipeline to the Gulf. The proposed route for the Gulf pipeline runs along an existing pipeline, Shell No. 258, through some 40.4 miles of marshland to the coast and 23.6 miles to the Gulf diffuser.

Oil distribution is planned via a new pipeline connection to the terminal facilities on the Mississippi River, 22 miles northeast of the proposed site. Presently, a 16-inch pipeline (Shell No. 258) crosses the Chacahoula dome and connects the CAPLINE terminal with offshore production wells. Because of limited available capacity, and the need for reverse flow capability, a new pipeline for the proposed facility would be constructed near the existing pipeline right-of-way (see Figure 2.6-2).

#### 2.6.2.2 Alternative Facilities

Shallow subsurface aquifers are also an alternative water source. A well field would be located in the same pipeline right-of-way as the brine disposal pipeline. The wells would tap the Plaquemine aquifer at depths between 100 and 450 feet. The aquifer is considered capable of providing the water quantities required during oil removal.

Using the Gulf of Mexico as a raw water source would require that a pipeline follow the brine disposal pipeline to the coast and extend several miles into the Gulf. Another alternative raw water source would be directly from the Mississippi River at St. James. This system may also include a centrifugal desander for clearing excess sediment from the water. Effluent from the desander would be returned to the Mississippi River; a desilting pond may be constructed if needed to prevent buildup in the caverns.

An alternative brine diffuser location in the Gulf of Mexico would require a 62.7 mile pipeline along the DOE right-of-way and extending into the Gulf southeast of the proposed diffuser site. An alternative to disposing of brine in the Gulf would be deep well injection south of the site.

## 2.7 SUMMARY

The Capline Group of storage sites has been designed to reach a storage capacity of from approximately 300 MMB to 500 MMB for the SPR Program. This capacity would be stored in existing salt mine space and existing and new solution-mined caverns in salt domes in southeastern Louisiana. For the early storage phase of the project, up to 94 MMB and 89 MMB of existing capacity has been planned at Bayou Choctaw and Weeks Island domes, respectively, for a total storage of up to 183 MMB. Continued utilization of those sites plus construction of a 150 MMB facility at Napoleonville dome is the proposed development for the group, and would yield a total capacity of 333 MMB. Development of the Napoleonville site would include leaching of 10 new caverns and conversion (and expansion) of 7 existing caverns, and the installation of oil distribution, raw water supply, and brine disposal systems.

Use of one of the three alternative site groupings would result in a system capacity ranging from 274 to 383 MMB. Development of any of these site groupings would involve the solution mining of new capacity and construction of their respective oil distribution, raw water supply, and brine disposal systems.

Current plans call for the development of one site grouping, either the proposed site or one of the alternatives, in addition to the early storage phase capacity. Development of more than one site grouping, a reorganization of the sites within each grouping or inclusion of additional sites (i.e. Cote Blanche) is not unreasonable, and the impacts of a modified grouping would remain substantially similar to those discussed here.

As referenced in Section 1.1, the President proposed to the Congress that the SPR be expanded to a total of one billion barrels. An amendment to the SPR Plan addressing that expansion was prepared, submitted to Congress, and became effective on June 12, 1978. As a result of that Amendment, the total capacity of the Capline Group may be increased to as much as 500 MMB. Additional storage could be developed by combining parts of the proposed and/or alternate systems or possibly by expansion of weeks Island by an additional 90 MMB. The facilities required for different combinations of sites would be identical to those described in the existing site groupings; however, the time required for site development, and fill and withdrawal, would be extended. For example, the withdrawal rate for the system would probably be somewhat less than 2 MMB per day, and would take about 10 months to complete. Similarly, the time required to fill a Capline Group with a 500 MMB capacity would be about 2.6 years, rather than under two years, assuming a constant fill rate of approximately 525,000 barrels per day. The raw water, brine and oil distribution systems would not need to be significantly modified.

# CHAPTER 3.0

# THE ENVIRONMENT

## 3.1 INTRODUCTION

This chapter summarizes the environment, both natural and manmade in the vicinity of each of the domes considered for sites for development in the proposed and alternative actions.

Detailed descriptions of the regional and site environments are presented in Appendix B of this report. A detailed analysis of the Gulf brine disposal environment is presented in Appendix G. For Weeks Island and Bayou Choctaw, detailed descriptions of pre-early storage conditions are included in the final EISs and the supplements to those documents (FES 76/77-8 and FES 76-5).

## 3.2 REGIONAL ENVIRONMENT

### 3.2.1 Land Features

The project area, in south-central Louisiana, lies within the Western Gulf Coastal Plain physiographic province; this is a low-lying area consisting of coastal marshlands, the Mississippi River floodplain, and a series of low hills and Pleistocene terraces (Figure 3.2-1). Underlying the region is a gulfward thickening wedge of sediments deposited in the Gulf Coast geosyncline (Figure 3.2-2). This down-sinking basin is the major structural element along the Gulf Coast of the United States. In some areas more than 50,000 feet of sediments have been deposited.

Several series of faults, paralleling the coast, are probably related to the down-sinking of the basin. They are not of significance seismically; that is, they are not related to deep-seated features normally associated with earthquakes. The region is one of low seismic risks as indicated on Figure 3.2-3.

Other local structures of extreme importance are the several hundred salt domes which have penetrated into the overlying sediments (Figure 3.2-2). These masses have risen into the overlying beds by viscoplastic flow from a salt layer which underlies most of the Gulf Basin (see Section B.1.2 of Appendix B). The salt has a lower specific gravity than the rest of the sedimentary sequence, and several factors, the most important of which is the thickness of the overlying strata, combine to permit the viscoplastic flow of the salt upward into the younger beds. The structures under consideration for storage of petroleum are all classified as shallow domes, that is, they penetrate to within 2000 feet of the surface. The salt is generally fairly pure sodium chloride. Overlying many domes is a layer of caprock, varying in thickness, and consisting primarily of gypsum and anhydrite. The caprock of many domes also contains considerable amounts of sulfur and varying amounts of other minerals - dolomite, calcite, barite, pyrite, and quartz.

The domes are of economic importance, especially because of the large quantities of oil and gas that are trapped along their flanks and

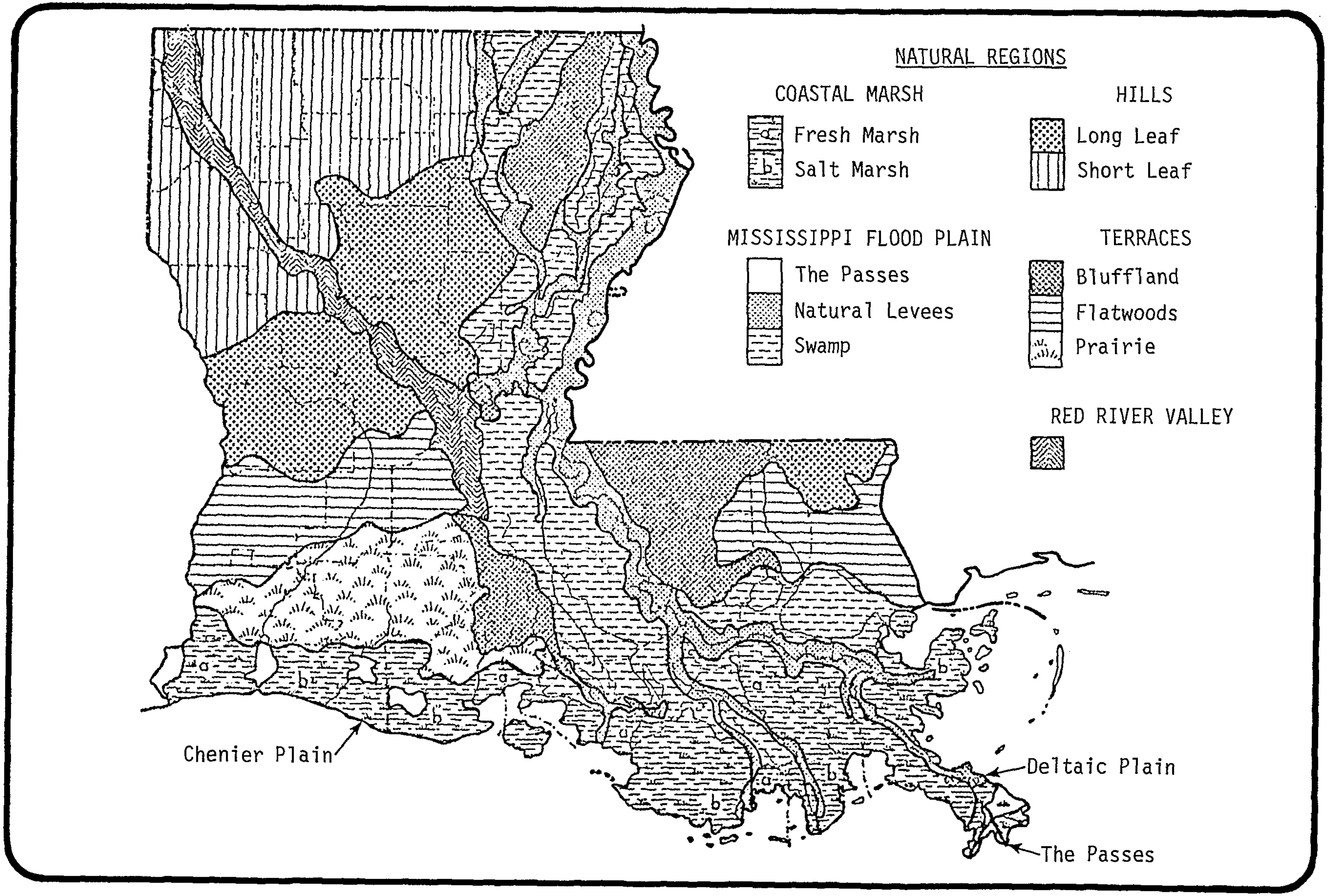



FIGURE 3.2-1 Natural regions of the state of Louisiana.

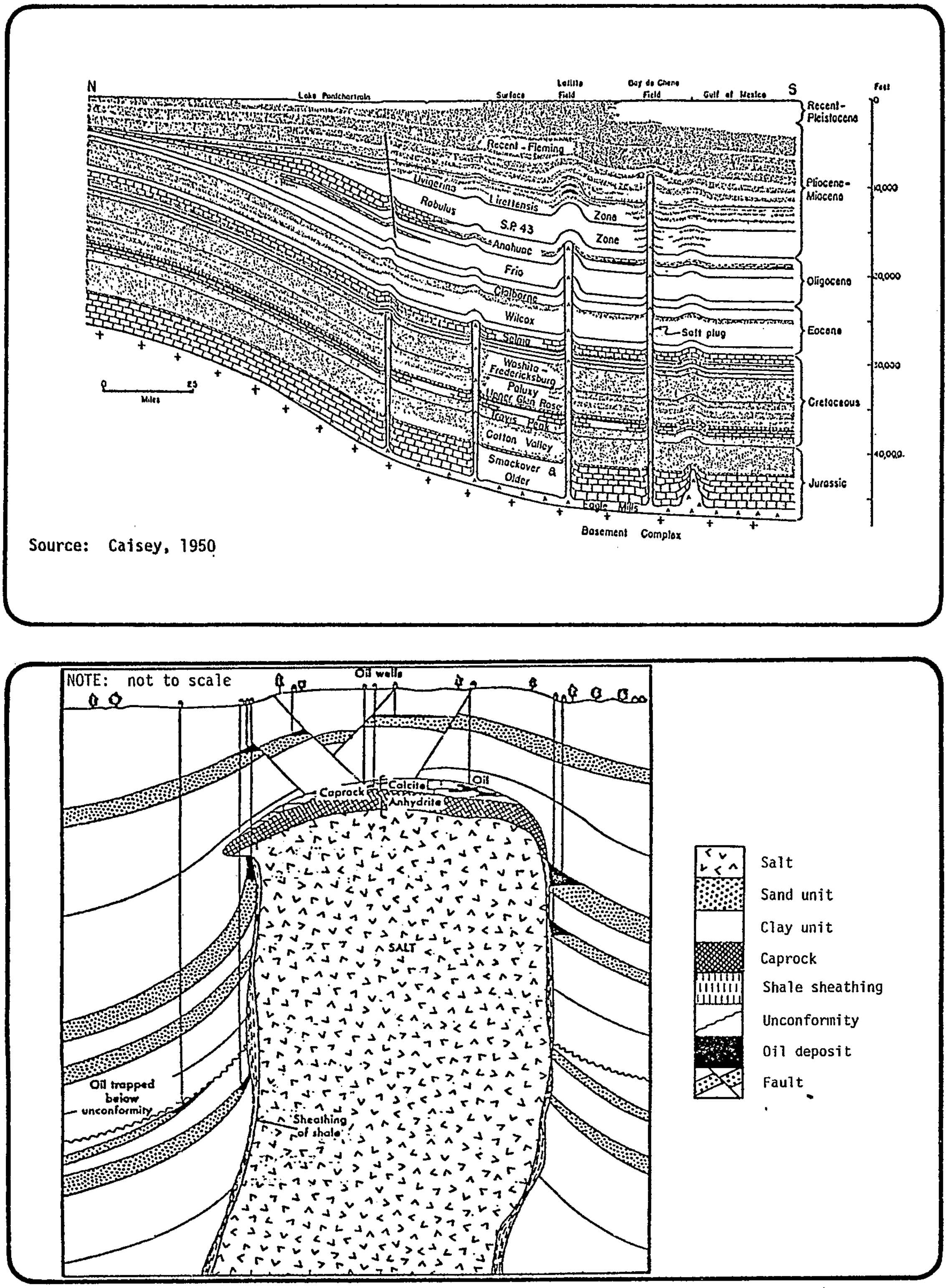



FIGURE 3.2-2 Regional geologic cross section (top); typical salt dome structure (bottom).

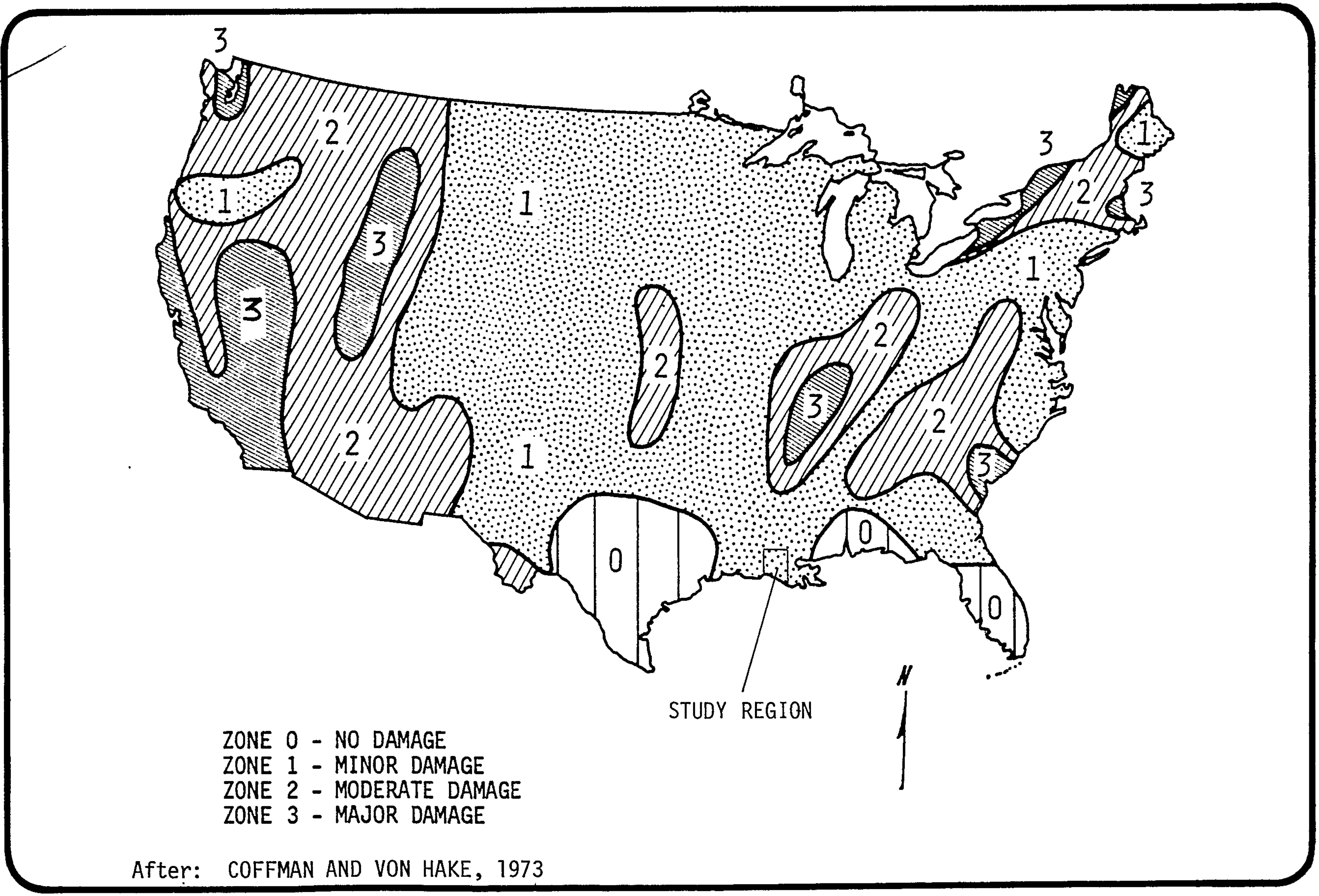



FIGURE 3.2-3 Seismic risk map.

in overlying faulted sediments. Sulfur is also an important product, as is the salt itself, which is used primarily as brine feedstock for the petrochemical industry.

Soils in the region are largely of alluvial origin, consisting of sands, silts, and clays which comprise the levees, swamps, and marshes of the region. Offshore are silts, clayey silts, and sands. The near-shore Gulf bottom slopes gradually offshore at 2 feet per mile.

### 3.2.2 Water Environment

#### 3.2.2.1 Surface Water Systems

The surface water system includes the Mississippi River, Vermilion River, Atchafalaya River and Floodway, Bayou Lafourche, Bayou Teche, Bayou Penchant, the Intracoastal Waterway, the coastal bays along the Gulf, the nearshore Gulf, and several lakes (Figure 3.2-4).

Water quality and streamflow data for the major waterbodies are available from such agencies as the U.S.G.S, the Corps of Engineers, and NOAA (see Section B.2.2.1 of Appendix B).

The Mississippi is the major drainage feature in the region. The nearest gauging stations are at Baton Rouge and at Donaldsonville, 53 miles downstream. In this stretch, streamflow is fairly constant, averaging 925,000 cfs. Applicable water use designations are secondary contact recreation, propagation of fish and wildlife, and domestic raw water supply.

The Vermilion River has a calculated average discharge of 160 cfs into the northwestern part of Vermilion Bay. It is used by commercial and sport fishermen. A port is located at Intracoastal City, at the intersection with the Intracoastal Waterway (ICW). From the origin of the river to the intersection with the ICW, the Vermilion is designated for primary and secondary contact recreation and propagation of fish and wildlife.

The Atchafalaya is a Mississippi River distributary, maintained by the Corps for navigation and flood control purposes. The average discharge is 149,824 cfs and the depth varies from 14 to 18 feet. Upstream of Wax Lake Outlet (Figure 3.2-4) the water is suitable for all

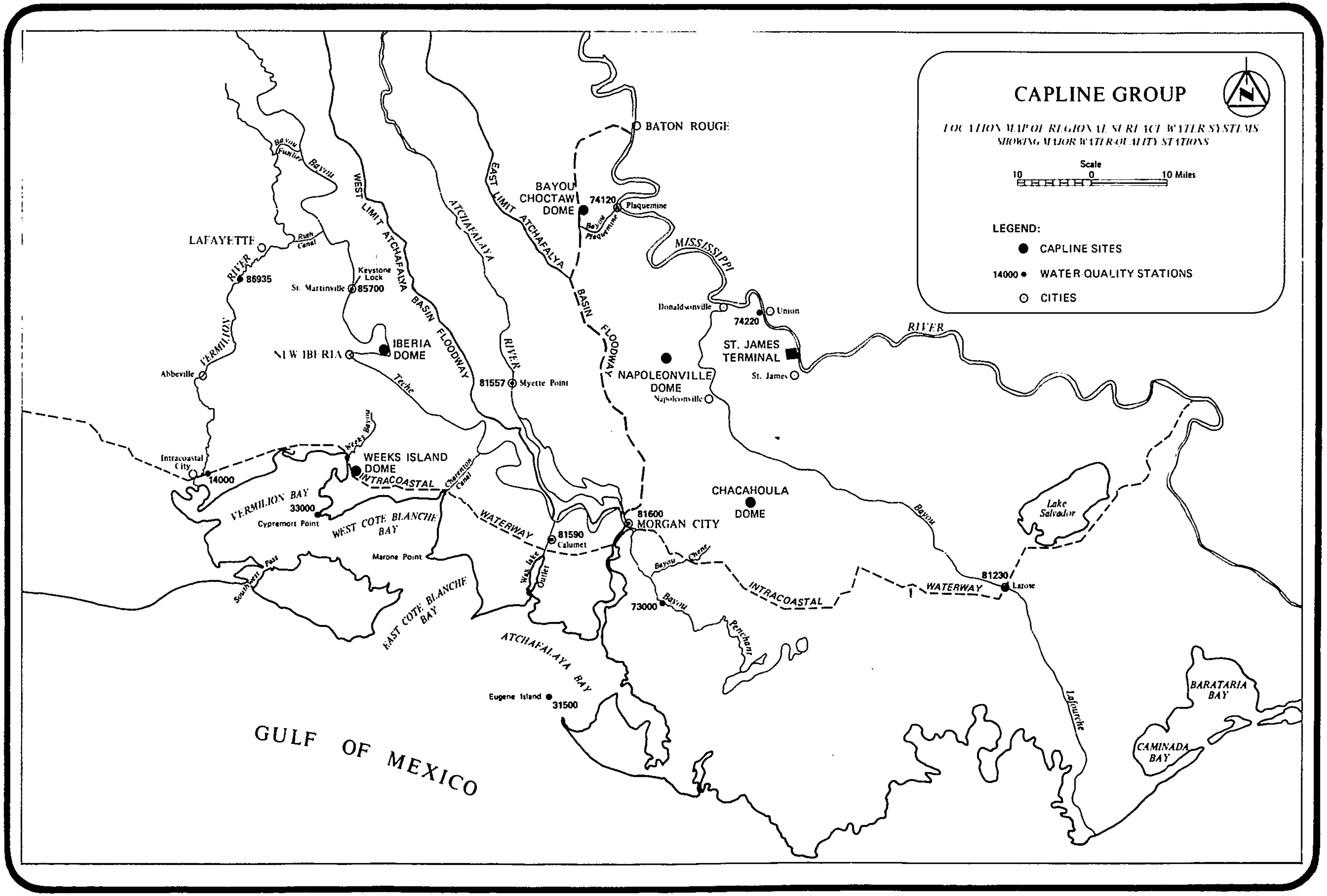



FIGURE 3.2-4 Capline Group location map of regional surface water systems showing major water quality status.

uses, but below that point, which is considered to be under tidal influence, it is suitable for only secondary contact recreation and aquatic-life uses. The Atchafalaya is a major sediment source for deposits in the Vermilion, West and East Cote Blanche, and Atchafalaya Bay system.

Bayou Lafourche represents an old course of the Mississippi. The entire flow of 252 cfs is maintained by pumpage from the Mississippi at Donaldsonville. Water quality data are obtained from a station at the intersection with the ICW. The use classifications for both bodies are: primary and secondary contact recreation, aquatic life, and water supply, with a large number of communities using the bayou as a source of domestic and industrial water.

Bayou Teche has an average flow of 492 cfs, of this an average of 135 cfs is diverted to the Vermilion River for irrigation. The bayou is classified as usable for primary and secondary contact recreation, fish and wildlife, and domestic raw water supply.

In the project area the Intracoastal Waterway extends for nearly 160 miles from the Mississippi on the east to the Vermilion River on the west. It is 125 feet wide and 12 feet deep. This artery is a major route for east-west commercial water traffic across the southern United States. It is presently designated for secondary contact recreation and propagation of fish and wildlife.

Several bays indent the Gulf shoreline within the study area - the Atchafalaya, East and West Cote Blanche, and Vermilion. These bays average 5 to 7 feet in depth, with an average diurnal tidal range of 1.6 feet. Tidal flow is measured at several stations within the study area, reaching as much as 4.0 feet per second. Significant inflow into the bay system is contributed by several water bodies (Figure 3.2-4). Water quality data from Vermilion and Atchafalaya Bays indicate that both water bodies are suitable for secondary contact recreation and propagation of fish and wildlife.

Bayou Penchant, southeast of Morgan City, is included here because water quality data are available from one station. The stream is classified for primary and secondary contact recreation and for propagation of fish and wildlife.

The nearshore Gulf of Mexico's surface currents have a net annual drift to the west at 0.2 to 0.4 knots. Tides are usually diurnal, and range in average height from 1.5 to 2.0 feet. Waves travel to the northwest in the spring and summer and to the west in the fall and winter; 95% of the time wave heights do not exceed 4 feet. Salinities during the summer average 23 ppt at the surface and 36 ppt at the bottom; the water column becomes isohaline in the winter at 32 ppt. The water column is nearly isothermal during the cool and warm seasons, 61, and 78$^{o}$F, respectively. Chemical quality is greatly influenced by river inflow. As a result, turbidity, nutrient and trace metal concentration has an inverse relationship to salinity.

In general, comparison of water quality data to applicable standards throughout the region indicate that marine aquatic-life standards are met except for coliform bacteria and phosphorus.

#### 3.2.2.2 Subsurface Water

The subsurface water systems in the project area include the ground water system comprising fresh (less than 1000 milligrams per liter) and slightly saline (1000 to 3000 milligrams per liter) supplies found in the Gulf Coast aquifer. Beneath the ground water systems the more saline waters are present in the deep sands being considered for disposal of brines. In all, more than 9000 feet of Miocene and younger sediments are present. Of these about 40 percent are sands capable of bearing water. The ground water supplies occur under both water table (unconfined) and artesian (confined) conditions. South of Baton Rouge, only the uppermost sands contain fresh water.

In areas not affected by pumping, natural ground water movement is toward the Gulf. In areas of large withdrawals, the direction of movement may be modified or reversed, with ground water flow toward the direction of withdrawal.

In the project area, the principal fresh water bearing sands of Pleistocene age are interconnected and are considered to be a single artesian aquifer system known as the Plaquemine (or Chicot) aquifer. The aquifer is confined by a top stratum of clay and silt about 100 feet thick, and in much of the project area consists of a massive body of sand and gravel with only a few thin, lenticular interbeds of clay and silt. The depth to the base of the aquifer in the project area ranges from about 800 feet near Bayou Choctaw to about 1500 feet near Chacahoula dome. The depth to the base of fresh water ranges from about 200 feet at Chacahoula dome to about 400 feet at Bayou Choctaw to over 600 feet at Weeks Island.

The Plaquemine aquifer is very permeable, with a coefficient of permeability on the order of 2000 gpd per square foot over most of the area. Well yields of over 5000 gpm have been reported in the project area. The aquifer is in direct hydraulic contact with the Mississippi River in places where the river has cut through the silt and clay of the top stratum and into the upper sand of the aquifer.

The sands underlying the Plaquemine aquifer do not contain fresh water in the area south of Baton Rouge and therefore have not been named as aquifers. The Miocene and Pliocene formations in the project area have not been investigated in detail from the standpoint of water supply because they appear to have little potential as a source of fresh water. However, the sands in these deposits are potentially a prolific source of brackish or salty water. Examination of well logs and of data from side wall core samples from oil exploration wells in the project region indicates a net sand thickness of 1000 feet to 1500 feet in the depth interval from -3000 feet to -8000 feet. Porosity decreases linearly with depth, ranging downward from about 40 percent at -3000 feet to about 30 percent at -8000 feet. The permeability of these deep formations is less than that of the overlying Chicot/Plaquemine aquifer, and is generally in the Darcy range. This water is under artesian pressure and wells flow naturally at the surface upon completion. The movement of ground water in the deeper formations (approximately 2800 feet, msl) may be impeded by large normal faults generally trending parallel to the axis of the Gulf Coast geosyncline.

As might be expected, water use in the region has increased steadily with increased population and industrialization. Early development in southern Louisiana below Baton Rouge was confined to the higher parts of the natural levees. Towns, plantation buildings, and light industries were built near the crests of the natural levees to reduce the potential for flood damage. Agricultural development also followed the topography, with cultivated cropland restricted to the higher parts of the natural levees, grazing lands at the intermediate elevations, and the swampy lowlands left forested. With this pattern of development, water demands were generally light and widely scattered.

New industrial plants and processes, growing population, and rising living standards require constantly increasing supplies of fresh water. Although all foreseeable water needs in the project area could be met by surface water, the costs of diversion, treatment, and distribution of available surface water supplies often make ground water preferable where it is available in adequate quantity and quality. Ground water also offers the advantages of relatively uniform temperature and chemical quality. All domestic and municipal water supplies in the project area are provided by ground water with the exception of a few residences and fishing or hunting camps that use rainwater stored in cisterns.

### 3.2.3 Climatology and Air Quality

#### 3.2.3.1 Climatology

The general classification of the climate of southern Louisiana is humid subtropical with a strong maritime influence. Prevailing wind flow is from the south much of the year. This movement of maritime air from the Gulf of Mexico helps to temper extremes of summer heat, to shorten the duration of winter cold spells, and to provide a source of abundant moisture and rainfall. Extended periods of subfreezing temperatures are rare and significant amounts of snowfall are quite rare. During the winter and spring, the cold Mississippi River water enhances the formation of river fogs, particularly when light southerly winds transport warm, moist air into the area from the Gulf of Mexico. Severe weather is generally associated with heavy thunderstorms and tropical cyclones.

Climatological records from the nearest National Weather Service (NWS) stations served as the basis for approximating climatic conditions that may be expected in the Capline area. Most of the data are from the NWS stations at the New Orleans International Airport, the Lake Charles Municipal Airport, and Ryan Airport at Baton Rouge. A detailed discussed of the regional climatology is presented in Section B.2.3.1 of Appendix B.

#### 3.2.3.2 Air Quality

The Federal Clean Air Act provides for the prevention and control of air pollution. Several categories of air quality standards were reviewed to extract all of the regulations and standards applicable to the Capline region. These include primary standards, which are intended to protect public health, and secondary standards, which are intended to protect public welfare.

The Louisiana Air Control Commission (LACC) routinely monitors air quality in the State, and several sampling sites are in the general vicinity of the proposed Capline distribution system. Data from these stations indicate that air quality has improved in this region between 1972 and 1974 (the period of record). This trend is particularly notable in the particulate and $SO_2$ levels. Preliminary summaries of 1975 and 1976 LACC air quality data indicate a continuing decrease in levels of $SO_2$, $NO_2$, and particulates at most sampling locations.

Quantitative information on rates of pollutant emissions in a particular region is necessary to determine the sources of degraded air quality and to plan air quality control measures. The candidate storage sites and terminals are located in 5 parishes in southern Louisiana, which, together with 34 other parishes constitutes the Louisiana portion of AQCR 106. The largest regional source of pollutants are petroleum refineries and petrochemical industries. Transportation sources and the combustion of industrial fuels are also important sources.

### 3.2.4 Background Ambient Sound Levels

Background ambient sound levels in the Capline Group region are typical of an area having a wide diversity of sound sources. No in situ noise measurements were performed in the area under this study, but principal land uses have been identified from topographic maps and site visit reports. Ambient sound surveys made under earlier studies at similar sites also provide data upon which to base ambient sound level estimations.

### 3.2.5 Ecosystems and Species

The Southern Louisiana Delta Zone, formed primarily of alluvial deposits, covers an area of 8 million acres. The lowland physiography of this area has had a significant role in determining the wildlife that inhabits the region. Characterized by numerous swamps, marshes, lakes, and bays, this area of Louisiana provides a rich environment for an abundant wildlife resource. Fresh water and marine environments are common and assist in increasing the diversity of wildlife found in the area. In all, six ecosystems are recognized: cleared land; bottomland forest; deciduous swamp; saline, brackish, intermediate, and fresh water marsh; estuarine and nearshore Gulf waters; and rivers, inland waters, and fresh water wetlands. Typical flora and fauna in these ecosystems are shown on Table 3.2-1.

The deciduous swamps, bottomland forests, and marshes of the study area are considered ecologically sensitive in view of the resources they provide to highly diverse faunal groups. The ecosystems supported by these habitats are particularly sensitive to changes in salinity and in surface and ground water levels. The deciduous swamp provides suitable habitat for the southern bald eagle and the alligator, both of which are endangered species. Marshes also provide habitat for the alligator as well as the peregrine falcon, another endangered species encountered in the study area during the migratory season. Populations of recreationally and commercially important fish and wildlife species, in addition to hundreds of other species, are supported by the bottomland forest, swamp, and marsh ecosystems. Section B.2.5.2 of Appendix B presents a detailed discussion of commercially and recreationally important species. Endangered species which may occur in the project area include 4 plants, 4 birds, 3 turtles, and 1 reptile (see Section B.2.5.4 of Appendix B).

TABLE 3.2-1 Typical fauna and flora of the region.

| Ecosystem | Cleared Lands | | Woodlands | Marshlands | | Coastal and Inland Waters | |
|---|---|---|---|---|---|---|---|
| *Vegetation Type* | Croplands and Pasture Lands | Urban and sub-urban areas | Deciduous swamp and bottomland Forest | Saline Marsh | Intermediate and Brackish marsh | Fresh water and freshwater wetlands | Saline |
| Typical herbs and grasses | signal grass, goat-weed | St. Augustine carpet grass | sedges, spiderwort, panic grass | wire grass, three corner grass, coco, widgeon grass | wire grass, saw grass, wild millet | N/A | N/A |
| Typical shrubs | N/A | ornamentals | palmetto, elderberry, youpon, pawpaw | N/A | N/A | N/A | N/A |
| Typical trees | N/A | ornamentals | cypress, water tupelo, water oak | N/A | N/A | N/A | N/A |
| Typical mollusks and crustaceans | N/A | N/A | snails | Fiddler crabs, mud crabs, clams, snails, shrimp | snails, oysters, crabs clams, shrimp | clams, snails, crayfish | clams, oysters, shrimp, snails,crabs |
| Typical amphi-bians and reptiles | eastern garter snake ornate box turtle Gulf coast toad | woodhouses toad Gulfcoast toad squirrel treefrog e. garter snake | Mississippi ringneck snake, w. cottonmouth, yellow-bellied water snake, southern copperhead, Miss. mud turtle, Missouri slider, broad-headed skink, ground skink, dusky salamander, N. cricket frog, green tree-frog, upland chorus frog | banded water snake, green water snake, mud snake, marsh brown snake | mobile cooter, southern legged frog, broad-banded water snake, speckled king snake, western cottonmouth | southern leopard frog, bull frog, northern spring peaper, stinkpot, common snapping turtle, red-eared turtle, marbled salamander diamond back water snake, broad-banded water snake | diamond backed terapin river cooter, hawks-bill turtle, logerhead turtle, Atlantic ridley, leatherback |
| Typical fish | N/A | N/A | N/A | killfish, cyprinids, immature mullet spot | killifish, catfish, gar | bass, crappie, catfish, gar, buffalo, | mullet, anchovy, men-haden, seatrout, drum sea catfish |
| Typical birds | ducks, bobwhite, mourning dove, eastern meadowlarks, red-winged blackbirds, sparrow, horned lark, kill-deer, marsh hawk | starling, house sparrow, grackles, blackbirds, song-birds, sparrows | herons, egrets, ibises, wood-peckers, wood duck, warblers, woodcock, vultures, red-tailed and red-shouldered hawks, barred owl, thrushes, vieros, thrufted titmouse, Carolina chicadae, cardinal | waterfowl, herons, egrets, plovers, ibises, least-bitten, roseatespoonbill, rails, terns, gulls | herons, egrets, waterfowl, American coot, seaside sparrow, greater & lesser yellowlegs, terns, gulls | waterfowl, shorebirds, herons, egrets, marsh hawk | gulls, terns, water-fowl |
| Typical mammals | opossum, striped skunk, cotton rat, rice rat, fox squirrel | bats, opossum, squirrels, cotton-tail rabbit | gray and fox squirrels, swamp rabbit, raccoon, bobcat, gray fox, arradillo, nutria, mink, cotton mouse, white-footed mouse, white-tailed deer, opposum | raccoon, mink, otter, muskrat | mink, muskrat, otter, nutria, racoon, swamp rabbit | nutria, otter, mink, raccoon, bat, swamp rabbit | Atlantic bottle-nosed dolphin |

Cleared land refers principally to crop, pasture, urban, suburban, and industrial land areas. Cropland acreages, used primarily for production of sugar cane, rice, cotton, soybeans, and truck crops, are located primarily along the natural levees of the Mississippi River and other major drainageways. Generally, the vegetation production and carrying capacity of cleared land is less than that found in adjacent habitat types. Urban and suburban developments in the area generally are located at higher elevations along natural levees.

The bottomland forests of the area include both glade and hardwood bottoms which are seasonally flooded for several months and relatively dry for the remainder of the year. The forests of the hardwood bottoms are generally very dense, with an abundance of understory trees, shrubs, and lianas. They provide excellent habitat for a diverse wildlife population. The bottomland forests of the study area appear to be predominantly of the oak-gum-cypress type and cover more than half of the land in the area.

Approximately 40 percent of the study area is deciduous swamp, which, in the study area, is an alluvial swamp, containing bald cypress and water tupelo as principal species. Commonly, near the swamp margins many other species of trees occur, forming a band of intergrading cover types which often make demarcation of the borders of the swamp highly subjective. The development and extent of the deciduous swamp is dependent on water level fluctuation. In addition to the dominant overstory species previously mentioned, a rich understory flora is present (Table 3.2-1). This habitat provides forage and cover for several commercially important fur-bearing mammals including nutria, raccoon, and mink. Bird life is highly diverse in the bottomland deciduous swamps of Louisiana. Commercially important herpetofauna species of the swamp include snapping turtles and the bullfrog.

The coastal marshes may be divided into three distinct belts consisting of salt marsh, brackish marsh, and intermediate marsh. These belts lie along the Louisiana coastline in varying widths determined by factors such as surface elevation, soil characteristics, drainage, and tidal action. Each belt may be considered as a separate and unique ecosystem that produces tremendous amounts of plant and animal biomass.

The saline marsh occupies the land immediately adjacent to the bays and open waters of the Gulf and is subject to daily ebb and flow. Fresh water drainage has a relatively small effect on salinity. A fairly low diversity of vegetation grows abundantly in the salt marsh year-round. Vegetative productivity is high; much of the partially decomposed plant material (detritus) is flushed into the bays and open waters, rather than left to accumulate in the marsh as peat. A diverse and abundant community of animals inhabits the salt marsh during the year. Many species of marine animals use the salt marsh periodically as a feeding and nursery ground. Fishing and wading birds are abundant, especially adjacent to open water bodies.

The brackish marshes of the study area have salinities ranging from 10 to 20 parts per thousand (ppt) - lower than the saline marshes, but higher than the intermediate marshes. The brackish marsh is characterized by a lowland vegetation (Table 3.2-1). Waterfowl and furbearing species utilize this type of marsh heavily, but not as extensively as the intermediate marsh.

The intermediate marshes of the study area which occur in the topographic depressions have low salinities and are seasonally inundated. The diversity of plant life is greater than that found in brackish marshes, and for this reason the intermediate marsh is generally a more valuable resource for wildlife than the brackish marsh.

The coastal marshes provide high concentrations of nutrients that are cycled through the ecosystem and are made available to the organisms in the system according to their positions in the food chain. As a result of this rich nutrient supply, the coastal marsh system supports high productivity of organic matter, and a large diversity of both plants and animals.

The coastal marshes provide the base for the fur industry in Louisiana, the number one state in fur production in the United States. Major furbearing species of the coastal marshes include muskrat, nutria, mink, otter, and raccoon. Muskrat and mink are most common within the intermediate and brackish marshes. Nutria and raccoon prefer the bottomland swamps and marshes. The coastal marsh bird population is probably one of the most diverse in the entire United States. The marshes provide resources for a large number of wading birds and shorebirds, particularly during the winter months and migration periods. Amphibians and reptiles common to the coastal marshes are listed in Table 3.2-1.

The coastal region of Louisiana is interlaced with numerous lakes and ponds, large bays, rivers, streams, and manmade canals (see Section 3.2.2.1 and Figure 3.2-4). The several major bays (estuaries) in the region are important components of the aquatic ecosystems that act as large nursery grounds and habitats for an array of recreationally and commercially important shellfish and finfish. Louisiana waters are very productive for shrimp, crabs, oysters, and several species of fish. The high productivity of these bays is primarily due to their ability to act as nutrient traps, the nutrient and waste transportation benefits provided by tidal cycles, and the presence of a variety of producers which are capable of almost year-round photosynthesis.

The open bays, estuaries, and tidal passes provide habitat and migration routes for many species of fish and benthos; intertidal and subtidal oyster beds are prominent structures forming macrohabitat for many small organisms. Mud flats are rich in benthos. Receding tides flush detritus out of the salt marshes into the bays, and out into the Gulf to enrich offshore waters. Most spawning of estuarine-dependent species occurs offshore during fall and winter. Larvae often become part of the temporary zooplankton community offshore and in the bays until spring migration into the marshes to feed on concentrated sources of detritus and other food supplies.

Phytoplankton are probably the most important primary producers in the offshore coastal waters. The offshore area provides little habitat for larger plants (macrophytes) since solid substrate is generally lacking, and in the littoral (shallow) zone, the sandy or mud bottom is subject to scouring due to wave action. Thus, the floating phytoplankton, which do not need the solid substrate required by the macrophytes, are the important primary producers in deep water. Approximately 100 species of phytoplankton are common to the coastal waters of Louisiana.

Copepods are the dominant zooplankton in the coastal marshes, bays, and nearshore Gulf. At least 45 taxa of zooplankton were collected during one study of coastal waters in the region. Commercially important organisms occurring in the zooplankton during this study included eggs and larvae of brown and white shrimp and blue crabs.

Benthic organisms are an important link in the food chain as they are a major source of food for many species of fish. Polychaete worms, snails, clams, oysters, white and brown shrimps, and blue crabs are typical benthic organisms inhabiting the region.

The estuarine and offshore areas of the southern Louisiana region are very productive environments for fish. This is partially related to the proximity of the vast marsh complex which serves as a breeding ground, nursery, and/or feeding ground for many fish of the region and the high primary and secondary productivity of the nearshore Gulf. Recent studies have identified nearly 100 species of fish in the region including the bay anchovies, Atlantic croaker, Gulf menhaden and sea catfish. During periods of low salinity in the estuaries and bays, several species of freshwater fish may be found, including catfish, sunfish, crappie, and gar as the most abundant.

Few mammals are expected to occur in the open water habitats of the bays and Gulf.

The major bodies of open freshwater within the study region (Figure 3.2-4) as well as numerous canals and bayous and many small ponds, swamps, marshes, and backwater areas combined with the heavy vegetation and low topography of the region contribute to excellent habitat for a wide variety of aquatic organisms.

Macrophytes (aquatic plants with complex structures; i.e., leaves, roots, and stems) are the dominant aquatic vegetation in the region and serve as a primary food source for many insects, mammals, and birds.

Benthic and suspended algae are abundant in the wetlands of the region. Many of the macrophytes contain growth of periphyton on their submerged portions. Benthic algae are utilized as food by many higher forms of life and also provide a considerable amount of detritus to the system upon their death and decay.

Zooplankton groups which are likely to occur in the wetlands are copepods, cladocerans, rotifers, ostracods, and amphipods. As primary and secondary consumers, zooplankters are an important intermediate link between primary producers and detritus, and other consumers.

Benthic invertebrates in wetlands of the region are dominated by dipterans, oligochaetes, and amphipods. Other benthic invertebrates perform an important function in the ecosystem by feeding on detritus, phytoplankton, and bacteria and by providing food for larger invertebrates and fish. The benthic invertebrate organisms are relatively immobile as a group, rendering them especially vulnerable to environmental stress.

Fresh water fish common in the region are indicated on Table 3.2-1. A total of about 68 kinds of fresh water fish inhabit the region. Several authors have reported that stocked and fertilized fish ponds and highly productive marsh waters can produce 200 to 500 pounds of fish per acre per year.

Fresh water wetlands provide resources for a number of permanent wildlife residents plus many part-time inhabitants. Millions of waterfowl in Louisiana make use of the coastal marshes as a winter habitat. Over 80 percent of the 2 million puddle ducks which winter in southeastern Louisiana are found in the freshwater marshes.

There are several commercially important species in the Capline region. The timber industry is based primarily on cypress, oak and gum. The major cash crops include sugar cane, rice, cotton, soybeans, tobacco and field corn. Louisiana leads the United States in wild fur production with major species including muskrat, mink, nutria, racoon and otter. Games species include waterfowl, rabbits, squirrels, dove, quail and deer. Commercial reptiles include turtles and bullfrogs. In the freshwater environment, crayfish, catfish, buffalo and drum are important. Louisiana is one of the nation's leading states with regard to the total value of its fishery. The marine organisms of prime commercial importance include Gulf menhaden, white and brown shrimp, blue crab and oysters.

Various plants and animals found in Louisiana and its waters are considered as threatened or endangered species. Eleven species of plants and 12 species of marsh birds which are having difficulty in maintaining their population are found in Louisiana (Table B.2-26). Other endangered species which may occur in the Capline region include the Atlantic ridley turtle, hawksbill turtle, leatherback turtle, American alligator, brown pelican, southern bald eagle, and Arctic peregrine falcon. Six species of endangered whales have been sighted in the northern Gulf: sperm whale, black night whale, humpback whale, sei whale, fin whale and blue whale.

### 3.2.6 Natural and Scenic Resources

Much of the region's scenic beauty comes from the forests and marshes discussed above. Tall stands of trees and abundant water bodies, both lakes and bays, provide numerous peaceful, natural vistas. Most of the region is quite flat with few areas of topographic interest except for scattered mounds such as Weeks Island which rise as much as 150 feet above the surrounding marshland.

Recreational and wildlife areas in the region are both numerous and vast. The region contains a number of national and state wildlife refuges, bird sanctuaries, fishing lakes, and state parks. These areas provide important opportunities for scientific study, for outdoor recreation and for natural scenic appreciation. A listing of major recreation and wildlife areas is given in Table 3.2-2 and shown on Figure 3.2-5.

### 3.2.7 Archaeological, Historical, and Cultural Resources

The coastal zone and Mississippi Delta region of southern Louisiana contain archaeological sites that indicate human habitation at least over the past 12,000 years. The discovery and study of archaeological sites provide essential understanding of prehistoric cultures and man's

TABLE 3.2-2 Existing and potential recreation and wildlife areas.

| Site No. | Site | Parish | Comments |
|---|---|---|---|
| 1. | Beau Sejour Oaks | Lafayette | Area of 100 year-old oaks |
| 2. | Lake Fausse Pointe | Iberia | Natural swamp and water area |
| 3. | Cypremore Point | St. Mary | Vermillion Bay peninsula |
| 4. | Burns Point | St. Mary | Accredited site on Cote Blanche Bay |
| 5. | Spanish Lake | Iberia | Bass fishing mecca |
| 6. | Grand-Lake-Six-Mile Lake Area (Atchafalaya Basin) | | Future water recreation area with abundant wildlife |
| 7. | Berwick Island | St. Mary | Seven acres of wooded island potentially acceptable for recreation |
| 8. | Avery Island | Iberia | 200-acre wooded island with bird sanctuary |
| 9. | Burns Point | St. Mary | Shady camping and picnic areas with access to Gulf |
| 10. | Lake Palourde | St. Mary | Recreational lake by Morgan City |
| 11. | Shell Keys National Wildlife Refuge | Iberia | Eight-acre colonial bird nesting area |
| 12. | Marsh Island Wildlife Refuge | Iberia | |
| 13. | East Timbalier Island | Lafourche | 337 acre wildlife refuge |
| 14. | Wisner | Lafourche | 3000 acre wildlife refuge |
| 15. | Edward Douglas White State Park | Lafourche | Historical monument |
| 16. | Bayou Penchant | Terrebonne | Scenic Waterway |
| 17. | Point au Chein Area | Lafourche & Terrebonne | 28,244 acre wildlife management area |
| 18. | McElroy State Park Area | St. James | |
| 19. | Lake Verret State Park | Assumption | |
| 20. | Iberville State Park | Iberville | |
| 21. | Untitled | Terrebonne | Proposed park or wildlife area |

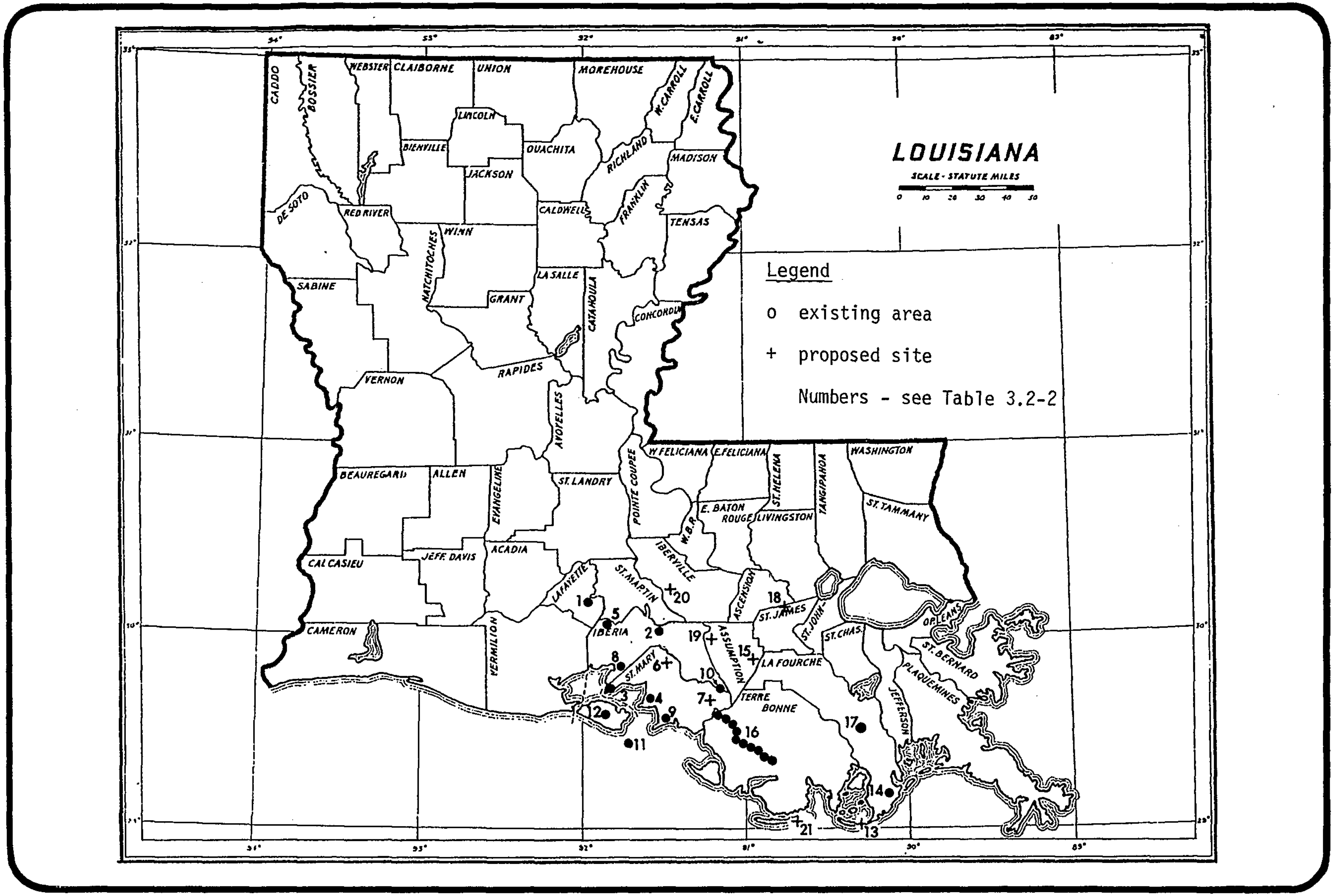



FIGURE 3.2-5  Existing and potential recreation and wildlife areas.

cultural evolution in this part of the world. In the six parish regions covered or influenced by the Capline sites, several hundred known archaeological or historic sites occur. Ten historic sites are listed in the National Register (1977), four are in Iberia Parish, one in Assumption Parish, and one in Terrebonne Parish (see Section B.2.7 of Appendix B).

### 3.2.8 Socioeconomic Environment

While the physical development associated with the proposed SPR sites would be confined to a relatively small land area within south-central Louisiana, a fairly large region of the state would receive the socioeconomic impacts from the project. In order to study these impacts, an eleven-parish region surrounding the sites was chosen as the area where the direct effects of development would occur (Figure 3.2-6). Included in this region are the parishes of Lafayette, Iberia, St. Mary, Terrebonne, Lafourche, Assumption, St. James, Ascension, Iberville, East Baton Rouge, and West Baton Rouge. The lower portion of St. Martin Parish is within the study region but is nearly unpopulated because it is largely within the Atchafalaya Basin Floodway; meaningful statistical data are therefore not available for this parish and impacts are expected to be minimal. Three of eight regional planning districts are represented, in part, in the region of concern. Lafayette, Iberia, and St. Mary Parishes are included in the State's District IV; East and West Baton Rouge, Iberville, and Ascension Parishes are in the Capital Region (District II); Assumption, St. James, Terrebonne, and Lafourche are in District III. The region's systems of waterways include the ICW, Bayou Teche, Bayou Lafourche, and the Mississippi River, as well as the coastal bays and connecting canals. Baton Rouge and Morgan City are both shipping ports. The region's major commercial airport is in Baton Rouge. Smaller commercial airports are located in Lafayette and Morgan City.

Baton Rouge, the state capital, is the largest city in the region, with over 150,000 inhabitants. It is expected to be a major source of labor for several of the proposed sites, especially the Bayou Choctaw dome. Other major cities in the region with populations of over 10,000

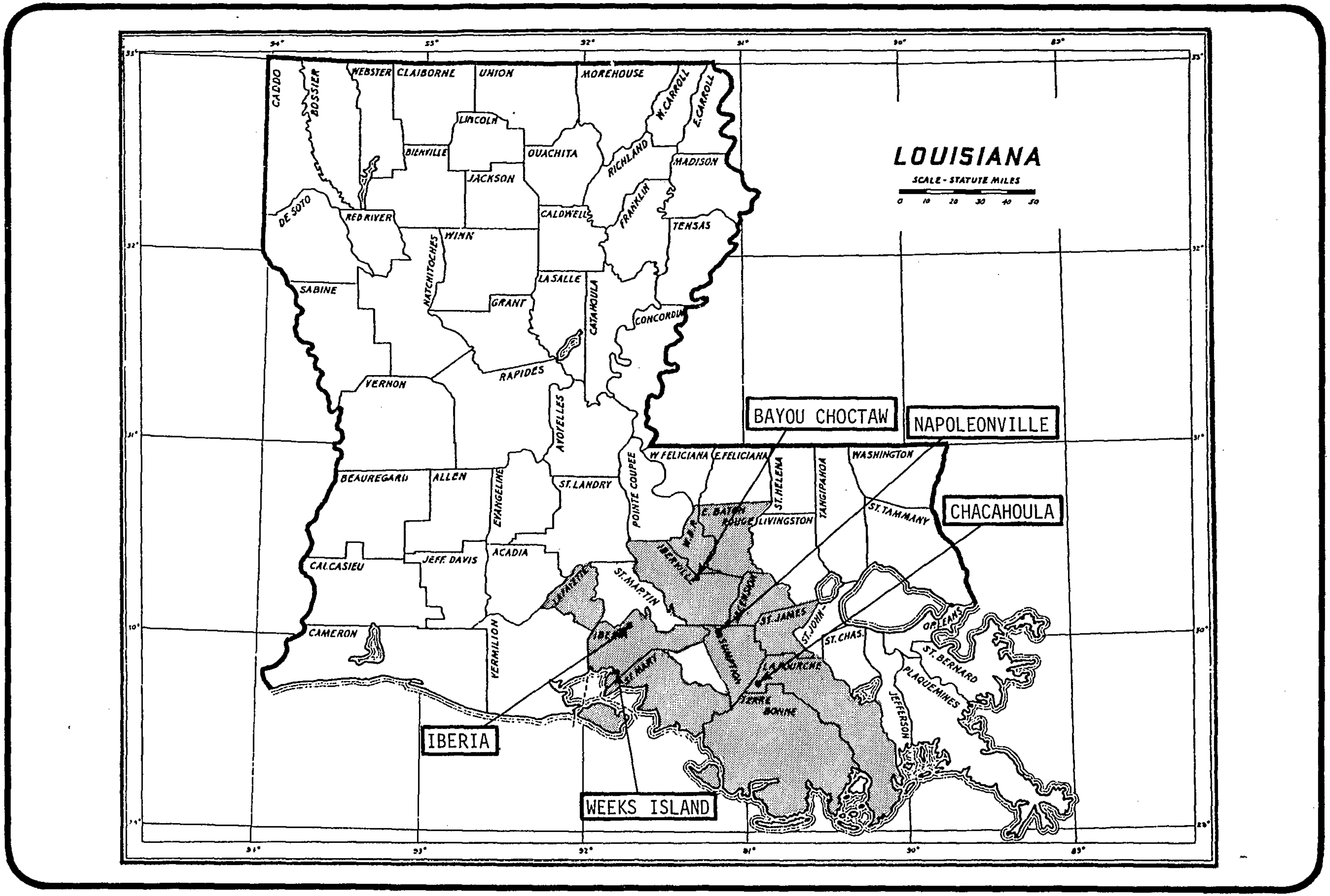



FIGURE 3.2-6 SPR sites and socioeconomic region.

inhabitants are Lafayette, New Iberia, Houma, Morgan City, and Thibodaux. New Orleans, while not in the eleven-parish area, is within feasible commuting distance from several proposed sites and may provide some labor for the projects; its 1970 population was 593,471.

All of the 11 parishes, except St. Mary, Lafayette, and East Baton Rouge, had substantial rural non-farm populations in 1970, indicating that a major part of the region's populations resided in non-urban areas. Many also lived in small towns of 2500 or less inhabitants. Throughout the region, population has been growing rapidly, but not at the same rate in each parish.

Two corridors have been identified as locations of probable future rapid development. The first in the New Orleans-Lafayette Corridor (NOLAF) which roughly parallels Highway 90 between these two cities (Figure 3.2-7). This portion of the project region includes the Bayou Teche levee from Morgan City to New Iberia, in St. Mary and Iberia Parishes. The second growth corridor is the New Orleans-Baton Rouge Corridor (NOBAR), within which lies the CAPLINE Terminal at St. James.

Settlement patterns and land use in the region have been influenced significantly by the topography and drainage. Natural levees provided areas suitable for development in the low-lying region, and furnished easy access to the waterways which were the main means of transportation. Most of the urban/residential land uses are still on these same levees especially along the Mississippi River, Bayou Lafourche, and Bayou Teche. Today, most major state highways and railroad links in the region still follow these levees. An extensive system of canals has been built to provide navigable waterways and to allow exploration and production of oil and gas resources. In some areas, oil and gas wells are extensive. Because of the extensive acreage of undeveloped forests and marshes, southern Louisiana is a virtual paradise for hunters and fishermen. The Gulf of Mexico is used for waterborne commerce, pleasure boating, fishing and offshore mineral production.

Major components of the region's economy are mineral production, manufacturing, shipping, and agriculture. A number of minerals are

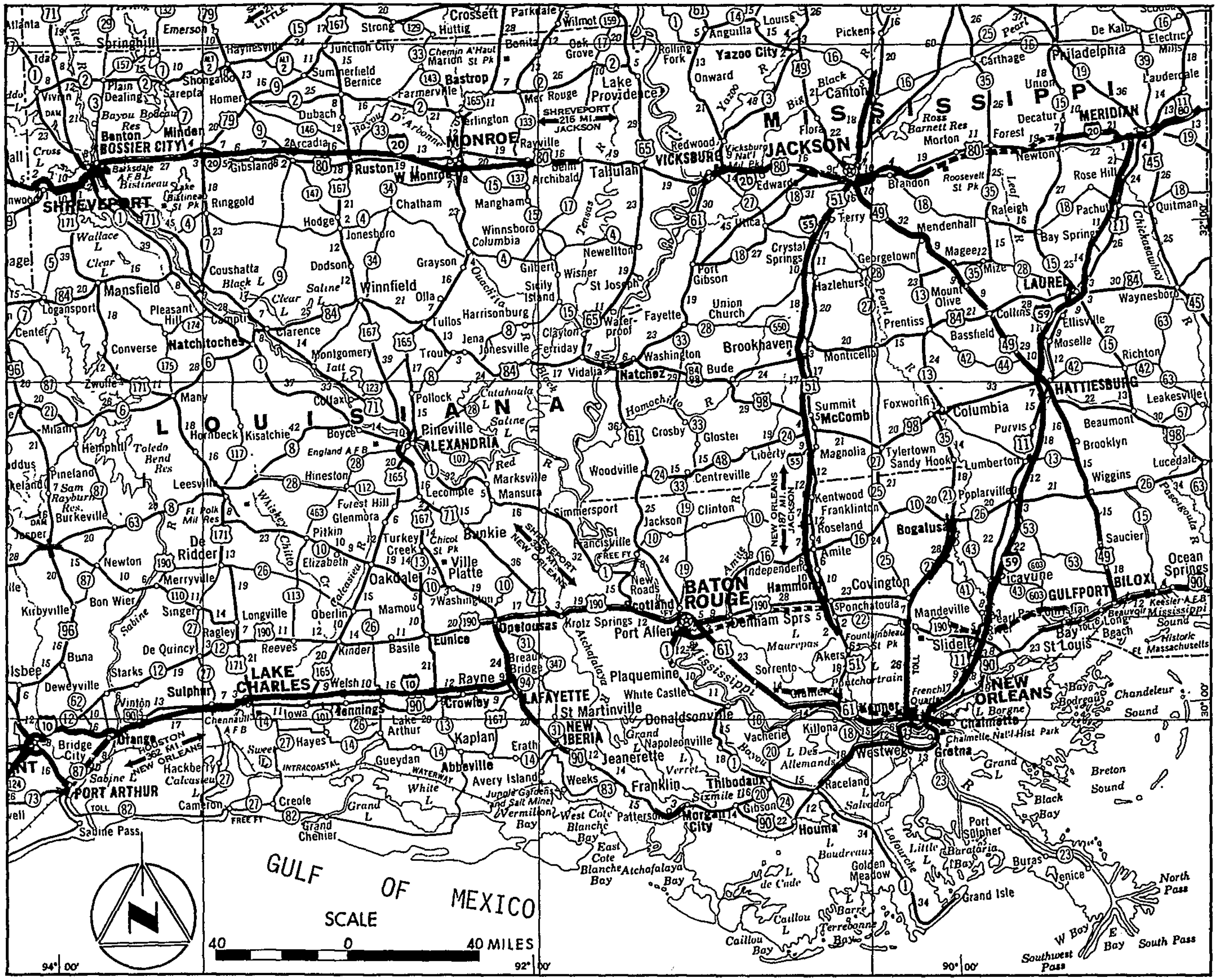



FIGURE 3.2-7 Regional highway network.

extracted throughout the region, the most important being petroleum, natural gas, and natural gas liquids. Other minerals extracted from the area include salt, sand and gravel, lime, cement, and natural clays. St. Mary and Iberia Parishes are important centers for salt mining.

Employment relies heavily on the industries discussed above. Manufacturing, construction, and mineral production are important industrial occupation categories within the region. Agriculture and retail trade and services are also significant employers. There are a substantial number of workers in the region who would be classified as: 1) craftsmen, foremen, and kindred workers; 2) equipment and vehicle operators; and 3) laborers.

There is a widespread pattern of commuting in the region. In the parishes near the city of Baton Rouge, in particular, the number and proportion of workers who commute out of their home parishes to their jobs is high.

Unemployment in the 11 parishes in 1976 varied from a high of 9.2 percent in West Baton Rouge down to 4.1 percent in Lafourche Parish. The average unemployment in the entire region was substantial; slightly over 5 percent. There is a large pool of available workers in East Baton Rouge Parish.

In general, mean family income in the region was above the state average in 1970. The percentage of families below poverty level varied considerably by parish and was above the state average in 5 of the 11 parishes (see Section B.2.8 of Appendix B).

Most of the public services provided in the region come from local governmental units - the parishes, municipal governments, and special districts. In terms of overall expenditures, schools generally account for one-half to two-thirds, highways for 5 to 10 percent, and "other" (which includes police and fire protection) for 15 to 25 percent of local spending.

The three most important sources of revenue for local government in Louisiana are intergovernmental transfers, real property (or _ad valorem_) taxes, and sales taxes. The most important local source of taxation to parishes is the _ad valorem_ tax.

## 3.3 SITE SPECIFIC ENVIRONMENT - PROPOSED DEVELOPMENT EARLY STORAGE SITES PLUS NAPOLEONVILLE

### 3.3.1 Group Description

The following sections present details of the existing environment specific to the proposed development of the Capline Group. The existing environment of Bayou Choctaw dome prior to construction of early storage facilities at that site and modifications to the environment resulting from that construction are detailed in FES 76-5 and its Supplement of May 1977 (see also Section 3.5.2). Development of Weeks Island dome as an early storage site and modifications to the existing environment are presented in FES 76/77-8 and its Supplement of July 1977 (see also Section 3.4.2). Information concerning the natural and manmade environment in the vicinity of the Napoleonville dome in Assumption Parish is summarized in Section 3.3.2 and described in detail in Section B.3.3 of Appendix B.

### 3.3.2 Capline Group Oil Distribution Terminal Systems

The sections below describe the environmental settings of the Koch and Nordix terminal system locations. As the environmental setting of the DOE terminal system at St. James has been described in a previous EIS (FES 76/77-5) and its supplement, the description presented will center on the settings of the Koch terminal system and the Nordix terminal system.

#### 3.3.2.1 Land Features

##### 3.3.2.1.1 Koch Terminal System

The Koch terminal system would be located within the Mississippi River Alluvial Plain, an area characterized by low relief and crossed by abandoned courses and distributaries of the Mississippi River system. Most of the soils found at the site are a result of Holocene alluvial deposits which form the natural levee ridges. The soils are interfingering deposits of clays and silts, and are used extensively for agriculture. In the river, substratum soils are composed of massive sands, grading to gravelly sands and gravel with increasing depths. Accretionary soils consist of alternating layers of clay, silt, silty sands, and sands.

3.3.2.1.2 Nordix Terminal System

The Nordix terminal system also lies within the Mississippi River Alluvial Plain, and its soils are also the results of Holocene alluvial deposits. The nature of substratum soils found in the Mississippi River are the same as those described above.

3.3.2.2 Water Environment

3.3.2.2.1 Koch Terminal System

The principal water body in the vicinity of the Koch terminal system is the Mississippi River, which separates the proposed tanker dock and storage tanks and would be crossed by a pipeline connecting these two components. Also in the vicinity are a series of drainage canals that provide intermittent flow of surface water.

The average flow in the Mississippi River in the vicinity of the project was 925,000 cubic feet per second (cfs) during 1973-1974. Over the 98-year period of record, the highest recorded flow was 1,473,000 cfs; the minimum flow was 73,700 cfs. The stream cross section at the pipeline crossing is approximately 120,000 square feet and has an average width of 2400 feet and average depth of 50 feet.

No data is available on flow rates in the drainage canals crossed by the pipeline on the west bank of the Mississippi River. Because of low gradients found in these areas, water flow is typically sluggish and intermittent. One factor controlling water quantity in the canals is the seasonal variations in precipitation.

Drainage from the land area of the storage tanks or that are crossed by the pipeline is generally to the west, toward the St. James Canal; however the direction of flow varies. Under certain conditions, backflow will occur up the canals from the west.

Potable ground water supplies in the vicinity of the Koch terminal system come from the Plaquemine aquifer, the major shallow subsurface aquifer in the region. It is comprised of deltaic and alluvial deposits of sand and gravel which are covered by a clay and silt surface layer approximately 100 feet thick. In the vicinity of St. James, fresh water (less than 250 mg chloride/liter) occurs to a maximum depth of less than 300 feet.

3.3.2.2.2 Nordix Terminal System

The principal waterway affected by the proposed facilities is the Mississippi River, which would be the site of a tanker dock and a 3400-foot pipeline crossing at about Mile Post 203.7. Two other very small waterways would be crossed by the pipeline and are shown on Figure B.3-2. Bayou Paul, which crosses the Nordix site just south of the proposed tank farm, provides local drainage of wetlands to the Mississippi River and tributaries drainage system, and to the Bayou-Pontchartrain-Maurepas system to the east. Bayou Butte is a channelized canal which drains the Point Pleasant sector of the west levee to the wetlands of the Barataria-Salvador-Des Allemands drainage system west of the river. Several very small, intermittent channels which drain local rainfall from the agricultural land are crossed on the west bank levee (Figure B.3-2).

The hydrology of the Mississippi River is described in Section B.2.2.1.2 of Appendix B. Channel depth ranges up to 70 feet or more. The 500-foot navigation channel is maintained at a minimum depth of 40 feet. The river discharge may range from recorded extremes of 70,000 cfs to nearly 1.5 million cfs. River stage fluctuates as much as 30 to 45 feet with these extremes; annual fluctuations of 25 feet are common at Baton Rouge, approximately 25 miles upstream of the Nordix Terminal site. River current velocities may range from 0.6 to 9 feet/second (fps) at the surface, from 0.8 to 12 fps at 60 percent of river depth, and from 0.3 to 4.5 fps at the bottom (U.S. Army Corps of Engineers, unpublished data). The high-water season generally lasts from near the end of March through mid-May and the low water season occurs from August through mid-December.

Potable ground water supplies in the project vicinity come primarily from the Plaquemine aquifer, which is overlain by 100 feet of generally impermeable deposits of clay and silt. Though there may be an interconnection with the Mississippi River in places, the water supply is only locally affected by recharge from the river (Whiteman, 1972). Deep aquifers would not be affected by the Nordix Terminal facilities.

#### 3.3.2.3 Climatology and Air Quality

##### 3.3.2.3.1 Koch Terminal System

Climatological summaries from New Orleans are believed to be representative for this area since both are about the same distance from the coast. Tropical storm effects will be significantly less pronounced than along the coast where the additional hazard of hurricane tides (waves and swells) exists.

Generally, the air quality data presented in Section B.2.3.3 of Appendix B are applicable to the St. James vicinity. The nearest sampling station to the area is located at Donaldsonville, where particulate concentrations in excess of the national and state standard have been recorded. As this station is located approximately 14 miles north of St. James and both sites are in the same heavily industrialized corridor, air quality at St. James is expected to be very similar to that recorded at Donaldsonville.

##### 3.3.2.3.2 Nordix Terminal System

Climatological summaries from Baton Rouge are believed to be representative of the Sunshine vicinity due to the proximal location of this station to the site. Tropical cyclones, including hurricanes, lose strength rapidly as they move inland. The greatest concern at Sunshine is potential damage from wind or flooding due to excessive rainfall.

Generally, the air quality data presented in Section B.2.3.3 of Appendix B are applicable at Sunshine. However, since the site is 10 miles away from the nearest industrial center (Baton Rouge), the air quality at Sunshine normally will be less polluted than in industrial areas.

#### 3.3.2.4 Background Ambient Sound Levels

##### 3.3.2.4.1 Koch Terminal System

Although site-specific ambient sound data were not available, data from ambient sound surveys conducted at potential SPR sites at Cote

Blanche (FES 76/77-7) and Weeks Island (FES 76/77-8) were used to estimate baseline sound levels at the Koch terminal site. Ambient sound levels at the site are dominated by sounds from highways, river traffic, and other industrial sources. Ambient day-night weighted sound levels at the Koch terminal site are estimated to be 65 dB.

#### 3.3.2.4.2 Nordix Terminal System

Ambient sound levels along the proposed pipeline route between the Nordix terminal site and the Bayou Choctaw-St. James pipeline tie-in are typical of levels expected for a secluded, essentially flat, moderately forested area. The sounds in the area are dominated by the wind in the trees, insects, crickets, birds, and other wildlife. Noise levels measured at undeveloped areas on Weeks Island in the coastal area of Louisiana indicate that day-night weighted sound levels are slightly above 50 decibels (dB) (FEA, 1977b). It is expected that a similar sound level (53 dB) should apply to the undeveloped areas located along the proposed Nordix pipeline route.

At the Nordix terminal site, the ambient sound levels may occasionally be significantly higher than along other area of the pipeline route due to ongoing industrial activity. Ambient day-night weighted sound levels at the Nordix terminal site are mainly contributed by truck and barge traffic and are estimated to be 65 dB.

### 3.3.2.5 Ecosystems and Species

The description of the environmental setting of the proposed Koch and Nordix terminal facilities site areas are based on regional inventories, known species ranges, literature sources, topographic maps, aerial photographs, and a field inspection of the site.

#### 3.3.2.5.1 Koch Terminal System

The 32-acre site is dominated by cleared lands, supporting both industrial and agricultural activities, that intergrades with bottomland forest and the Mississippi River. Industrial activities in the vicinity of the site on the west bank are primarily concerned with oil terminaling (including docks, pipelines, and oil storage tanks), while on the east bank, these activities include a chemical plant. No bottomland forest, swamp forest or marshland would be affected by the proposed oil distribution terminal facilities.

Land near the Koch terminal facilities is presently used for agricultural purposes, principally cultivation of sugar cane, and for industrial purposes. Crop and pastureland support a less diverse fauna and flora than do bottomland forests. Vegetation is generally sugar cane, soy beans, signal grass, or goatweed. Common wildlife include blackbirds, sparrows, field birds (such as dove and quail), cottontail rabbits, skunks, rats, and mice. Migrant wildfowl often feed in croplands in high densities.

Bottomland forests in the vicinity of the Koch terminal system occur on the east bank of the Mississippi River. These alluvial lands, or batture, which front the river, are periodically flooded. Common species of trees include the willow, cottonwood, huckberry, sycamore, honey locust, sweetgum, Drummond red maple, and water locust. Many species of herbs, grasses, and sedges, as well as submerged plants and floating vegetation, occur in the zone between normal low and high water and in the numerous borrow pits created by excavation during levee construction (Corps of Engineers, 1974). Bottomland forest provides excellent habitat for a variety of terrestrial and avian wildlife. Common species include small rodents, fur-bearing mammals (nutria, muskrat, mink, fox, raccoon, and opossum), rabbits, white-tail deer, skunk, armadillo, and a variety of wading birds, hawks, owls, and song birds.

Fish which can be found in the Mississippi River in the vicinity of the Koch terminal system include largemouth bass, bluegill, redear, warmouth, black crappie, white crappie, several other sunfishes, catfishes (blue, channel, flathead, and bullhead), and several species of gar and carp.

3.3.2.5.2 Nordix Terminal System

Approximately 4.2 miles of agricultural land on the west side of the river would be crossed by the proposed 36-inch pipeline. In addition, approximately 38 acres of land at the Nordix terminal system site is presently cleared and suitable for agriculture. Crop and pasture lands support a less diverse fauna and flora than nearby bottomland forests and wetlands. Vegetation is generally sugar cane, soy beans, signal grass, or goatweed. Common wildlife include blackbirds, sparrows, field birds (such as dove and quail), cottontail rabbits, skunks, rats, and mice. Migrant waterfowl often feed in croplands in high densities.

Common species of trees occurring on well-drained levee lands which have not been cleared include honey and water locust, various oaks (Nuttall, shumard, water, overcup, cherry bark, and live), elms (American, cedar, water), persimmon, pecan, swamp privet, hawthorne and green ash. Several species of shrubs, vines, and grasses occur in the understory. The alluvial land, or batture, which fronts the Mississippi River, is flooded periodically. Common trees include the willow, cottonwood, hackberry, sycamore, honey locust, sweetgum, Drummond red maple, and water locust. Many species of herbs, grasses and sedges, as well as submerged plants and floating vegetation, occur in the zone between normal low and high water and in the numerous borrow pits created by excavation during levee construction (Corps of Engineers, 1974).

The bottomland forest provides excellent habitat for a variety of terrestrial and avian wildlife. Common species include small rodents, fur-bearing mammals (nutrial, muskrat, mink, fox, raccoon, opossum), rabbits, white-tail deer, skunk, armadillo, and a variety of wading birds, hawks, owls, and song birds.

Fish which can be found in the Mississippi River and its tributaries in the study area include largemouth bass, bluegill, redear, warmouth, black crappie, white crappie, several other sunfishes, catfishes (blue, channel, flathead, bullhead), and several species of gar and carp. Zooplankton and benthos are present in small populations.

Several species of waterfowl occasionally rest on the river during migration.

#### 3.3.2.5.3 Threatened or Endangered Species

Although the eastern cougar, southern bald eagle, and arctic peregrine falcon are endangered species which occur in southern Louisiana, neither the Koch terminal system facilities nor the Nordix terminal system facilities pass through habitat expected to be used by these species. The American alligator is presently considered threatened and could occur occasionally in small water bodies or along the batture in the area.

A list of endangered or threatened plant species which occur in Louisiana is provided in Section B.2.5 of Appendix B. It is unlikely that any of these occur on lands used for the Koch or Nordix terminal system facilities.

3.3.2.6 Natural and Scenic Resources

3.3.2.6.1 Koch Terminal System

Scenic resources in the vicinity of St. James, Louisiana consist primarily of a landscape dominated by agricultural and industrial land uses. There is little variation in topography with the Mississippi River levee providing the highest topography for some miles on either side of the river. Away from those agricultural and industrial areas, however, the vegetative cover is lush and provides a natural beauty to the area.

Although there are several National, state, and private wildlife refuges in the coastal wetlands of south Louisiana, there are none located in the vicinity of the Koch oil distribution terminal system. Nor are any state forests, commemorative areas, or preservation areas located in that vicinity.

3.3.2.6.2 Nordix Terminal System

Scenic resources in the vicinity of the Nordix terminal system are similar to those discussed above, although agricultural and industrial activities are somewhat less predominant. The visual intrusions that these activities present to the more natural areas are less extensive and residential areas are also found.

3.3.2.7 Archaeological, Historical, and Cultural Resources

3.3.2.7.1 Koch Terminal System

Although there are numerous sites in southern Louisiana that have been identified as having historical, archaeological, architectural, or cultural importance, there are very few known sites in St. James Parish. The U.S. Army Corps of Engineers (1973) lists three known archaeological sites in the Parish. Federal historical sites listed in the National Register of Historic Places include two sites in the Parish. No archaeological sites are known to exist in the vicinity of the Koch Terminal System.

3.3.2.7.2 Nordix Terminal System

The Corps of Engineers (1973) lists 23 archaeological sites recorded in Iberville Parish. None are thought to be located within the proposed project corridor. Other sites may exist which have not been recorded but it is unlikely any would be within proposed project lands because most areas have been developed for many years.

There are presently three sites in Iberville Parish listed in the National Register of Historic Places. There are at least 46 sites listed in the Louisiana State Plan, including the communities of Soulouque and Tallyho which are near the proposed pipeline right-of-way.

3.3.2.8 Socioeconomic Environment

3.3.2.8.1 Koch Terminal System

St. James Parish is a predominantly rural area located on either bank of the Mississippi River. Of 157,000 total acres within the Parish, over half (79,781 acres) is forested wetlands, 6700 acres are waterways and streams, 7400 acres are deciduous forestlands, 55,575 acres are crop and pastureland, and 6400 are urban and built-up lands. In this latter category is included 1200 acres of residential uses, 1500 acres of industrial use, and 2700 acres of cluster and strip development areas. These urban land uses are generally found in close proximity to the Mississippi River.

Land within the vicinity of the Koch terminal system is generally used for agricultural, industrial, or residential uses. Agricultural land is predominated by the cultivation of sugar cane, with small areas (such as the levee) being used as pastureland. Industrial uses are predominated by oil handling facilities and petroleum and petrochemical refineries. Near the dock area on the east bank of the river, a chemical plant is located. Throughout the vicinity, residential, industrial, and agricultural land uses are intermingled.

The population of St. James Parish in 1970 was 19,733, an increase of 7.4 percent from the 1960 population level (University of New Orleans, 1974). Most of this population is rural, non-farm, and reside in numerous small towns having populations less than 2500. Near the Koch terminal are the towns of St. James (located approximately 4 miles south), Burton Lane, Chatman Town, and Convent. Population density in the Parish, in 1970, was 78 persons per square mile.

Principal sources of income in St. James Parish are found in manufacturing, shipping, resource production, and agriculture. Manufacturing activities are centered around the Mississippi River and are predominated by chemical plants, the manufacture of goods related to construction activities, and the refining of petroleum. The value of mineral production, in 1971, in St. James Parish was $11.1 million.

The median family income for St. James Parish for 1970 was $8048, which is considerably higher than the state median income of $7527. Low income families in the Parish accounted for 21.5 percent of the number of families, only slightly lower than the percentage of low income families in the state (21.5 percent).

Transportation in the vicinity of the Koch terminal system include two state highways (route 18 on the west bank and route 44 on the east bank), two railroads (Texas and Pacific on the west bank and Illinois Central Gulf on the east bank), the Mississippi River, and numerous pipelines for the transport of petroleum products. Shipping traffic on the Mississippi River transports grains, coal and coke, petroleum products, non-metallic minerals, metal products, building materials, sand and gravel, salt, sulfur, chemicals, and miscellaneous other commodities. Traffic in the 40-foot channel between Baton Rouge and New Orleans more than doubled between 1960 and 1970 (from 22 to 44 million tons of ocean-going commerce and from 31 to 87 million tons of barge commerce, Corps of Engineers, 1974). During 1975, there were a total of 46,852 vessel trips in the segment of the river between St. James and Baton Rouge reported by the Corps of Engineers in Waterborne Commerce of the United States, 1975. Approximately 95 percent of these trips were made by vessels with a draft of less than 18 feet. There are many barge and tanker terminals along both banks of the river, which is the focus of most industrial and manufacturing development in the area.

Data on housing availability and community services are presented in FES 76-5 and its supplement (FEA, 1977). Generally, housing is severely limited on the east bank of the river, though more available in the larger population centers in the region.

3.3.2.8.2 Nordix Terminal System

Iberville Parish contains predominantly rural land south and west of the Baton Rouge area. The eastern edge of the parish includes both sides of the Mississippi River near Sunshine; the western edge includes a part of the Atchafalaya Basin. Predominant land use is agricultural (more than 100,000 acres under cultivation, Fielder, 1973) and forest land (over 410,000 acres including 279,000 acres in commercial production, Earles, 1975).

The 1975 population was approximately 30,700 (Segal, et al., 1976), which was slightly lower than in 1970. Segal predicts a 7 percent net loss in population by the year 2000, in part due to the continuing trend toward fewer, larger farms with increased mechanization. The 1975 population density was 47 per square mile, or 168 per square mile of habitable land. Plaquemine (pop. 7739) and White Castle (pop. 2206) are the largest communities in the parish.

Prinicpal sources of basin income in Iberville Parish are agriculture, forestry, mineral resource production, and manufacturing. Crops were valued at $7.2 million in 1972, nearly 90 percent being sugar cane (Fielder and Guy, 1973). Three million cubic feet of timber were harvested in 1973 (Earles, 1973). Mineral production in 1970 was valued at about $6.2 million, mostly oil and gas with some salt, sand and gravel (Corps of Engineers, 1973). Total manufacturing income for 1972 was $26 million (Bobo and Charlton, 1974). Commercial fishing is not an important economic activity.

The median family income in Iberville Parish for 1970 was $6251, which was lowest of all nearby parishes and $108 below the Louisiana average (Bobo and Charlton, 1974). In part, this is a reflection of the fact that many people who work in Iberville Parish, particularly near Plaquemine, commute from homes in neighboring, more urbanized, parishes.

Transportation in the vicinity of the Nordix terminal system includes a state road that passes near the site (route 75), ferry connection to the town of Plaquemine, the Illinois Central Gulf railroad, numerous pipelines (principally transporting petroleum products), and the Mississippi River. The Nordix site lies between St. James and Baton Rouge segment of the river which is discussed above.

Data on housing availability and community services are presented in FES 76-5 and its supplement (FEA, 1977c). Generally, housing is severely limited on the west bank of the river, though more available in the Baton Rouge area to the northwest.

### 3.3.3 Napoleonville Dome

#### 3.3.3.1 Land Features

The Napoleonville salt dome is an elliptically shaped piercement dome with a flat top and steep sides (Figure 3.3-1). Unconsolidated and partially consolidated muds, sands, and shales of Pleistocene to Holocene age overlie the central portion of the dome, developing thicknesses of 600 to 1000 feet. Unconsolidated and partially consolidated sands and shales of Pliocene and Miocene age extend downward to between -15,000 and -16,000 feet adjacent to the dome. Faulting of Miocene and overlying Pliocene formations adjacent to the dome is extensive and complex.

Information on the quality of the salt mass is not available. The caprock is composed of an average (from top to bottom) of 105 feet of calcite ($CaCO_3$), 114 feet of gypsum ($CaSO_4.2H_2O$) - within which is commonly found a 25-foot bed of shale, and as much as 29 feet of anhydrite ($CaSO_4$). Other constituents include an average of eight percent sands and shales.

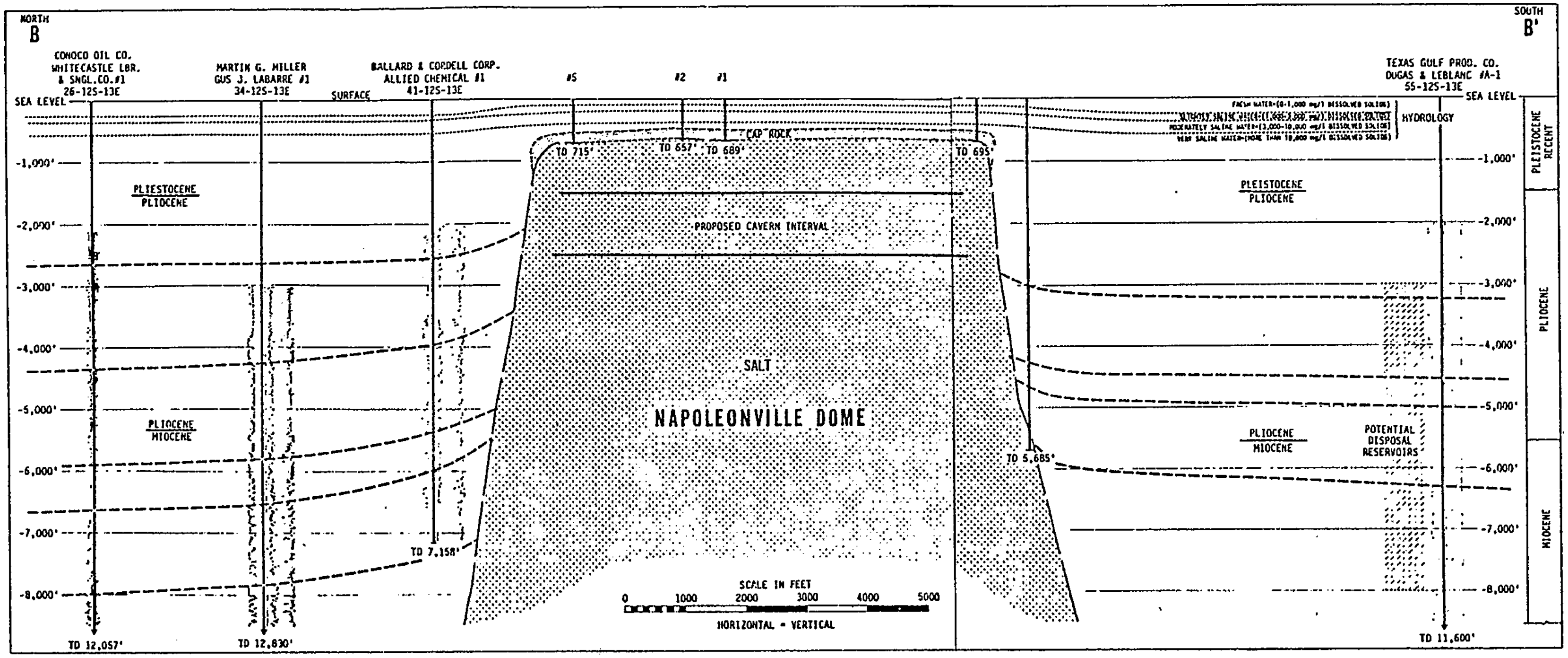



FIGURE 3.3-1 Geologic cross section (north/south) Napoleonville dome.

Average depth to the top of the caprock is 580 feet. Information concerning the extent of caprock is poor; and it has not been determined whether it covers only the dome, or whether it extends out over the flanks. Caprock is usually intensely fractured and faulted due to the upward pressures exerted by the rising salt stock. During periods when the salt is not rising as fast as it is dissolving, caprock may be partially unsupported and fall along new or preexisting fault planes, thus creating the brecciation commonly encountered in drilling.

Oil production has largely been confined to the north rim of the dome, with the greatest density of drilling on the northeast flank. Interpretation of available data suggests that oil and gas occur on the flanks of the dome in Miocene or younger sediments that are faulted or pinched out against the sides of the dome. Deepest production is from -8989 and -12,016 feet.

Soils in the vicinity of the Napoleonville dome comprise unprotected clayey soils, which occur at low elevations that are frequently flooded; poorly drained, clayey alkaline soils occur in depressions and at the base of natural levees; and somewhat poorly drained, alkaline soils are found at the higher elevations on the levees.

#### 3.3.3.2 Water Environment

Grand Bayou is approximately 0.5 mile to the west of the site, and flows generally southerly to Lake Verret about 6 miles downstream. Other water bodies in the site area include Bayou Corne, about 2 miles to the west, and Bayou Lafourche, about 5 miles to the east. Numerous other smaller canals are located in close proximity to the site. Natural drainage is generally to the south and west.

The dome penetrates the Plaquemine aquifer, the base of which is at a depth of about 1400 feet in the site vicinity (Figure 3.3-1). Highly saline water (greater than 10,000 mg/l dissolved solids) occurs below a depth of about 550 feet. The base of fresh water is about 250 feet below sea level in the vicinity of the dome.

Aquifers in the vicinity of Napoleonville dome are capable of delivering large quantities of slightly to moderately saline water to properly completed wells. Aquifer porosities are on the order of 40 percent, with permeabilities in the range of 1000 to 2000 gpd per foot. Well yields of 5000 gpm or more may be anticipated. Ground water use in the vicinity of Napoleonville dome is minor.

#### 3.3.3.3 Climatology and Air Quality

Climatological summaries from New Orleans are believed to be representative for Napoleonville, since both are about the same distance from the coast. Tropical storm effects, while more pronounced at Napoleonville than farther inland, will be significantly less than along the coast where the additional hazard of hurricane tides (waves and swells) exists.

Generally, the air quality data presented in Section B.2.3.3 of Appendix B are applicable at Napoleonville. The nearest sampling station to the site is at Donaldsonville, where particulate concentration in excess of the national and state standards has been measured. However, Donaldsonville is near a more heavily industrialized area of the state, and air quality at Napoleonville will normally be less polluted than at Donaldsonville.

#### 3.3.3.4 Background Ambient Sound Levels

Site-specific ambient sound data are not available. Data from ambient sound surveys conducted at potential SPR sites at Cote Blanche (FES 76/77) and Weeks Island (FES 76/77-8) were used to estimate baseline sound levels at the Napoleonville site. Areas around Cote Blanche and Weeks Island have low density population and marshland uses similar to Napoleonville. Ambient sound levels at the site are dominated by sounds from highways, pumping stations, storage facilities, and other industrial activities. Ambient sound levels in neighboring areas are dominated by insect and animal noise, wind noise, and traffic on local roads.

#### 3.3.3.5 Ecosystems and Species

The description of the environmental setting of the Napoleonville site area is based on regional inventories, known species ranges, literature sources, topographic maps, aerial photographs, and a field inspection of the site.

The primary types of ecosystems within the immediate vicinity of the site are cropland, bottomland forest, and deciduous swamp. In addition, the village of Grand Bayou extends onto a portion of the dome. Generally, arable land within the site area has been used for agricultural production of livestock, sugar cane, corn, sorghum, wheat, soybeans, and peanuts. The vegetation found on and around the site is dominated by bald cypress, followed in importance by tupelo, gum, red maple, water ash, and pumpkin ash. Generally, areas to the west of and close to Grand Bayou are vegetated by cottonwood, sycamore, red gum, black willow, and hackberry. Water oak and nutall oak are also represented in the overstory.

Understory vegetation of the bottomland forest generally includes significant representation by regenerants of the dominant overstory stratum. Other species of importance in the site vicinity include greenbriar, poison ivy, palmetto, blackberry, trumpet vine, Virginia creeper, peppervine, holly, and grape.

In addition to the native vegetation surrounding the site, areas such as roadway edges, levees, and built-up sites on the dome have been modified and revegetated with Bermuda grass, wild rye, panic grass, Bahai grass, and Johnson grass.

The deciduous swamp and bottomland forest is by far the most significant and characteristic habitat type (in terms of surface acres) found at the site. This habitat type provides resources for a large number of wildlife species (see Table 3.2-1 and Section B.2.5 of Appendix B). Some common bird species of the bottomland forest and swamp include herons, egrets, woodpeckers, wood duck, woodcock, thrushes, vireos, and warblers. Two important recreational species likely to occur on site are the wood duck and woodcock. Bottomland areas such as those present on the site, provide essential nesting and wintering habitat for both species. The bottomland swamps also provide suitable habitat for the rare and endangered southern bald eagle.

Some common mammals expected to occur in the bottomland forest and swamp include opossum, squirrels, nutria, mink, raccoon, swamp rabbit, bobcat, and white-tailed deer. Important commercial or recreational inhabitants include squirrels, rabbits, furbearers, and deer.

Amphibians and reptiles expected to occur are discussed in Section B.2.5 of Appendix B. The bottomland swamp provides important habitat for the alligator which is considered an endangered species in the Napoleonville site area.

Cleared lands provide limited habitat for wildlife. Most wildlife species found in these areas are those that have adapted to man and can survive in significantly altered habitats. Some of these species are presented in Table 3.2-1 under the cleared lands category.

The freshwater wetlands at the site consist of a vast swamp area connected by a canal-bayou-lake complex to Grand Bayou at the western margin of the site (Figure 2.3-4). Wildlife species expected to occur in these wetlands are discussed in Section B.2.3 of Appendix B. Commercially and recreationally important species include waterfowl and furbearers.

The most apparent constituent of the swamp complex at the Napoleonville dome is the aquatic macrophyte community. Plants which often dominate the freshwater swamps in southern Louisiana include bulltongue, maidencane, water hyacinth, and spikerushes (accounting for 66 percent of swamp vegetation). Giant cutgrass, elephant's ear, various pond weeds, and black willow also dominate the swamp/creek interface along Grand Bayou in many places. A blanket of duckweed covers much of the water surface on the site during warm parts of the year.

The freshwater swamps are most diverse habitats and are among the most productive natural ecosystems in the world, with mean net productivity of organic materials as high as 2000 grams dry weight per square meter per year. Since the Napoleonville dome is in a temperate, nutrient enriched area, this level of production should be indicative of specific production in the vicinity of the proposed facility.

The majority of phytoplankton likely to be encountered in the standing waters around the site include green algae, blue-green algae, and diatoms, which are usually most abundant in the spring. Copepods are likely to be the most abundant zooplankter; however, cladocerans, rotifers, and ostracods may also be abundant.

Benthic macroinvertebrate data specific to the site are not available, and fisheries data are limited. However, the characteristics of these communities are probably not much different from those discussed for the regional environmental setting (Section 3.2.5). A fishery survey of Grand Bayou (1973-1975) about 3 miles north of the site identified 19 fish, the most abundant being the gizzard shad. The most abundant game fish was the white crappie and the most abundant commercial fish were blue and channel catfish. Total standing crop for the 1973 sample was 307.0 pounds/acre and 126.0 pounds/acre in 1975.

The productivity of the habitats in the vicinity of the proposed brine disposal system may be higher than that of the dome since most of the habitats near the brine disposal system are undisturbed. The alternative brine disposal system to the Gulf of Mexico would require a pipeline across the Atchafalaya Basin. However, the alternative system would be in area along pipeline routes already established for another system (pipeline from Weeks Island to St. James). The environmental setting of the alternative brine disposal system encompasses an area about 74.4 miles long, which includes a 32.1 mile section in the Gulf of Mexico. This area is characterized by the same ecosystems as discussed in the regional setting of the Capline Group (Section 3.2.5). A major portion of the alternative brine disposal route would be through relatively undisturbed swamps and marshlands, and would require crossing many streams.

The primary oil delivery system and the alternatives for raw water from Grand Bayou, the Mississippi River, or from the well field would involve habitats similar to those on the dome. The alternative system for raw water from the Gulf of Mexico would use the same habitat as the Gulf of Mexico brine disposal system but would be 30.1 miles shorter since the raw water system pipeline would only extend 2 miles offshore.

#### 3.3.3.6 Natural and Scenic Resources

The storage site is located in an area that was originally swamp and cropland but which has been significantly altered by previous industrial development. The natural aesthetic value of much of the site is fairly low due to the presence of brine producing facilities including wells, pumping stations, storage facilities, pipelines, and roads. There are wooded areas on the site itself, however, which have some natural aesthetic appeal. The area along Grand Bayou has a slightly higher aesthetic value due to the waterway and associated vegetation. Access roads through the developed area are not open to the public. The surrounding swamps and bottomland areas are inaccessible by road. The site is not visible from the nearest public road, Route 70.

The area south of the site toward the Gulf of Mexico contains many remote areas of fresh and brackish swamps and marshes with valuable scenic resources. These areas are frequently inaccessible by road and are viewed only by occasional waterborne travelers.

The areas between the storage site and Bayou Lafourche to the east are of lesser scenic appeal having been cleared in most cases. The open fields offer broad vistas of varying beauty depending on the season.

The proposed Lake Verret State Park is about 3 miles south of the Napoleonville site. Other wildlife and recreational areas in the region surrounding Napoleonville are discussed in Section B.2.6.1 of Appendix B, but none are within a 10-mile radius of the dome (see also Figure 3.2-5).

#### 3.3.3.7 Archaeological, Historical, and Cultural Resources

The Napoleonville dome does not appear to contain any known sites of archaeological or historic significance. However, there are several sites within a 5-mile radius of the dome.

Two sites of archaeological interest are north of the dome in Assumption Parish near the intersection of the boundaries of Ascension, Assumption, and Iberville Parishes. Three other sites occur south of the dome on either side of Grand Bayou and approximately half-way between Lake Verret and Route 70. There are approximately 15 sites along Grand River south of the Iberville-Assumption Parish border to the south end of Lake Verret, some of which may occur within 5 miles of the dome. Additionally, the Belle Rose Sugar House north of Belle Rose, and the historic town of Paincourtville are approximately 5 miles from the dome. Other listed sites are all farther away.

#### 3.3.3.8 Socioeconomic Environment

The project site is in the northern part of Assumption Parish which had a total population of 19,654 in 1970. The largest urban settlement in the parish is Napoleonville, about 7 miles southeast of the project. It had a population of 1008 persons in 1970, a 12.2 percent decrease from the population recorded in 1960. There are a number of small areas of population concentration with fewer than 1000 persons along Route 1, east of the site. The town of Grand Bayou is located about a quarter of a mile north of the northern boundary of the site. The major population centers of Baton Rouge, Thibodaux, and Morgan City in the regions surrounding Napoleonville are discussed in Section 3.2.8.

The village of Grand Bayou which overlies a portion of the dome north of the site consists of about 30 residences and a few additional scattered structures. Several sections of land over the dome are currently in use for extraction or mining; brine and sulfur have been produced since 1957. Dow Chemical, Texas Brine and Storage Company, and Shell Oil Company lease significant portions of the dome property. A few above-ground structures related to extraction and mining activities exist on and around the proposed site area. Within a 10-mile radius of the site, the land area west and north of the site is predominantly marshland. To the east and northeast of the site along Bayou Lafourche, much of the land up to the Mississippi River is in agricultural use. Some residential and commercial strip settlement has occurred along Louisiana Route 1 which runs north/south about 5 miles east of the site. Grand Bayou flows south through the dome immediately adjacent to the west edge of the proposed SPR site. Lake Verret is located about 6 miles to the south.

The area surrounding the storage site is served by the regional transportation network shown in Figure 3.2-7, especially Route 1 east of the storage site and Route 90 to the south. Site access was discussed in Section 2.3.3.

Assumption Parish had 5290 year-round housing units in 1970. Of these units the large majority (3384) were owner-occupied. The median value of the owner-occupied units was $8,900. The parish had a relatively low vacancy rate with only 2.9 percent of the units unoccupied. With few rental units available, there are a few rooming houses in Napoleonville and several hotels and motels in Donaldsonville. The Napoleonville area is within commuting distance of the housing markets in Baton Rouge, Thibodaux, Houma, Morgan City, and their respective parishes.

Manufacturing and agriculture make the greatest contributions to the local economy in Assumption Parish. Most of the major manufacturing which is related to petroleum and petrochemicals, occurs outside the Parish, however, near Donaldsonville, and local workers must commute to these jobs. Agriculture within the county contributes over $7.8 million in income to the economy annually. Sugar cane is ground and refined from October to December in Napoleonville. The construction and retail and wholesale trade sectors are also major employers. The developing urban areas in Iberville and Ascension Parishes demand local laborers.

Assumption Parish has a relatively low mean-income in comparison with the rest of the state. This figure is heavily influenced by the number of families below the poverty level in the parish, however. Over 30 percent (1328) of the families in the parish in 1970 had incomes below the poverty level. The average income for these families was $2,329 annually.

Many reasons have been postulated for the low levels of income in this area. Among these are: 1) the fluctuating and seasonal employment demand in the oil and gas fields, construction industries, and fisheries; 2) the lack of strength in trade unions relative to other areas of the state; and 3) the lower cost of living in the parish relative to urban areas in the state and nation.

Police protection for the storage site would be provided by the Assumption Parish Sheriff's Department. Fire protection services for the storage site would be provided by the Tankerville Voluntary Fire Department.

Hospitals closest to the storage site are Assumption General Hospital in Napoleonville and Prevost Memorial Hospital in Donaldsonville. In addition, there are two hospitals in Thibodaux.

The greatest tax source in the parish is the severance tax on resource extraction which approached $3 million in 1971-72. The next largest source was property tax which returned nearly $1 million on over $25 million of assessed real property value in 1971.

## 3.4 SITE SPECIFIC ENVIRONMENT - ALTERNATIVE GROUPING NO. 1 - EARLY STORAGE SITES PLUS EXPANSION OF WEEKS ISLAND

### 3.4.1 Group Description

As discussed in Section 2.4, the first alternative grouping for the SPR program for the Capline Group includes use of early storage phase facilities at Bayou Choctaw and at Weeks Island, with expansion of the storage facilities at Weeks Island. The existing environment for Bayou Choctaw has been discussed in FES 76-5; details of the environment relative to expanded use of that site are presented in Section B.5.2 of Appendix B to this report and are summarized in Section 3.5.2. Further information on Weeks Island is available in FES 76/77-8 and in Section B.4.2 of Appendix B. A detailed description of the Gulf brine disposal environment is given in Appendix G. Section 3.4.2 summarizes the existing environment of Weeks Island dome subsequent to early storage development at that location.

### 3.4.2 Weeks Island Dome Expansion Alternative

#### 3.4.2.1 Land Features

Weeks Island salt dome is roughly circular in plan view; it is flattened on the top and overhangs slightly on the north and east (Figure 3.4-1). The existing Morton salt mine is in the southwestern quarter of the dome. At least two major faults cut across the Oligocene-Miocene sediments adjacent to the deep portions of the dome. These features resulted from differential movement between the salt and the sediments and occurred simultaneously with the deposition of these flanking sediments. Shear zones are also present, which separate different spines of salt within the main salt stock. One zone has been mapped along the southwest side of the mine workings. Another extends from the south edge of the salt stock to the approximate center.

Sedimentary materials consisting principally of sands and gravels of the Pleistocene Prairie Formation overlie the dome and vary from about 40 to 100 feet in thickness. Exploratory drilling has not revealed the presence of caprock. Except for a few minor pockets of methane gas, no cavities are indicated above the salt.

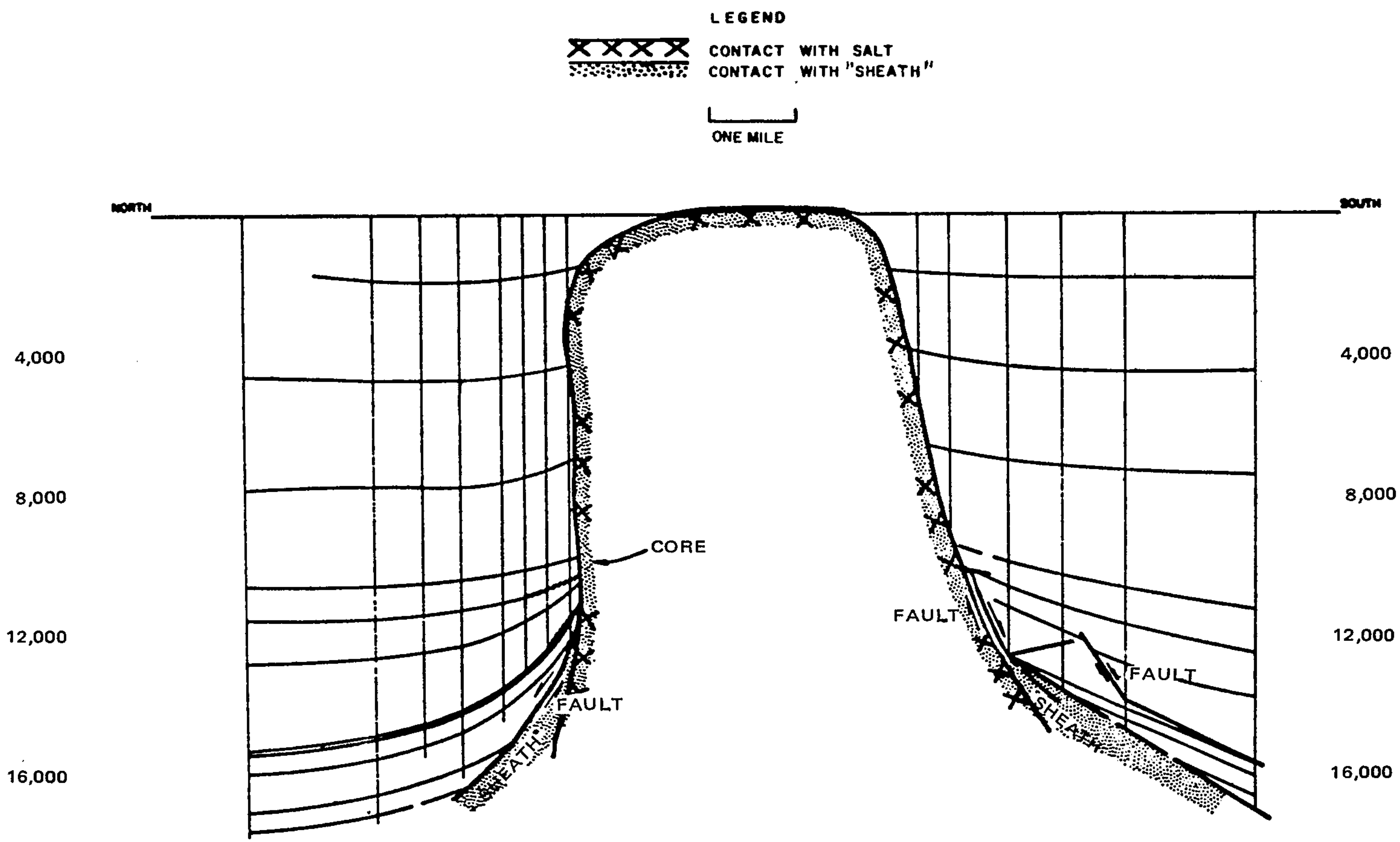



FIGURE 3.4-1 Geologic cross section (north/south) Weeks Island dome.

The workings of the lower mine level are mostly stable, but continuous spalling requires periodic scaling of the walls in the active sections of the mine. Rock bolting has been used for six years in the ceiling of the lower level at an average spacing of 5 feet by 5 feet. Some rock bolts have broken due to corrosion and stress in a few of the supported sections. The abandoned upper level of the mine has been closed off from the rest of the mine due to unsafe conditions. No rock bolting or other support methods were used at this level and spalling occurs in many areas.

The rate of plastic closure of the mine is 3/4 of an inch per year for new openings and decreases after two or three years. A few upheavals occur in the mine.

At present, the mine is dry. Several years ago a small seep occurred in the new shaft, but the seep was grouted and no seepage has occurred since.

The salt, mined from the dome by the Morton Salt Company, is described as medium-grained, white crystalline, pure sodium chloride in two eight-inch thick layers alternating with thin, dark layers containing anhydrite inclusions. Two brine wells on the island, drilled to a depth of 1400 feet, presently account for 5 percent of the salt operation. They are located approximately 4000 and 4500 feet northeast of the nearest mine workings.

Oil and gas production comes from under the north flank overhang of the dome (Figure 3.4-1). Currently, 29 wells on or adjacent to the island are producing oil.

Surficial materials of the island are mostly brownish-yellow loamy silts and clays ranging in thickness from several inches to 30 or 40 feet. Ferruginous sands with bands of chert pebbles are exposed on the southern parts of the ridges and in some of the deep gorges on the island.

#### 3.4.2.2 Water Environment

Watercourses in the immediate site vicinity include the Intracoastal Waterway to the west and south; Bayou Cypremort to the southeast; Weeks, Warehouse, and Patout Bayous to the north; and Plantation Lake on the dome (see Figure 2.4-2). The major coastal water bodies include Weeks Bay to the west, and West Cote Blanche Bay to the south. Weeks Bay is formed by Shark Island to the south and constitutes the northeast portion of larger Vermilion Bay. West Cote Blanche Bay is located to the south of Weeks Island. Natural drainage in the site vicinity is to the west and south into Weeks Bay and West Cote Blanche Bay. The brine diffuser pipeline would underlie West and East Cote Blanche Bays, Atchafalaya Bay, and the nearshore Gulf of Mexico. These environments are discussed in Section 3.2.2.1.

Fresh ground water is present in the high capacity Chicot aquifer to a depth of about 600 feet in the site vicinity. The piezometric surface in the Chicot aquifer is approximately at sea level near Weeks Island and slopes gently northwestward towards the inland depression recently caused by heavy withdrawals, particularly at the city of Lake Charles. Available evidence suggests that a single local water table may not exist. Instead, the varying levels of fresh water ponds on the island, which range from about 15 to 60 feet above sea level, suggest that much, if not all of the shallow ground water is perched above impervious horizons of varying elevations. The coefficient of permeability of the Chicot aquifer ranges from about 900 to 2000 gpd per square foot and averages about 1500 gpd per square foot. Coefficients of transmissibility of individual beds range from 75,000 to 1,000,000 gpd per foot.

### 3.4.2.3 Climatology and Air Quality

The regional climatic conditions (see Section 3.2.3.1 of Appendix B) are generally applicable at Weeks Island. Specifically, coastal effects are pronounced at this site. Compared to sites farther inland, Weeks Island is expected to experience: 1) higher wind speeds and more frequent southerly winds; 2) slightly warmer temperatures, especially in winter, averaging only about 12 days below freezing; 3) slightly higher humidity; 4) somewhat more rainfall particularly in summer; and 5) fewer stable periods.

Because of the proximity of the site to the coast, tropical cyclones are of more significance. Damage from hurricanes results from high winds, and, particularly in the coastal areas, from the storm surge or tide. In the marsh areas, extensive and prolonged inundation and pounding occurs, resulting in damage or loss of manmade structures and habitats. The storm surge at Pass Christian, Mississippi, associated with hurricane Camille in 1969, was 25 feet, and that associated with Hurricane Betsy in 1965 reached nearly 20 feet at Bayou Lafourche.

Due to the remoteness of the site, the air normally will be less polluted than in industrial areas. Data presented for Lafayette are probably representative of the higher levels of pollution that could occur at the site under unfavorable dispersion conditions. Nevertheless, it is probable that the 3-hour standard for non-methane hydrocarbons is exceeded quite frequently at Weeks Island.

#### 3.4.2.4 Background Ambient Sound Levels

An ambient sound survey was conducted on February 4 and 5, 1976 to provide preliminary sound data in the vicinity of Weeks Island (FES 76/77-8).

The major sources of noise are the Morton salt mine and chemical plant in the southeastern portion of the Island and the Shell Oil facility on the northern edge. Other sources of noise are the highway traffic along Route 83, barge traffic in the Intracoastal Waterway, and train traffic on the Southern Pacific Railroad line. Much of the central and southern portion of the island, formerly the site of the town of Weeks, is now thickly overgrown with vegetation, with wind and birdlife as the major noise sources.

#### 3.4.2.5 Ecosystems and Species

The vegetation on Weeks Island is quite varied. The island is characterized by lowland hardwood species which exist here because of the higher elevation afforded by the island's topography and the presence of very fertile loam as a soil base. Some of the cleared land is associated with salt mining. Additional cleared land on the east side of the dome is used to produce sugar cane, corn, soybeans, sorghum, and peanuts.

The dominant trees are oak, magnolia, and hickory, with a conspicuous understory of yaupon, French mulberry, and immature trees. The trees are quite large, many reaching heights of 60 to 70 feet and forming a fairly closed canopy. The oak-hickory-magnolia association extends down to the surrounding marsh. There is no fringe of cypress near the marsh as is found in other lowland areas. Vines and understory plants are quite dense along roadsides and transmission line corridors. Heavy accumulations of leaf litter do not occur on the island, because high temperatures and abundant rainfall aid fast decomposition. The litter accumulation is substantial enough, however, to discourage heavy groundcover such as grasses and forbs. Grasses are present along roadsides and corridors. The site of the former town of Weeks is now almost completely covered by natural vegetation such as sweetgum, oak, magnolia, grasses, and understory plants.

Wildlife habitat types found at the Weeks Island site include deciduous swamp and bottomland forest, cleared lands (existing oil field development), and coastal wetlands (Intracoastal Waterway and marshes).

The deciduous swamp and bottomland forest provide resources for a large number of wildlife species (Table 3.2-1). Some common bird species of the lowland hardwoods include hawks, owls, woodpeckers, thrushes, vireos, and warblers. The lowland hardwoods also provide suitable habitat for the rare and endangered southern bald eagle.

Some common mammals expected to occur in the swamp and bottomland forest include opossum, bats, squirrels, raccoon, swamp rabbit, bobcat, and white-tailed deer.

The coastal wetlands found at the Weeks Island site include the Intracoastal Waterway and saline and brackish marshes. Gulls, terns, herons, and egrets, are commonly found in and around the marshes. Mink, nutria, otter, and raccoon are the most common mammal species found in the intermediate marshes. The intermediate marshes of the island provide suitable habitat for the alligator, which is considered an endangered species in this area. Because Weeks Island is privately owned, its many wildlife resources are not available to the people of Louisiana.

Collectively, the many water bodies which surround Weeks Island are important components of a vast nursery ground for an array of commercially and recreationally important finfish and shellfish. Specific aquatic communities of the area around the dome are discussed in the regional environmental setting (Section 3.2).

Estimate of acreages of various habitat types to be used for proposed and alternative systems associated with site development are provided in Table B.4-2.

The productivity of the habitats in the vicinity of the proposed brine disposal system to the Gulf of Mexico is higher than that of the dome since about half of the 5.5 mile on-land portion of the system would be in undisturbed marshland. Also, there would be one crossing of the Intracoastal Waterway and 32.1 miles of pipeline in undisturbed benthic habitat of the Gulf of Mexico. Fish and other forms which live in the coastal waters are discussed in Section 3.2.5.

The alternate brine disposal system (deep well injection field) would be located almost entirely on cropland and other disturbed areas of relatively low productivity.

The proposed 0.9 mile-long raw water supply system to the Intracoastal Waterway would be located almost entirely on developed land of low productivity, and the alternate water system and diffuser pipeline would be in the same habitat that was discussed for the onshore portion of the proposed brine disposal system. The alternative brine diffuser would be located in the Gulf, further offshore than the proposed system, in 20 feet of water.

3.4.2.6 Natural and Scenic Resources

A number of wildlife refuges and recreational areas are in the general vicinity of the storage site (see Figure 3.2-5 and Section B.2.6 of Appendix B). The closest area, Avery Island bird sanctuary, is approximately 10 miles northeast of Weeks Island. Marsh Island, in the Gulf of Mexico about 17 miles south of Weeks Island, is a national wildlife refuge. Immediately offshore to the south of Marsh Island is an 8-acre bird nesting area called Shell Keys National Wildlife Refuge.

Two camping and picnic areas are in St. Mary Parish on the east shore of East Cote Blanche Bay about 15 and 20 miles southeast of Weeks Island.

The continuity of the marshlands and prairie terraces along the Louisiana coastline is interrupted by the presence of the Five Islands, which attain elevations of 150 feet or more above sea level and are of scenic interest because of the contrast they provide to the prevailing lowlands. The unique range of habitats on Weeks Island supports vegetation that is strikingly different from that of the Louisiana coast in general. In addition, despite the fact that the island has been occupied and exploited by man for a considerable number of years, it still supports a significant amount of native flora and fauna.

3.4.2.7 Archaeological, Historical, and Cultural Resources

The setting of Weeks Island offers great potential for the presence of archaeological resources. Of two known sites, the North Hill site is nearer the project location, but neither it, nor the other known site, Morton Shell Mound, nor any other known sites of signficance were found at the surface in the area of proposed construction during the cultural resources field survey done in March 1976.

3.4.2.8 Socioeconomic Environment

Weeks Island covers approximately 1960 acres and is roughly circular, with a diameter of 2 miles. Various land uses and history of the island are discussed in Section B.4.2.8 of Appendix B. Site access was discussed in Section 2.4.2.

Weeks Island itself is virtually uninhabited. The immediate surrounding area is sparsely populated, with an intermittent linear pattern of rural settlement following the roads and highways that traverse higher ground. There are a number of small rural communities along Route 83 north and east of the storage site and along U.S. 90. The town of Jeanerette, with a population of 6322 in 1970, is about 10 miles to the northeast of the island. New Iberia, a major urban center, is within 15 miles of the site and is expected to supply part of the labor force for the project as described in Section 3.2.8. Estimates for 1976 put New Iberia's growing population at 31,850, up 5.6 percent from 30,147 in 1970. The city plans to extend its boundaries in the near future. Lafayette City in Lafayette Parish and Morgan City in St. Mary Parish, are also within feasible commuting distance of the Weeks Island site (see Section 3.2.8).

Housing availability in the immediate vicinity of the Weeks Island site is limited due to the small sizes of nearby rural settlements. The city of New Iberia is most likely to be the closest major source of housing. At present New Iberia has a shortage of housing units. There were 16,595 housing units in Iberia Parish in 1970. The parish had a relatively high vacancy rate of 6 percent at that time. Some vacancies may be due to substandard housing or undesirable rural location. The housing characteristics of neighboring St. Mary Parish are similar. More housing is available in nearby Lafayette Parish, primarily in Lafayette City.

The major employment sectors of Iberia Parish are mineral production, manufacturing, construction, agriculture, and wholesale and retail trade. The manufacture of food and related products provides one-quarter of the total manufacturing employment. The most important minerals are petroleum and natural gas. Iberia Parish and neighboring St. Mary Parish are both important centers for salt mining. Unemployment in Iberia Parish was relatively low in 1976.

Police services for the storage site would be provided by the Iberia Parish Sheriff's Department. Fire services would be provided by the New Iberia Fire Department. The two hospitals closest to the storage site are in New Iberia. Both have emergency facilities and operating rooms. In addition, there are five hospitals in Lafayette City and small hospitals in Loreauville 10 miles northeast of New Iberia. In 1975 the New Iberia school district, the closest district to Weeks Island, had 19 elementary schools with a total enrollment of 7855, one junior high school, and one senior high school.

Severance taxes on resource extraction were by far the largest source of tax revenue within the county in 1971-72.

## 3.5 SITE SPECIFIC ENVIRONMENT - ALTERNATIVE GROUPING NO. 2 - EARLY STORAGE SITES PLUS EXPANSION OF BAYOU CHOCTAW PLUS IBERIA

### 3.5.1 Group Description

The second alternative grouping for the SPR program for the Capline Group (see Section 2.5) requires use of the early storage phase facilities at Weeks Island and Bayou Choctaw, coupled with expansion of facilities at Bayou Choctaw and development of storage at Iberia. The existing environment at Weeks Island was detailed in FES 76/77-8 for the early phase; the site to be impacted by possible increased use (Alternative Grouping No. 1) was reviewed in Section 3.4.2 and is presented in detail in Section B.4.2 of Appendix B to this report. The environment at Bayou Choctaw, prior to its use as an early storage site, is presented in FES 76-5. Details of the environment at that dome before expansion are included as Section B.5.2 of Appendix B; a summary of that environment is included in Section 3.5.2. Iberia dome, which would be developed as part of this alternative, is discussed in Section 3.5.3. A more detailed discussion of the environment is included as Section B.5.3 of Appendix B.

### 3.5.2 Bayou Choctaw Dome Expansion Alternative

#### 3.5.2.1 Land Features

The Bayou Choctaw salt dome is a nearly circular, shallow piercement dome. The shallowest known salt occurrence is at -645 feet near the center of the dome. Overhang on the west side significantly decreases the area available for solution-mined storage cavern construction (Figure 3.5-1). The lateral extent of the undercut of the salt on the west side is not known, and a program of investigation should be accomplished prior to any construction on the west perimeter of the dome. No information is available at this time concerning the quality of the salt mass; nor is the composition of the caprock known. An analysis of records of drill holes penetrating caprock and salt of the Bayou Choctaw dome indicates a highly irregular caprock surface and thickness. General cap rock thickness seems to vary from 200 to 400 feet. It appears that the caprock completely overlies the central salt

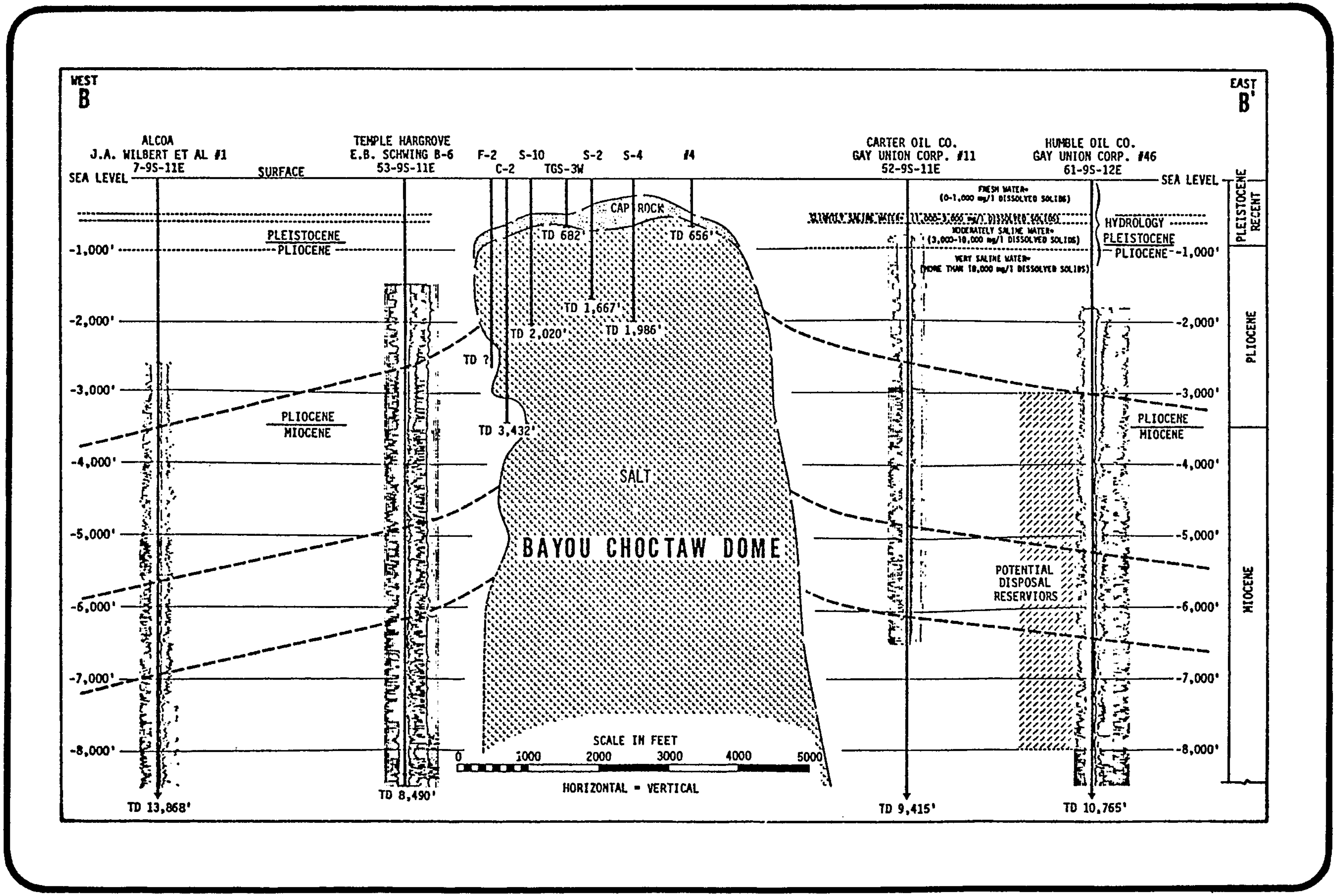



FIGURE 3.5-1 Geologic cross section (east/west) Bayou Choctaw dome.

stock but is not draped over the sides. Voids or sedimentary rock inclusions are reported to have been encountered in some of the caprock drilling.

Unconsolidated and partially consolidated Pleistocene and Holocene sediments overlie the caprock (Figure 3.5-1). Unconsolidated and partially consolidated sands and shales of Pliocene and Miocene age underlie the Pleistocene sediments and extend downward to about -9500 feet. Faulting around the dome, within the Miocene and overlying Pliocene formations, is thought to be extensive and complex.

Oil production has occurred all around the dome; however, the greatest density of drilling has been on the southeast and north flanks. Oil or gas production currently occurs from two deep zones with tops at -11,592 and -11,287 feet.

Soils in the area consist of somewhat poorly drained, alkaline loamy soils that occur on the crests of natural levees. Clayey soils are developed on lands adjacent to the natural levees of the Mississippi River.

### 3.5.2.2 Water Environment

The lake at the dome (Figure 2.5-2) formed as a result of collapse of a salt mine cavity in the Bayou Choctaw dome. The cavity was not being used as a storage facility at the time. Other similar caverns, originally formed for brine production, currently are being used for storage in the Bayou Choctaw dome and apparently are working satisfactorily. The surface area of the pond is approximately 12 acres; its depth is 85 feet. Assuming a conical shape, the volume of the lake is approximately 110 million gallons.

Surface water bodies in the general vicinity of the Bayou Choctaw site include the Mississippi River, the Port Allen Canal, Choctaw Bayou, Bull Bay, Bayou Bourbeaux, and numerous small drainage canals.

The Port Allen Canal portion of the ICW is connected to the Mississippi River by the Port Allen Locks approximately 14 waterway miles north of the Bayou Choctaw salt dome. Smaller water courses in the immediate site vicinity include Bayou Bourbeaux and Bull Bay. Bayou

Bourbeaux flows generally southeasterly to join Bull Bay in the site vicinity. Bull Bay joins Choctaw Bayou and the ICW a short distance southwest of the site.

The dome penetrates the Plaquemine aquifer, the base of which is at a depth of about 900 feet in the site vicinity, with highly saline water occurring below a depth of about 1000 feet. Aquifers in the vicinity of the Bayou Choctaw dome are capable of delivering large quantities of slightly to moderately saline water to properly completed wells. Aquifer porosities are on the order of 40 percent, with permeabilities in the range of 1000 to 2000 gpd per foot. Well yields of 5000 gpm or more may be anticipated.

The Plaquemine aquifer is a source of fresh water for several municipalities in both Iberville and West Baton Rouge Parishes. The water wells serving the municipalities of Plaquemine (1.65 million gallons per day) and Addis (0.1 million gallons per day) are especially significant because these wells are located within 5 miles of the Bayou Choctaw site. In addition, an aquifer in the Baton Rouge area, known as the 2800-foot sand, is a major source of fresh water in that area. This aquifer occurs at a depth of about -4000 feet and contains saline water in the vicinity of Bayou Choctaw dome.

#### 3.5.2.3 Climatology and Air Quality

Climatological summaries from Baton Rouge are representative of those at the site. Compared to sites nearer the coast, Bayou Choctaw is expected to experience: 1) lower wind speeds, including a higher frequency of calms; 2) slightly cooler weather, especially in winter, with about twice as many days below freezing; 3) slightly lower humidity; 4) somewhat less rainfall, especially in summer; and 5) a slightly higher frequency of stable periods.

Tropical cyclones, including hurricanes, lose strength rapidly as they move inland. Such storms could, nevertheless, cause potentially damaging winds or flooding due to excessive rainfall in the site vicinity.

Since the site is 15 miles away from the nearest industrial center (Baton Rouge), the air quality at Bayou Choctaw normally will be less polluted than in industrial areas. The one exception is non-methane hydrocarbons, with levels in excess of the three-hour standard recorded in remote areas of southern Louisiana.

#### 3.5.2.4 Background Ambient Sound Levels

Ambient sound levels at Bayou Choctaw are typical of a secluded, essentially flat, moderately forested area. Sounds are dominated by wind in the trees, insects, crickets, birds, and other wildlife. At the proposed site of Bayou Choctaw, the ambient sound levels are significantly higher than other areas of the pipeline route due to ongoing industrial activity.

#### 3.5.2.5 Ecosystems and Species

The bottomland forest and deciduous swamp ecosystems predominate at the Bayou Choctaw site. The foremost overstory vegetation consists of bald cypress and water tupelo. Species of the supportive understory strata include black willow, water ash, and pumpkin ash. The understory and groundcover vegetation include greenbriar, palmetto, blackberry, trumpet vine, Virginia creeper, holly, and grape. Agricultural areas to the east of the Bayou Choctaw site produce sugar cane, corn, sorghum, wheat, soybeans, and peanuts.

The bottomland forest and deciduous swamp are by far the most significant and characteristic habitat types (in terms of surface acres) found at the site. These habitat types provide resources for a large number of wildlife species (Table 3.2-1). Wildlife common to these habitats has been discussed in Section 3.3.2.5 (see also Sections B.2.5 and B.5.2.5 of Appendix B).

The freshwater wetlands found at the Bayou Choctaw site consist of a vast swamp area connected by a canal-bayou-swamp complex to the Port Allen Canal/ICW (see Figure 2.5-2). Freshwater marshes are most diverse habitats, and are among the most productive natural ecosystems in the world. Since the Bayou Choctaw dome is in a temperate, nutrient enriched area, a high level of production should be indicative of specific production in the vicinity of the proposed facility. Plant and animal life common in the swamps and marshes is discussed in Section 3.3.2.5 (see also Sections B.2.5 and B.5.2.5 of Appendix B).

The productivity of the habitats in the vicinity of the proposed deep well injection brine disposal system is higher than that of the dome since most of the habitats near the brine disposal system are undisturbed.

The environmental setting of the alternative brine disposal system to the Gulf of Mexico encompasses an area more than 119.9 miles long, which includes a 23.6-mile section in the Gulf. This area is characterized by the same ecosystems as discussed in the regional setting to the Capline Group (Section 3.2.5). A major portion of this route to the Gulf would be through relatively undisturbed swamps and marshlands, and would require crossing many streams. This route would cross about 9 miles of leased oyster grounds, a major portion of which is considered a seed oyster reservation. The seed oyster reservation at Bay Junop is one of two in the region. The pipeline would also cross Bayou Penchant, which is one of the few streams in the region to be evaluated as good for fishing.

The alternative deep well injection brine disposal system will parallel the proposed raw water supply system pipeline that goes from the site to the Mississippi River and covers a total of 2.6 miles. Most of the area used by these systems is located on cropland or other developed land, and would not use much of the highly productive bottomland forest and deciduous swamp discussed for the Bayou Choctaw site area.

The primary raw water supply system (previously considered as an alternative in the Bayou Choctaw FES 76-5) would require a 5.4 mile pipeline to the Mississippi River and one minor water crossing at Bayou Bourbeaux. For the most part, this route is located on cropland or other developed land and would not use much of the highly productive bottomland forest and deciduous swamp described for the site area.

Many of the groups of aquatic organisms discussed in the regional setting are present in the Mississippi River. Phytoplankton densities are probably lower and benthic macroinvertebrates are likely to be less diverse than in the Mississippi. Additionally, sportsfish are not likely to be as abundant, and fish (such as darters) which prefer small streams and riffle areas, are scarce or absent. Zooplankton, fish eggs, fish larvae, and small fish, particularly drum and shad, may be abundant near the shore and in backwater areas. Bayou Bourbeaux may support a small community of aquatic organisms similar to those discussed in the regional environmental setting.

The alternate raw water supply system from wells would be built in the same highly productive undisturbed bottomland forest and deciduous swamp habitats as proposed for the primary deep well injection brine disposal system.

The alternate raw water supply system Port Allen Canal/ICW, which would be about 1 mile long, would run along the eastern shoreline of Bull Bay through an area of relatively undisturbed forest and deciduous swamp similar to that discussed for the site area. The aquatic biota inhabiting the area in the vicinity of the proposed intake structure may be expected to be similar to that of Grand Bayou and other freshwater biota discussed in the regional environmental setting.

An alternate raw water supply system has also been proposed for the Gulf of Mexico using the same route as the alternate brine disposal system to the Gulf of Mexico. The raw water system would therefore involve the same habitats as the brine disposal system except for the benthic habitats of the Gulf (since there would be only 2 miles of off-shore construction for the raw water system).

### 3.5.2.6 Natural and Scenic Resources

No regional wildlife areas or state parks are within a 10-mile radius of the main storage area. The proposed Iberville State Park, however, would be approximately 10 miles southwest of the central storage area. In addition, there are 6 historic sites and 4 small recreational sites within a 5-mile radius of the dome. One historic site is less than a mile northwest of the storage site.

Several existing or proposed regional recreational areas are south and southwest of the storage site between the Bayou Choctaw dome and the Gulf of Mexico. These include the proposed Lake Verret State Park in Assumption Parish, Edward Douglas White State Park in Lafourche Parish, and the Bayou Penchant Scenic Waterway in Terrebonne Parish (Figure 3.2-5).

Manmade facilities associated with early storage, including buildings, roads, wells, drill pads, and pipelines, detract from the surrounding natural aesthetic quality of the site, especially at the central storage area. Some of these facilities such as the brine disposal wells, however, are spaced far enough apart to be fairly well camouflaged by interspersed natural vegetation and trees. There are no public roads in the immediate area, making site visibility low to the general public.

3.5.2.7 Archaeological, Historical, and Cultural Resources

The Bayou Choctaw dome does not appear to contain any known sites of archaeological or historic significance.

Iberville Parish has four historic sites listed in the National Register: one in Rosedale, one in the St. Gabriel vicinity, the Bayou Plaquemine Lock in Plaquemine, and the St. Louis Plantation one mile south of Plaquemine on Route 405. The first two sites are greater than 5 miles from the Bayou Choctaw dome, and the other two are within approximately 3 to 5 miles of the dome.

No archaeological sites are located on the dome; the closest is an Indian village on Route 77 approximately 4 miles south of the dome.

3.5.2.8 Socioeconomic Environment

The Bayou Choctaw salt dome is entirely located within the fresh backwater swamp to the west of the natural levee of the Mississippi River. The potential development of the immediate vicinity in and around the Bayou Choctaw salt dome is restricted to activities such as mineral or fuel extraction and/or storage, inasmuch as the physical environment places severe constaints on the types of land use that are feasible for backwater swamp and coastal marshes.

The area immediately surrounding the site is rural, with a number of people living in small settlement along highways connecting towns with major intersections. Site access was discussed in Section 2.5.2. There are 15 to 20 villages within a 10-mile radius of the storage site which had 1970 populations of less than 1000.

Most commercial and retail businesses servicing the area are in Baton Rouge. The largest urban settlement in Iberville Parish is Plaquemine about 4 miles southeast of the dome. Nearby population centers also include Port Allen to the north (in West Baton Rouge Parish) and Donaldsonville to the south. The influx of industry to the area during the past decade has encouraged young people to stay rather than move to the larger cities.

Baton Rouge, a major source of housing with a total of 56,379 year-round units, had a low vacancy rate (1.3 percent) in owner-occupied units in 1970, but a much larger vacancy rate (14.2 percent) in rental units. The site is within easy commuting distance of Baton Rouge. The availability of housing for sale or rent was severely limited in the area west of the Mississippi River near the site. There is a greater availability in the communities east of the Mississippi.

The petroleum industry is particularly important to Iberville Parish, where the value of mineral production in 1971 exceeded $67,000,000. Other commercial minerals include salt, gravel, lime, cement, and natural clays.

The arable land in this region is used both as pasture for grazing cattle and for raising a limited variety of cash crops, especially sugar cane, soybeans, and corn. Lumbering is an important industry in Iberville Parish where there are about 279,300 acres of commercial forest. Several lumber companies and wood products industries are located there.

The relatively high rate of unemployment in Iberville Parish may be accounted for by the effects of an unsteady job market in some of the plants and a lack of skills among a sizeable proportion of the labor force. The largest number of workers in the area are in contract construction, manufacturing, and retail trade. In Iberville and East Baton Rouge Parishes, there are a large proportion of workers employed in various service industries.

The proportion of workers who commute out of their home parishes is high in this area. The widespread pattern of commuting reflects the concentration of jobs in Baton Rouge and the growth of manufacturing plants along the Mississippi north and south of that city, and developing areas in Iberville and Ascension Parishes.

Police protection for the proposed storage site would be provided by the Iberville Parish Sheriff's office operating from Plaquemine. Fire protection for the storage site would be available from Plaquemine's municipal fire department. The hospital closest to the storage site is in Plaquemine. There are three hospitals in Baton Rouge offering general medical and surgical services.

The largest single source of revenues in Iberville Parish is the severance tax on mineral extraction. Property taxes were also a major source of revenue in 1971. In West Baton Rouge Parish, state sales taxes provided the largest single revenue source followed by severance taxes.

### 3.5.3 Iberia Dome Alternative Site

#### 3.5.3.1 Land Features

The Iberia salt dome is a shallow piercement dome almost circular in plan and with a relatively short, spiked top at about 950 feet below sea level (Figure 3.5-2).

The shallowest known salt is encountered at -950 feet. Quality of the salt mass is unknown, as is the composition, extent, thickness, and configuration of the cap rock.

Pleistocene and Holocene unconsolidated muds and sands overlie the dome, with an estimated maximum thickness of 1000 feet. Unconsolidated and partially consolidated sands and shales of Pliocene and Miocene age underlie the Pleistocene sediments and extend downward to a depth of approximately -13,500 feet. Faulting around the dome within the Miocene and overlying Pliocene is extensive and complex.

Louisiana State Department of Conservation records show that oil and gas production occurs in numerous zones ranging from -3608 to -10,452 feet around the flanks of the dome. The greatest density of drilling is on the south and west flanks. Some oil and gas production is situated over the top of the dome near the proposed storage facility, but it is not known if these wells are active at this time.

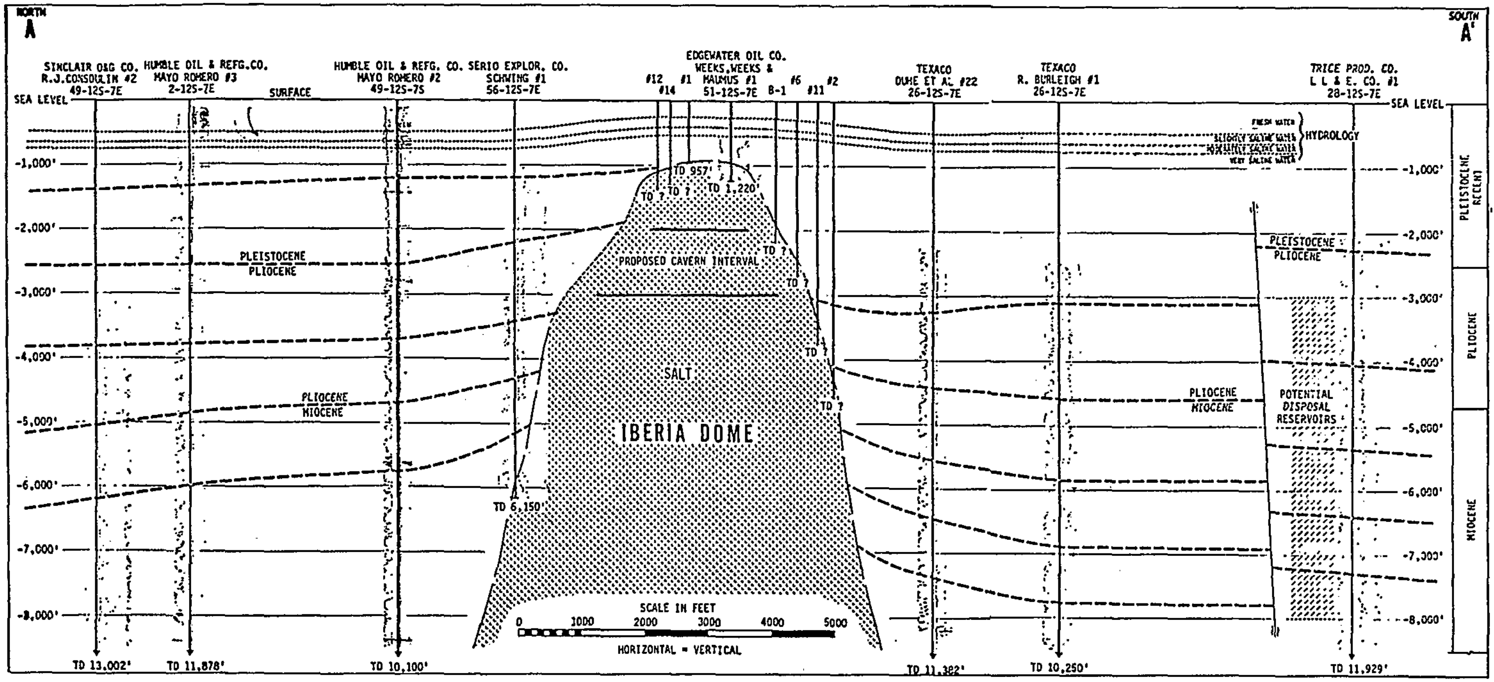



FIGURE 3.5-2 Geologic cross section (north/south) Iberia dome.

Poorly drained, clayey soils occur on broad flats east of the natural levee of Bayou Teche. Bordering this association are clayey bottomland soils which occur on low flats subject to flooding.

3.5.3.2 Water Environment

Surface water bodies in the vicinity of the Iberia site are shown on Figure 2.6-2. Tete Bayou, approximately 0.2 miles north, flows generally easterly to Lake Fausse Pointe about 5 miles farther downstream. Bayou Teche, discussed in Section 3.2.2.1 as a regional surface water body, is about 1.5 miles south of the site.

Ground water use in the vicinity of Iberia Dome is minor. The base of the fresh water is about 500 feet below sea level in the vicinity of the dome. The base of the Chicot aquifer is at a depth of about 2000 feet in the site vicinity, with highly saline water occurring below a depth of about 750 feet.

Aquifers in the vicinity of Iberia dome are capable of delivering large quantities of slightly to moderately saline water to properly completed wells. Aquifer porosities are on the order of 40 percent with permeabilities in the range of 1000 to 2000 gpd per foot. Well yields of 5000 gpm or more may be anticipated.

3.5.3.3 Climatology and Air Quality

In general, the site specific information given in Section 3.4.2.3 for Weeks Island is applicable at Iberia. Specifically, at Iberia, coastal effects are less pronounced and existing air quality is expected to be somewhat more polluted than at Weeks Island.

3.5.3.4 Background Ambient Sound Levels

No site specific ambient sound data were available for the Iberia site. Areas around the site are principally agricultural in nature. Sound sources are dominantly insect and animal noises, wind, and traffic on local roads.

3.5.3.5 Ecosystems and Species

The area around the site is characterized by a lowland physiography with numerous swamps, marshes, lakes, and bays. Though some native vegetation is found to the north and east of the site, the vegetation in the immediate vicinity has largely been diverted to agricultural production, especially cultivation of sugar cane, soybeans, peanuts, and grain crops.

The eastern portion of the site is situated within the bottomland forest and deciduous swamp ecosystems. Overstory vegetation consists primarily of bald cypress and water tupelo. Components of the supportive vegetation include black willow, hackberry, water ash, and pumpkin ash. The understory vegetation includes greenbriar, palmetto, blackberry, Virginia creeper, and holly. Overstory regenerates are in the understory and ground cover.

Wildlife habitat types found at the site include cleared lands (existing oil field development areas, and agriculture lands), deciduous swamp and bottomland forest, and freshwater wetlands (creeks, bayous, and marshes).

The deciduous swamp and bottomland forest ecosystems provide resources for a large number of wildlife species (Table 3.2-1). Species common to these habitats were discussed in Section 3.3.2.5 (see also Sections B.2.5 and B.5.3.5 of Appendix B).

The only aquatic habitat in the vicinity of the Iberia dome is Tete Bayou which crosses the northern side of the dome. Tete Bayou is expected to be similar to other freshwater areas discussed in the regional environmental setting (Section 3.2.5).

Most of the land in the vicinity of the proposed brine disposal system is under cultivation and, therefore, productivity is expected to be quite similar to productivity of the cultivated dome site area. The productivity of the habitats to be crossed by the alternate brine disposal system is much higher than in the vicinity of the dome since a major part of the 20.1 miles of on-land pipeline would cross productive marsh and swampland areas. There would be major water crossings at Bayou Teche (fresh water) and the ICW (saline water), and 32.1 miles of pipeline would be in the Gulf of Mexico (crossing undisturbed benthic habitat). The aquatic environments of Bayou Teche and the ICW in the vicinity of the pipeline crossings are probably low in species diversity (especially diversity of pollution-intolerant species) because the crossing is downstream of the wastewater discharge from the city of New Iberia, and the ICW crossing is in an area disturbed by barge traffic. The smaller creeks and bayous along the Gulf brine disposal route may have a higher species diversity than the major waterways since many of them are not subject to the environmental stresses discussed for the major waterways.

The proposed raw water system, which would be connected to Bayou Teche, about 1.5 miles south of the Iberia storage site, would not involve any highly productive terrestrial habitats since most of the route is through cropland. The only aquatic habitat to be entered by the system would be Bayou Teche where the intake structure would be located. As stated previously, this area of Bayou Teche is not expected to be high in species diversity since it is just downstream from the wastewater discharge of the city of New Iberia.

The alternative raw water source from Lake Fausse Pointe (about 7.3 miles to the east) would use very little productive terrestrial habitat since most of the pipeline route would be through cropland similar to that described for the dome. Aquatic productivity of Lake Fausse Pointe may be expected to be relatively high since large portions of the lake are relatively shallow and there has been very little development around the lake and adjoining swamp.

The alternate raw water system to the Gulf of Mexico would use the same route as the alternate brine disposal system and therefore, the on-land environmental setting would be the same. Since there is only 2 miles of offshore pipeline involved with this raw water system, there would be little disturbance of the offshore benthic habitats.

The proposed (14.6-mile long) oil delivery system to Weeks Island would use cropland habitat for a majority of its length; however, about 5 miles of the pipeline would be in marshland habitat. Aquatic habitat that would be required for this system would involve only one major stream crossing at Bayou Teche (discussed with respect to the brine disposal system to the Gulf of Mexico). The alternative oil delivery system would be a 39-mile long pipeline to the Weeks Island-St. James pipeline near Napoleonville. Nearly all of this pipeline route is characterized by relatively undisturbed bottomland forest and deciduous swamp. This highly productive habitat in the heart of the Atchafalaya Basin also includes several major water bodies such as Lake Fausse Pointe, the Atchafalaya River, and Bayou Plaquemine. Many other smaller creeks and bayous would be crossed by this route, all being characterized by freshwater aquatic biota discussed in the regional setting.

3.5.3.6 Natural and Scenic Resources

No wildlife or recreational areas are in the immediate vicinity of the dome. Lake Fausse Pointe, a natural swamp area, is only 4.2 miles to the east. The next closest recreational area is a bass fishing lake, called Spanish Lake, about 10 miles northwest of the site.

The scenic value of the storage site is already somewhat lessened by the presence of manmade facilities. Numerous small roads crisscross the dome and a fair amount of oil and gas production has occurred, especially on the south and west flanks of the dome.

The natural area of trees and wetland which covers the southeast third of the dome is an area of high scenic value. The large areas of forested wetland which continue to the east (forming the Atchafalaya River Basin) are also of high aesthetic value, containing many water bodies and marsh vegetation undisturbed by man. Lake Fausse Pointe, a natural swamp and water body east of the dome, is an area of great natural aesthetic value.

A similar swamp and forested wetland lies south of the cultivated land which surrounds the Iberia dome. This marsh area surrounds Weeks Island, and is of high scenic value.

3.5.3.7 Archaeological, Historical, and Cultural Resources

The Iberia dome does not appear to contain any known sites of archaeological or historic significance.

3.5.3.8 Socioeconomic Environment

Iberia dome is located in the south central portion of Louisiana in an area of mixed agricultural and wetland land uses. Transportation and site access were discussed in Section 2.5.3.

The population center nearest the site is the small village of Oliver, located about 2 miles to the west on Route 87. The residents are employed primarily in agriculture or salt mining. Two other nearby urban settlements are New Iberia, 5 miles northwest of the storage site, and Jeanerette. New Iberia is a major urban center and is expected to supply part of the labor force for work at the storage site.

Major cities outside the Iberia Parish include Lafayette City in Lafayette Parish and Morgan City in St. Mary Parish. These urban centers are within feasible commuting distance of the Iberia dome, and are expected to be major sources of labor for work at the storage site.

Information concerning housing, economy, and governmental services for Iberia Parish were discussed in Section 3.4.2.8.

## 3.6 SITE SPECIFIC ENVIRONMENT - ALTERNATIVE GROUPING NO. 3 - EARLY STORAGE SITES PLUS CHACAHOULA

### 3.6.1 Group Description

The third alternative grouping of sites for the SPR for the Capline Group would involve utilization of the early storage facilities at Weeks Island and Bayou Choctaw and development of storage at Chachoula dome in Lafourche Parish. Development of early storage at Bayou Choctaw has been discussed in FES 76-5 and at Weeks Island, in FES 76/77-8. Possible use of these sites for further development has been discussed in Section 3.4.2 of this report and Section B.4.2 of Appendix B for Weeks Island, and in Section 3.5.2 of this Report and Section B.5.2 of Appendix B for Bayou Choctaw. The environment at Chacahoula dome is presented in Section 3.6.2. Further details concerning the site are described in Section B.6.2 of Appendix B. A detailed description of the Gulf brine disposal environment is given in Appendix G.

### 3.6.2 Chacahoula Dome

#### 3.6.2.1 Land Features

The Chacahoula salt dome is a shallow piercement dome. Salt geometry shows a sharp, elliptical piercement structure which has a broad, rounded top and steeply dipping flanks (Figure 3.6-1). The shallowest known salt occurrence is an isolated high point at a depth of -1100 feet. The area enclosed within the -2000-foot contour is approximately 2 square miles.

Quality of the salt mass is largely unknown at this time. Disseminated anhydrite, however, is probably present in amounts of perhaps three to seven percent. Incorporated portions of sandstone and shale through which the piercement structure has passed occur in outer portions of the salt. Caprock overlying the dome is primarily composed of anhydrite, with gypsum and calcite probably present. Sulfur is a minor constituent of the caprock. Average caprock thickness is reported to be approximately 225 feet. The caprock apparently does not cover the entire salt mass, since several drill holes around the periphery of the dome encountered salt without caprock.

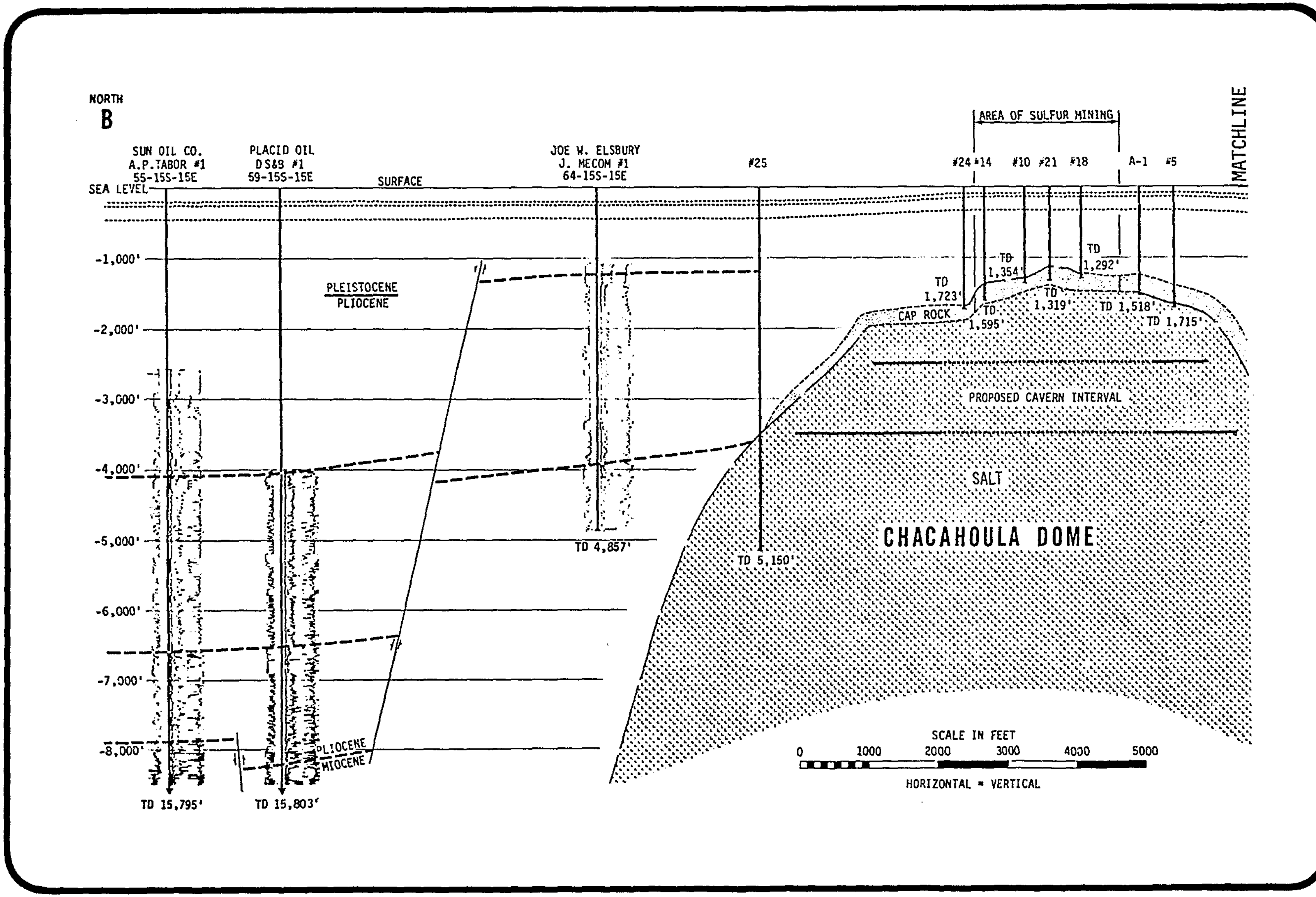



FIGURE 3.6-1 Geologic cross section (north/south) Chacahoula dome.

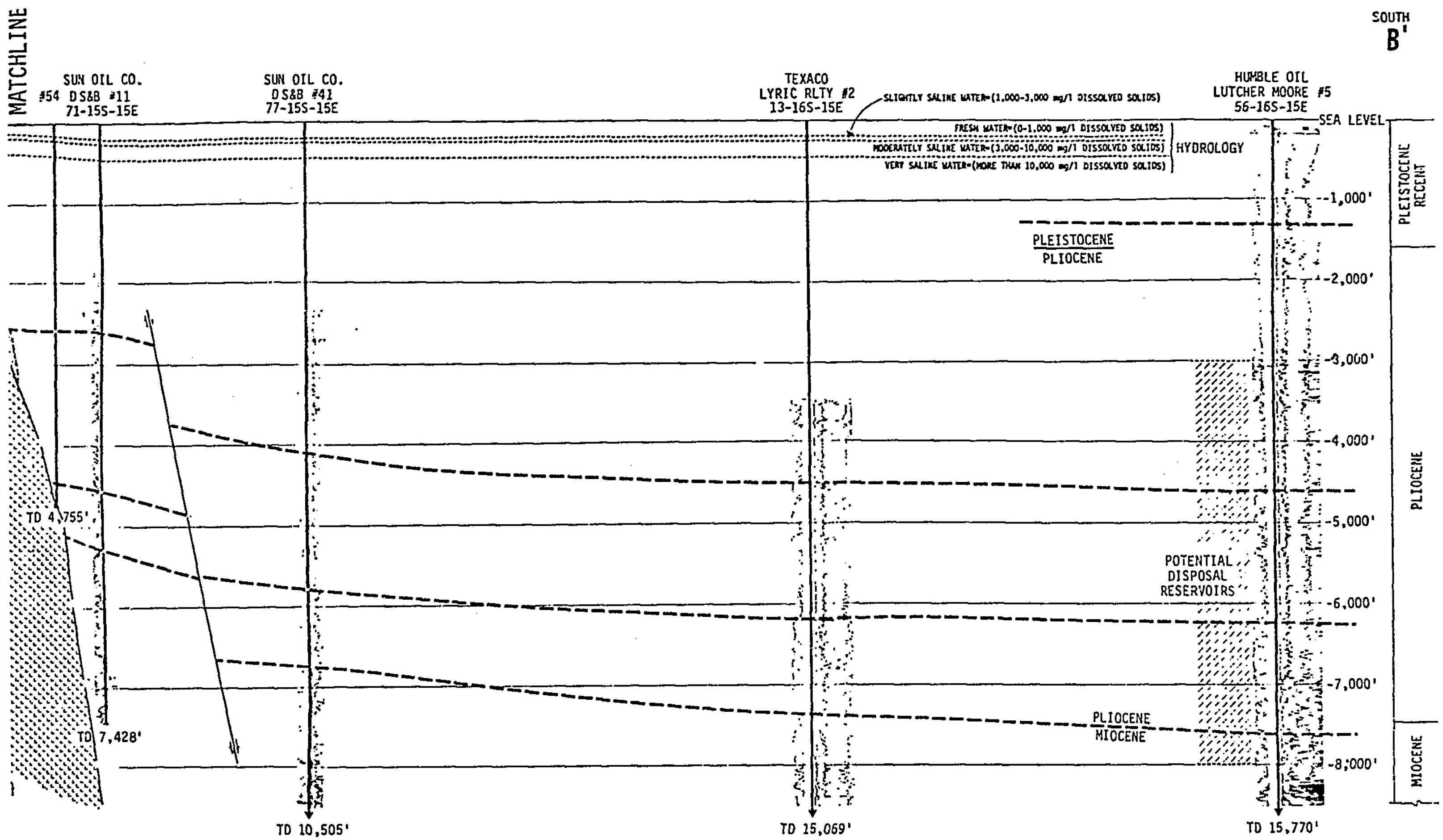



FIGURE 3.6-1 continued.

Up to 1500 feet of unconsolidated and partially consolidated muds, sands, and shales of Pleistocene and Holocene age overlie the central portion of the dome. Unconsolidated and partially consolidated sands and shales of Pliocene age underlie the Pleistocene and extend downward to about -7500 feet below sea level. Sand, shale, and limestone formations of Miocene age are found below -7500 feet, probably reaching depths in excess of -20,000 feet. The salt piercement has forced these sediments upward in the immediate vicinity of the dome. Faulting within the Miocene and overlying Pliocene formations adjacent to the dome is extensive and complex.

Present oil or gas production occurs all around the dome (Figure 3.6-1), with most oil production centered on the south and east flanks, and gas production concentrated mainly on the structure's north and west sides. Known depths of production zones vary from -8855 feet to -12,636 feet. No oil or gas production is known to have been found over the top of the dome in the area proposed for the storage facility.

Over 300 sulfur exploratory and production wells were drilled in the cap rock by Freeport Sulphur Company. Freeport's sulfur production at Chacahoula indicates subsurface removal of approximately 19.62 million cubic feet (3.5 million barrels) of material. No surface subsidence was reported during sulfur production nor is subsidence apparent on the present surface. Therefore, it is believed that the possibility of severe surface subsidence is minimal.

The Chacahoula dome and the adjacent lands within a radius of approximately 3 miles are within a backwater swamp area where undrained swamp soils predominate. Adjacent to the dome to the north, the back slope of the natural levee of Bayou Lafourche consists of poorly drained, clayey soils typical of those that occur in depressions on natural levees and on broad flat plains at the base of natural levees of the Mississippi River and its distributaries. These soils are used for cropland and pasture land. On the crest of the levee of Bayou Lafourche are alkaline soils that support crops and urban development. To the west of the dome, in Assumption Parish, swamp soils predominate.

#### 3.6.2.2 Water Environment

Bubbling Bayou, approximately 0.5 mile south of the site, is the most prominent of several local surface water bodies in the vicinity. Chacahoula Bayou is approximately 3 miles to the south, and flows westerly to the ICW. Numerous other small bayous and canals are in the general site vicinity with natural drainage prevailing to the south and west. The brine diffuser pipeline would underlie 23.6 miles of the Gulf of Mexico. This environment is discussed in Section 3.2.2.1.

The Chacahoula salt dome penetrates the Plaquemine aquifer, the base of which is at a depth of about 1400 feet in the site vicinity, with highly saline water occurring below a depth of about 450 feet. The base of the fresh water is about 250 feet below sea level in the vicinity of the dome (Figure 3.6-1).

#### 3.6.2.3 Climatology and Air Quality

Generally, the site specific information given in Section 3.3.2.3 for Napoleonville are applicable at Chacahoula. Specifically, at Chacahoula, coastal effects are expected to be slightly more pronounced and existing air quality somewhat less polluted than at Napoleonville.

#### 3.6.2.4 Background Ambient Sound Levels

Ambient sound levels at the Chacahoula site are dominated by industrial activities, while ambient sound in neighboring areas is dominated by insect and animal noises, wind, and traffic on local roads.

#### 3.6.2.5 Ecosystems and Species

The Chacahoula storage site is within the bottomland forest and deciduous swamp ecosystems. Overstory vegetation at the site is primarily bald cypress and water tupelo. In addition to the dominant overstory, components of the sub-dominant overstory include black willow, water ash, and pumpkin ash. Some water oak is also found but is not in abundance.

Understory vegetation of the site includes, greenbriar, palmetto, blackberry, trumpet vine, Virginia creeper, holly, and grape. In addition, regenerates of the overstory vegetation are found within the understory and groundcover strata. Several roadways crossing the area have road banks planted in Bermuda grass, wild rye, and panic grasses.

Wildlife habitat types found at the Chacahoula site include deciduous swamp, cleared lands (existing oil field development), and freshwater wetlands (creeks, drainage canals, and swamps). Wildlife population at this site is typical of that described for these habitats in Section 3.3.2.5 (see also Sections B.2.5 and B.6.2.5 of Appendix B).

The environmental settings of the pipeline systems and alternatives are composed of the same general habitat types discussed with respect to the Chacahoula dome site area. There are, however, some differences and similarities in the environmental setting of the dome and the environmental setting of particular systems or their alternates.

The environmental setting of the proposed brine disposal system to the Gulf of Mexico encompasses an area about 64 miles long, which includes a 23.6-mile section in the Gulf. A major portion of the brine disposal route would be through relatively undisturbed swamps and marshlands, and would require crossing many streams. The pipeline would cross near area considered to be a seed oyster reservation. The seed oyster reservation at Bay Junop is one of two in the region. The pipeline would also cross Bayou Penchant, which is one of the few streams in the region to be evaluated as good for fishing and would terminate in the Gulf of Mexico. Fish and other forms which live in the coastal waters are discussed in Section 3.2.5.

The alternative brine disposal system to an injection well field would not require extensive habitat modification since most of the system would be on cropland. The only sensitive (relatively undisturbed) terrestrial habitat involved would be along the 3.6-mile long right-of-way from the dome to the well field. This system would not require any major waterway crossings; therefore, the only aquatic habitat to be crossed by this system would be swamp areas and creeks between the dome and the injection well field. These areas are characterized by flora and fauna discussed for the habitats in Section 3.2.5. An alternative brine diffuser site would be located in the Gulf of Mexico, 14 miles south of Caillou Bay, in 23 feet of water. The biology of this area is the same as that for the proposed system (Section 3.2.5).

The proposed oil pipeline route to St. James and the alternative raw water supply pipeline route to the Mississippi River (21.9 miles long) is dominated by deciduous swamp habitat (about 60 percent), similar to that at the dome. The other major terrestrial habitat type associated with the pipeline is cropland. The major water-way crossings would include Bayou Lafourche, Baker Canal East, Bayou Verret, and St. James Canal. The aquatic communities of these bayous and canals are probably not much different from those discussed for the regional environmental setting in Section 3.2.5. Fish populations may be expected to be similar to those of Grand Bayou (Section 3.3.2.5).

The proposed raw water supply pipeline to Bayou Lafourche (6.5 miles long) would follow the same route as the proposed oil pipeline, with about half of the water supply route in deciduous swamp habitats and half in cropland. The major waterway associated with this system is Bayou Lafourche, where the intake structure would be located. The aquatic community of Bayou Lafourche is probably similar to that discussed for the regional setting in Section 3.2.5. The fish populations are probably similar to those in Grand Bayou, as discussed in Section 3.3.2.5.

The alternative raw water system to a well field would involve the same habitats as the proposed oil delivery system, but with only one major waterway crossing at Bayou Lafourche since the system would be only 10.2 miles long. The alternate raw water system to the Gulf of Mexico would follow the same route as the proposed brine disposal system; however, it would include only 2 miles of the 23.6 mile offshore portion. The habitats involved in the vicinity of this alternate system have been discussed previously.

### 3.6.2.6 Natural and Scenic Resources

The recreational and wildlife resources of the area are both numerous and vast (see Section 3.2.6). Between St. James, Chacahoula, and Atchafalaya River, and Caillou Bay, only a few designated or developed historical, recreational, or natural resource areas exist. Those that are of concern due to their proximity to potential pipeline rights-of-way or other impact areas are the Edward Douglas White State Park northwest of Thibodaux in Lafourche Parish, the Bayou Penchant Scenic Waterway in Terrebonne Parish, and an untitled proposed park or wildlife area in the Isles Derneires in southernmost Terrebonne Parish (Figure 3.2-5). None of the above listed sites or areas are in the area of the salt dome; however, Bayou Penchant in Terrebonne Parish is in the pathway of the proposed pipeline right-of-way for deep well disposal of the brine.

3.6.2.7 Archaeological, Historical, and Cultural Resources

The Chacahoula dome does not appear to contain any known sites of archaeological or historic significance.

3.6.2.8 Socioeconomic Environment

The communities which would be affected by the project are basically of two cultural types. One is representative of a way of life that has existed in the area for decades and is based on agriculture and commerce. These are the towns where families that have been established for generations own substantial portions of the land, and exert a conservative influence on community growth and civic affairs. The majority of the citizens are of French heritage. Their ethnic consciousness combined with the stability and small size of the communities tends to accentuate the cultural differences between those who have been raised there and those who have recently moved into the community. This pattern can be found to some extent in many small towns and neighborhoods throughout southern Louisiana. Thibodaux, Napoleonville, and many of the villages close to the project area are representative of this cultural pattern.

The other type of community is one which previously may have been like those just described, but which has grown rapidly since about 1950. This sudden expansion has been largely due to the development of the oil and gas industry. A relatively higher proportion of the population has migrated into the town from other states, and the people are generally more inclined to move in and out of different neighborhoods. This has resulted in a declining ethnic awareness and a greater acceptance of further growth with its concomittant changes in the appearance of the town itself and in the characteristics of social life and civic affairs. Within the area which would be affected by the proposed project, Morgan City is this type of community, as is Houma, to a lesser extent.

At the present time, no regional plans or pertinent zoning regulations relating to land use are available or in effect. Site access was discussed in Section 2.6.

Although the project site is located in the northwestern corner of Lafourche Parish, the project would have an impact on the adjacent parishes - Terrebonne, Assumption, and St. Mary - as well. Thibodaux, Houma, and Morgan City are the major towns in this area. These form a rough triangle connected by Interstate Highway 90, Louisiana Route 20, and Louisiana Route 24. A number of unincorporated communities having a population of less than 1000 lie along these main roads. Thibodaux is the parish seat of Lafourche Parish and is about 10 miles from the site via Routes 1 and 309. The 1970 census reported the Thibodaux population to be 14,925.

Houma could be expected to provide some of the labor for the project. Houma is the parish seat of Terrebonne Parish and is the major population center of this oil and natural gas area.

Much of the equipment and supplies, as well as a portion of the labor, for the project could be expected to come from Morgan City, a fast-growing community which is severely limited in land area. It is the fourth largest seaport in Louisiana. Located on a natural levee area that cuts across the lower Atchafalaya Basin, this highly industrialized area is wedged between low-lying wetlands and has extended itself eastward along Highway 90.

There is no resident population at the site itself. The closest small population center is the unincorporated area of Chacahoula, consisting of approximately 25 homes at the junction of Routes 309 and 30.

The population growth of this area has been largely due to the development of oil and natural gas resources and the migration of workers into the area from other parts of the country. Recent off-shore drilling activity has brought an influx of workers to Morgan City, which has grown substantially since the 1970 census. The greatest future expansion of population in the area is expected in Lafourche and Terrebonne Parishes where less than half of the area is dry land (only about 411 square miles of dry land exists in Lafourche Parish, out of a total of 1141 square miles). This expansion is expected to result in an intensified urban development along the dry land corridors that connect the major towns.

Overall there are few housing units available in the rapidly growing areas of Thibodaux, Houma, and Morgan City.

Lafourche Parish had 19,091 housing units in 1970, 12,754 of which were owner-occupied.

Police and fire protection for the site would be provided by Thibodaux, about 15 miles from the site. There is also a small volunteer fire department in Schreiver, 4 miles south of Thibodaux and about 10 miles east of the project site, one at Gibson about 10 miles southwest, and another at Amelia, 17 miles southwest.

There are two hospitals in Thibodaux; ambulance service is also available in Thibodaux. The available hospital and medical personnel for the parishes surrounding the site tend to be located in the population centers of 10,000 or more; Houma and Morgan City both have hospitals.

The rate of unemployment is generally low in this part of the country. The petroleum industry ranks as the primary income-producing industry in the Lafourche-Terrebonne Parish area surrounding the project. Production in this area peaked in 1970 and has since begun to show a decline. Petrochemical production, associated with petroleum production, is the leading source of income in nearby St. James Parish. Other manufacturing in the area includes sugar refining in Lafourche and St. James Parishes. Shipbuilding and fishing are also important industries in the area, with Houma and Morgan City having major port facilities.

CHAPTER 4.0

# ENVIRONMENTAL IMPACTS OF THE PROPOSED AND ALTERNATIVE ACTIONS

## 4.1 GENERAL CONSIDERATIONS

### 4.1.1 Introduction

Expected and potential impacts (both positive and negative) from construction and operation of the Capline Group of SPR crude oil storage sites are described in this chapter. Detailed discussions of these impacts are presented in Appendix C. Further impacts related to Gulf of Mexico brine disposal are discussed in Appendix G.

This chapter considers impacts associated with construction and operation of new facilities at the possible sites and with expanded use of the early storage facilities and distribution terminals. Particular attention is given to analyses of cumulative oil spill and air quality impacts which would be caused by the full Capline Group development. The most significant adverse effects that may occur are common to all candidate sites. These effects are related to the potential for oil spills, the release of hydrocarbon vapors, construction effects on wetland productivity and habitat value, and the temporary influx of construction workers to the region.

The risks associated with the handling and storage of both crude oil and brine are treated in Section 4.2 to apply to the Capline Group in any of the site combinations. Environmental impacts related to the construction and use of oil distribution terminal systems are described in Section 4.3. Those impacts related to the proposed development of the Capline Group storage (early phase sites plus Napoleonville dome) are described in Section 4.4. Sections 4.5 through 4.7 describe the impacts associated with the alternative site groupings. Considerations offsetting adverse impacts are detailed in Section 4.8, and a summary is presented in Section 4.9. Environmental effects of development of up to 500 MMB of SPR storage are summarized in Section 4.10.

### 4.1.2 Construction

All of the proposed and alternative developments have many characteristics in common. This section summarizes the types of impacts which will have to be evaluated during construction at any site. The particular effects related to a specific grouping are summarized in the respective sections.

4.1.2.1 Land Features

Impacts on land features are considered to be minor. From 6 to 24 caverns would be leached at the various sites.

Leaching of one storage cavity in a salt dome would involve removal of about 10 to 12 MMB of salt by leaching. This is equivalent to as much as 25 x $10^5$ cy of salt. Sufficient wall thickness would be maintained between cavities to maintain cavern integrity.

Excavation impacts at the sites are considered to be long term or permanent. They will, however, involve only small acreages. Excavation along the pipeline routes, except where canals are necessary through the marsh, is primarily short term.

4.1.2.2 Water Resources

4.1.2.2.1 Surface Water

Sediment represents the major nonpoint source of water pollution on most construction sites, especially on those which require extensive grading. Sediment includes solids and organic materials detached from the ground surface by erosion and carried into the drainage system, principally by runoff. The introduction of sediment into various natural bodies of water results in increased turbidity, deposition of solids, and possible eutrophication. Other impacts of construction on onshore and offshore water quality include decreases in pH and dissolved oxygen and increases in nutrients, BOD and heavy metals, hydrocarbons, and pesticides released from sediments.

For some sites disposal of brine to the Gulf of Mexico is the proposed method for brine disposal. For others it is an alternative method. Two potential sites are under consideration, one would extend into the Gulf about 11.5 miles south of South Point, Marsh Island, and the second would be about 26 miles south of Pointe Au Fer (see Figure 2.1-1). During construction (cavity leaching), a range of from 570 to 1250 MB/D of brine with a salinity of 200 parts per thousand (ppt) greater than ambient (about 30 to 35 ppt) would be discharged. In order to gain quantitative indications of the possible impacts of brine disposal to the Gulf of Mexico, computer simulation analyses were performed by the National Oceanographic and Atmospheric Administration (NOAA) using a time-dependent model. Model inputs included estimated current fields that closely approximate actual conditions and observed current patterns obtained from baseline monitoring at the Gulf diffuser site. A summary of the study results is presented in Appendix G. For the case of estimated moderate current conditions, an increase of less than 5 ppt above ambient could be expected within a $10^6$ square foot (23 acre) area around the brine diffuser. Using 13 days of actual current data collected at the Weeks Island site, the average predicted area contained in the 3 ppt isohaline was 40 acres at Weeks Island and 123 acres at Chacahoula. Due to geothermal heating, the brine in the cavern may increase to a temperature of from 120 to 150$^{\circ}$F. The temperature of the brine at the diffuser would not be reduced greatly but due to turbulent mixing, temperature elevation would be less than 1$^{\circ}$F within 25 acres of the diffuser. Other impacts of the brine plume include alterations in normal seawater ion ratios, increases in the concentration of precipitates, and deoxygenation. Due to jet dilution, oxygen levels would increase rapidly. Oil concentrations are expected to average 6 ppm over the life of the diffuser. For a discussion of the oil in brine analysis see Appendix D.

The salinity of coastal waters usually reflects a complex mixture of salts. Typically offshore ocean waters contain a salinity of about 35 ppt, but because of river flow into coastal areas the salinity in the nearshore ecosystems will vary depending upon the amount of dilution from the river inflow. Commonly, the salinity concentration varies from low values at some distance up the tidal tributaries to values of 30 to 35 ppt along the outer coast.

It has been shown that different groups of animals vary markedly in their reactions to changes in salinity and that several freshwater or marine groups are highly sensitive to any dilution or concentration of salinity levels from their normal environmental requirements.

4.1.2.2.2 Subsurface Water

Major impacts to the subsurface water systems would be as a result of deep well disposal of brine. The proposed receiving formations for injection of brine range in depth from 3000 feet to 8000 feet, which is below any aquifers containing fresh or slightly saline water. The increase in salinity, therefore, would be restricted to water that would not be economically competitive for desalination due to the large quantities of fresh and slightly saline water (1000 mg/l to 3000 mg/l) available in the region. It may thus be concluded that no adverse impact on water quality would occur from the use of a properly designed and constructed system of deep well injection as the method of brine disposal. The specific well designs would be formulated following a complete drilling of a test well and determination of reservoir parameters. The test program results would be used to define the specific casing, sealing and packing methods to be employed in the well field, and the necessary injection pressures. The depths of the respective casings would be determined during the well drilling program.

Ground water is considered as an alternate raw water supply for all sites. Impacts that might result from withdrawal of large quantities of water include lowering the potentiometric level in the pumped zone, land subsidence, and intrusion of the pumped zone by waters of different salinities. Land subsidence and salt water intrusion result directly from drawdown or reduction of the potentiometric level in the aquifer. This, in turn depends upon such factors as pumping rate, well spacing and completion, and aquifer thickness. With due consideration to well spacing and completion methods and given the great thickness and high permeability of sands containing moderately saline water in the vicinity of the sites, it should be possible to provide the required quantities of water with less than 100 feet of drawdown in the vicinity of a well field. The impact of those ground water withdrawals on water quality would be primarily an increase in salinity of the water in the production zone. This would be induced by migration of fluids from underlying more saline zones as a result of decrease in pressure. The increase in salinity can be minimized by proper spacing and completion of wells. In addition, the proposed production zone contains moderately saline water (3000 to 10,000 mg/l) which is not economically attractive for desalination because of the large quantities of slightly saline water available in the site region. Impacts from withdrawal from a properly designed well field are expected to be slight.

#### 4.1.2.3 Air Quality

The quality of air in the vicinity of a site, at the terminals, and along the pipeline rights-of-way would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. The principal pollutant of concern would be hydrocarbon emissions (see Section B.2.3.3 of Appendix B).

The quality of air during construction would be affected primarily by general construction vehicles, drilling rig engines, paint solvent on storage and surge tanks, and fugitive dust (see Section C.4.3.1.3 of Appendix C).

The impact of the atmospheric emissions due to site construction is dependent on the ambient air quality and the dispersal characteristics of the atmosphere, both of which are discussed in Section B.2.3 of Appendix B.

All impacts during construction would be short term in nature and confined to a relatively small area. Because all pollutants released during construction are assumed to be ground-level releases, concentrations would decrease with increasing distance.

#### 4.1.2.4 Noise

Impacts due to noise of construction activities will be related primarily to equipment used in construction activity. Except for sites where drilling rigs will be near to residential areas for several months, noise impacts will be short term and not significant. Noise impacts related to expansion of terminal facilities or site development are given in Sections 4.3 through 4.8.

4.1.2.5 Impact on Ecosystems and Species

Development of a site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance.

Wildlife species to be directly affected by construction include non-mobile species of small rodents, amphibians and reptiles. Direct effects on resident wildlife (mammals, birds, amphibians, and reptiles) would vary depending on whether construction can be avoided during the nesting and young-bearing season. Indirect effects of construction such as forced migration, would be dependent upon the availability of resources in an adjacent habitat. Noise and human disturbance during construction would discourage wildlife within the area. Upon completion of construction activities, some wildlife species are likely to return to the impacted area. However, due to the extensive fencing planned for the area, some wildlife species would be permanently displaced.

Increases in turbidity from construction would affect most of the surface water on and adjacent to the construction by decreasing light penetration and hence possibly reducing plankton production. However, an influx of nutrients from the sediments and fill could increase phytoplankton, periphyton, and macrophyte production in areas not buried by fill, or affected by reduced light power fraction, thus mitigating the effects of reduced light levels on plant productivity in the immediate vicinity of construction activity. Community composition also could be affected since different species have different physiological tolerances and ecological dependencies.

Siltation caused by construction activities might eliminate a small number of benthic invertebrates in the unfilled parts of the site or might affect their feeding, respiration, or reproduction. This reduction of invertebrate numbers in the aquatic system and food web would be of only local significance and, for the most part, would be temporary. Many species of sunfish and other freshwater fish which feed mainly by sight would be forced to migrate from the area in order to find food.

The expanse of interconnected and contiguous waters would cause the stress levels to be lower than they would be within a smaller or closed system. Fish should move back within a short time after turbidity settles and disturbances cease, if construction takes place. Mollusks (e.g., snails and bivalves) covered by filtration from rain runoff from the fill areas could suffocate or suffer gill abrasion. Crayfish can survive in water made turbid by a high content of detrital matter and presumably could tolerate high turbidity produced by other sources. Crayfish may temporarily decline in the areas affected by high turbidity because of a decline in food supply (decomposed organic matter) and disturbed habitats.

Pipeline construction in the bays, estuaries and nearshore Gulf would destroy benthic habitats and lead to stress of adjacent benthic habitats due to siltation. Increased turbidity and decreased dissolved oxygen would reduce plankton productivity and cause nekton to avoid the region. Some increased uptake of resuspended pollutants may occur.

The elimination of the cover vegetation within the pipeline rights-of-way is expected to have a significant though short-term adverse impact in areas of high precipitation and soil moisture. In efforts to reduce this impact, the felling of large trees and disturbance to natural plant communities adjacent to the proposed pipeline right-of-way would be avoided by restricting construction activities to the rightof-way when possible.

Clearing of the cover vegetation and removal of topsoil from the proposed pipeline rights-of-way would cause several secondary impacts. Most important of these is a decrease in productivity of forage material within the right-of-way corridor. Another impact results from altering the composition of the vegetation community; an example is the "invasion" of the right-of-way by low-productivity "decreaser" plant species having little or no forage value. In addition, clearing and/or spraying the right-of-way would have the secondary effect of increasing the fire danger due to drying out the brush and increasing human activity. Restoring the topsoil and reseeding the right-of-way with native grasses would serve to minimize the impacts of construction.

Another direct impact of construction of the proposed pipelines is the compaction and random mixing of the soil by heavy equipment and vehicles within the right-of-way. This impact would be minimized by the methodology used to ditch and backfill. A majority of the topsoil would end up at or near the top of the ditch by reversing the ditching steps when backfilling.

The effects of pipeline construction on wildlife in cleared land habitats are expected to be minor and short term. Most of the wildlife species commonly found in cleared lands are able to survive despite fluctuating conditions and altered habitats. Some loss of the less mobile species is expected during construction. The temporary loss of habitat and resources provided by that habitat would probably last 6 months to 1 year in old field and pasture areas. Other areas (urban and industrial) would probably require less recovery time.

The effects of pipeline construction on wildlife at river crossings would be minimal and temporary. Construction activities would force most wildlife away from the crossings. Most mammals birds, and herptofauna would return to the area once human activities decreased.

Pipeline construction in marsh (and some swamp area) that must use flotation canal construction methods would result in permanent open water enviornments and the loss of the marsh (or swamp) environment. Loss of terrestrial habitat would affect those species that use this habitat but the creation of open water would increase available aquatic habitat.

Permanent loss of habitat is expected in the wooded bottomlands and swamps. Brush and trees would be completely removed within the right-of-way in these areas. This removal would result in a loss of habitat, feeding areas, protective cover, and nesting areas for woodland species. Arboreal species of wildlife and woodland perching and nesting avifauna would be adversely affected. Some species within these groupings include the squirrels, raccoon, opossum, broadheaded skink, eastern gray treefrog, red-tailed and red-shouldered hawks, other hawks ( <u>Buteo</u> spp.), owls, and most passerines. The loss of feeding areas would be permanent for some species (i.e., squirrels); however, once recovery of grasses, shrubs, and emergent macrophytes takes place, the area may provide a food source for some wildlife species.

A positive factor derived from construction is the creation of an "edge effect," a transitional area where two major biotic communities meet and blend together. An edge includes organisms common to the communities on both sides of it, as well as other more versatile species.

The impacts of brine disposal in the Gulf would affect all organisms at all trophic levels. Plankton entrained in the plume would experience physiological stress, inhibition of growth, or death. Primary productivity would be reduced due to increased turbidity and decreased dissolved oxygen. Plankton in the upper water column would not be as greatly affected. Benthic organisms within the near field would be totally destroyed, while populations in the intermediate and far fields of the brine plume would be reduced.

Adult nekton would be minimally affected due to their avoidance ability. This would result from the increased salinity levels and decreased food availability. The brine plume may impact the developmental stages of the nekton by inhibiting metabolic function, growth, and development. Of particular importance are the commercially important shrimp.

The brine plume might also cause a possible disruption of shrimp, crab, and fish larval migration into the Louisiana coastal estuaries where the organisms mature. It is not known exactly what guides these larval forms into nursery areas, but one theory states that these organisms follow salinity gradients as a pathway to the nursery areas. If this is the case, the increased salinity caused by the brine plume may locally mask the normal salinity gradients which extend out from the coast to the offshore areas where spawning occurs and therefore prevent the larvae from reaching the protective coastal nursery areas.

The primary aquatic impact related to the raw water supply system would be the entrainment of plankton, drifting invertebrates, and larval fish and the impingement of juvenile fish on the intake screens. As discussed in Section 2.3.4.1, intake structures would be designed to meet EPA standards to minimize these effects. Entrained organisms would be lost since they would be unable to withstand the high salinity within the cavities. The percent of entrainable organisms lost depends upon the flow in the water body and the intake rate. The overall impacts would be moderate to low for the overall system (see, for example, Section B.4.3.1.5 of Appendix B).

The impingement of aquatic organisms on the intake screen would be primarily limited to juvenile fish (usually less than about 4 inches long). Since all of the impinged fish would be returned to the bayou, It is likely that many may survive. The actual survival rate would depend on flume design, and location and operating procedures used for the intake structure. Assuming that the intake structure is not located in the vicinity (or just downstream) of major fish spawning areas such as bars and backwater areas, the impact probably would be small.

4.1.2.6 Other Impacts

In compliance with Section 2(a) of Executive Order 11593, "Protection and Enhancement of the Cultural Environment" (May 13, 1971), a survey will be carried out to locate, inventory and nominate eligible historic, architectural and archeological properties to the National Register of Historic Places that may occur on land affected by the chosen development alternative. The results of this survey will insure the proposed undertaking will not result in the transfer, sale, demolition or substantial alteration of eligible National Register Properties. As the project progresses, additional surveys will be carried out to determine that no additional eligible properties have been uncovered.

In compliance with Section 1(3) of Executive Order 11593 it will be determined that the proposed project will not result in the destruction or deterioratin of non-federally owned districts, sites, buildings, structures or objects of historical, architectural or archaeological significance.

Impacts on natural and scenic resources; on archaeological, historical, and cultural resources; and on socioeconomics are primarily site specific and are discussed with the impacts of the proposed and alternative actions for each group.

### 4.1.3 Impacts from Operation and Standby Storage

Should an oil supply interruption occur after oil is stored at the selected sites, a total of approximately 300 MMB would be available for distribution, either by tanker or by the CAPLINE Pipeline. Oil would be pumped from both the early storage sites at Weeks Island and Bayou Choctaw and the SPR storage caverns at the additional site or sites, using separate 36-inch diameter pipelines. Oil would also be injected into the storage cavities via the same facilities. Until an oil supply interruption occurs, these facilities would be maintained in readiness by monitoring storage cavity systems, leak-checking pipelines, activating valves, and other standard procedures.

SPR development would not introduce any new or unique operational impacts to the program but would require extended use of existing systems to accommodate a capacity increase from 183 MMB to 300 MMB. Principal impacts of the operation are associated with hydrocarbon emissions and oil or brine spills (see Sections 4.2.2 and 4.2.3).

#### 4.1.3.1 Land Features and Geologic Impacts

Effects of operation and standby of the storage sites on land features are expected to be minimal. No significant disturbance of site soils is expected after construction is completed. Soils will stabilize soon after they are revegetated.

The sites are in an area identified as Seismic Zone 1, that is, with an expectation of minor earthquake damage (Figure 3.2-3). Also underground storage caverns are much less susceptible to damage from seismic events than surface tanks.

It is conceivable, though extremely unlikely, that the salt roof over one of the caverns could collapse. Appendix F considers the possible mechanism by which such an event could occur. A possible result would be the formation of a deep surface depression, probably resulting in a lake, over the dome. Should such an event take place, significant quantities of oil or brine could be released to the surface or to shallow aquifers. Impacts on surface storage equipment would be significant.

The structural integrity of the storage cavities would be monitored and all available measures would be taken to preserve cavern integrity (Appendix F). (CAVERN STABILITY)

Use of alternative raw water, brine, or oil transportation systems would impact land features during project operation and standby storage only through required maintenance of pipeline rights-of-way.

4.1.3.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling, and possible oil or brine spills. Information concerning effects of oil and brine spills are discussed in Sections 4.2.2 and 4.2.3, respectively.

During construction of the storage sites and at terminal facilities, measures would be incorporated into the design to minimize sediment transport and erosion at the site. These measures would include grading, diking and reseeding. Runoff from precipitation would therefore have minimal impact on water systems.

All sanitary wastes from the storage terminal facilities would be conveyed to a treatment plant sized to conform to Louisiana Health Department Standards, then routed to a receiving stream. As the number of operational employees would be small, no adverse impact on stream water quality would be expected.

When oil is pumped into the storage caverns, brine would be displaced intermittently to the Gulf of Mexico through the diffuser at an average rate of 250 to 540 MBCD over 1 or 2 years. Generally, the impacts of operational brine disposal would be similar to those of the leaching operation (Section 4.1.2). However, discharge volumes during operation would be less and would occur over a shorter period of time, lessening the impact.

Because the compensation water would remain in the cavern for a longer period of time than during leaching, the salinity of the brine would be close to saturation, 264 ppt. The oil-brine interaction that would occur only during the operational phase would result in a brine hydrocarbon concentration gradient of from 0 to 31.4 ppm during the initial oil fill. During subsequent refills, after a refractory oil layer had formed, the hydrocarbon content of the brine would vary from 4 to 15 ppm, depending on cavern geometry. However, reduction of oil content during brine discharge due to vaporization of light hydrocarbons and the mitigative oil skimming process would result in an estimated oil concentration in the discharged brine of approximately 6 ppm; this level is an order of magnitude greater than the ambient hydrocarbon concentration at the proposed diffuser site (See Appendix D).

#### 4.1.3.3 Air Quality

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. Non-methane hydrocarbon concentrations in the area frequently exceed the national and state standard of 160 $\mu g/m^3$ (3-hour average, 6-9 a.m.). Hydrogen sulfide losses are expected to be minimal since most of the crude oil that is expected to be stored in the Capline system would have weathered sufficiently during overseas transit to essentially eliminate the $H_2S$ component.

The quality of air during operation would be affected by the following pollution sources: fugitive dust; valves, seals, and gages; flaring at Weeks Island cavern; crude oil storage tanks; tanker and barge loading and unloading operations; brine ponds; and onsite power generation. Most of these effects are expected to be short term and of only local significance as discussed in Section C.2.3 of Appendix C. Nearly all of the hydrocarbon emissions result from storage tanks, and tanker loading and unloading operations at the distribution terminals; Section 4.3 describes these losses. Emissions resulting from storage site related activities are small and are discussed in Sections 4.4 through 4.8.

#### 4.1.3.4 Noise

Principal sound sources during the operation of the storage facilities would be material handling equipment such as pumps for filling and emptying the storage facility. The electric motor driven pumps would be mounted in a pump house with corrugated steel sides and roof. The sound level contribution for the facilities would be negligible compared to existing ambient sound levels. Impacts related to loading or unloading of tankers or other operation activities would also produce no significant effects.

#### 4.1.3.5 Species and Ecosystems

Operational impacts of the proposed SPR facilities on biological resources in the area are principally related to brine discharge and the potential for oil or brine spills (see Sections 4.2.3 and 4.2.4). Withdrawal of raw water to displace oil from the caverns would produce effects similar to those during construction. As noted in Section 4.1.2.5, intake structures would be constructed to conform to EPA standards. Where brine would be dishcarged to the Gulf the effects should be less significant than during leaching because the quantities of brine would be less. During operation, the brine disposed into the Gulf would contain hydrocarbons, adding additional impacts to those previously discussed in Section 4.1.2.5. These include depressed growth in all organisms and tainting of edible species. Normal surface activities at the storage site and in the vicinity of the tanker docks would exclude wildlife from the immediate project vicinity. This is an expansion of the existing industrial use of the project lands but is not a new or significantly adverse impact.

#### 4.1.3.6 Other Impacts

Impacts on natural and scenic resources; on archaeological, historical, and cultural resources; and on socioeconomics are primarily site specific and are discussed with the impacts of the proposed and alternative actions for each group.

### 4.1.4 Impact Due to Termination and Abandonment

No specific plan for termination and abandonment of the crude oil storage sites has been established. However, DOE will develop such a plan near the termination of the action. To date, no specific experience with the abandonment of an oil storage cavern facility has been developed in the United States. However, various feasible plans are available.

Environmental hazards that must be considered include surface subsidence and release of residual oils squeezed from the workings by possible long-term plastic closure.

At present, it is intended to put the facility to some beneficial use, rather than abandon it. Beneficial uses might include disposal of wastes or developing a compressed air storage facility for peak power use. The final selection of an abandonment plan will likely depend on the economic and environmental trade-offs and regulations that are in effect at the time of termination.

Use of the facility in the manner described above would assure continued surveillance of the cavern. The inherent integrity of the cavern would prevent any leakage of material into the environment. Certain activities associated with the specific use, such as waste transport, would impose some potential for environmental damage resulting from traffic, spillage, and noise.

Should no beneficial use be found for the facility, the wells could be sealed and the caverns left filled with brine. No adverse environmental effects are likely to result from such action.

### 4.1.5 The Relationship of the Proposed Actions to Land Use Plans, Policies and the Controls for the Affected Areas

There are presently no official plans, policies, or controls established by Federal, State, or local government agencies in the project area. Furthermore, lands under consideration for use in developing the SPR facilities are presently devoted to industrial uses.

Although a Coastal Zone Management Plan is in preparation in Louisiana, there is no apparent project conflict with the basic concepts established by the Louisiana Advisory Commission on Coastal and Marine Resources in 1973, which are expected to be an important part of the ultimate plan. Most development would occur at previously established industrial sites and oil transportation would follow established corridors. It is not anticipated that any land use policies or plans would be in conflict with the proposed facilities.

## 4.2 SPR OIL AND BRINE SPILLS FOR THE CANDIDATE SITES

### 4.2.1 Introduction

As the possible accidental release of oil and brine during project development and operation may have impacts on many aspects of the environment, the quantities of these fluids expected to be released to the environment are summarized in Section C.2 of Appendix C for each site. Detailed descriptions of oil and brine spill risks, including methodology of calculation, dispersal in the environment, and cleanup and prevention technology are provided in Appendix G. Evaluation of the associated environmental risks expected to accompany development of each site is provided in the site specific descriptions of impacts in Sections 4.4 through 4.8. General effects of oil spills and brine spills, that is, those that apply to any site, are summarized in Sections 4.2.2 and 4.2.3, respectively.

### 4.2.2 Oil Spill Impacts

Oil spills expected to accompany development of SPR storage facilities would result from marine transport between the open Gulf of Mexico and the terminal facilities, from operations at the terminals, from pipeline transport between the terminals and the storage site, and from operations at the storage sites. The risk of cavern collapse is considered unlikely. An analysis of the cavern design from an aspect of stability appears in Appendix F. Estimates of spill frequency and total spill volume during cavern fill and cavern withdrawal operations, respectively, are provided in tables in the sections discussing impacts related to the proposed and alternate developments.

The greatest volume of oil spill is expected to occur during cavern fill (for each site) because of the VLCC tanker lightering operation in the Gulf. During withdrawal, oil is expected to be transported directly to other ports by 45 to 50 thousand dead weight ton (MDWT) tankers. The greatest potential for large oil spills would occur as part of tanker transport between the Gulf and the Mississippi River terminals (60,000 barrels maximum credible spill; 1111 barrels average spill); however, there are estimated to be about 14 tanker casualty spills (of any size) during five complete fill/withdrawal cycles for Capline Group storage facility.

Because exposures are similar, the expected frequency and volume of oil spills is basically a function of storage capacity. Thus, a 383 MMB storage capacity at a combination of sites would produce roughly 1.4 times as much oil spillage as a 284 MMB storage site (383/284 = 1.35).

An "average" crude oil has 30 percent paraffin hydrocarbons (alkanes), 50 percent napthene hydrocarbons (cycloalkanes), 15 percent aromatic hydrocarbons, and 5 percent nitrogen, sulfur, and oxygen-containing compounds. As soon as crude oil is released to the water environment, weathering begins. The major weathering processes are evaporation, dissolution, emulsification, sedimentation, biological degradation, and chemical oxidation.

Low molecular-weight hydrocarbons and aromatics are the most immediately toxic components of crude oil. Evaporation results in selective loss of low molecular-weight hydrocarbons and aromatics, thus tending to reduce concentrations of the most toxic portions of the crude oil. Also, evaporation causes a surface residue, which has a higher concentration of sulfur and organics and may develop a specific gravity greater than water, especially if salt, clay, or organic particles are suspended in the water and available for attachment. As a result, this portion of crude oil will sink and may physically and chemically affect bottom organisms.

Dissolution in the water column is selective for low-molecular-weight hydrocarbons and aromatics as well as some of the nonhydrocarbon components that are polar. Most of the soluble material is produced later from biological and chemical oxidation. The solubility of the normal alkanes ranges from 40 ppm for $C_6$ molecules to 0.01 ppm for $C_{12}$ molecules. For aromatics, solubility ranges from 1800 ppm for $C_6$ (benezene) to 0.075 ppm for $C_{14}$ (amtracene). The proportion of various fractions of crude oil likely to go into solution in sea water are presented in Appendix E.

Emulsifications, which are crude oil globules in water columns, are dispersed easily by currents and, it is believed, eventually dissolve or sink to the sediments after contact with suspended solids.

Sedimentation of oil is encouraged by evaporation and dissolution of the lighter weight fractions and by contact with suspended sediments and organic material. In shallow waters, contact with suspended solids is likely during periods of high runoff or stormy weather, which disturbs bottom sediments. Sedimentation also can occur as a result of bacterial masses in the oil slick.

Bacterial degradation can occur in almost all crude oil fractions, but normal alkanes are attacked preferentially, and aromatics are least preferred. A supply of nitrogen, phosphorus, and oxygen is needed. In areas where oxygen concentrations are low, biodegradation is a slow, long-term process.

Oil spilled on the water's surface would initially spread under gravitational, viscosity, and surface-tension forces. The rate of spreading because of these forces would be a function of the initial chemical characteristics of the oil and the physical characteristics of the slick, e.g., viscosity, specific gravity, slick thickness, and so forth. The rate would also vary with time as weathering or degradative processes act on the spilled oil. In addition, surface currents and surface winds would transport the slick away from its point of origin.

The broad geographical distribution of possible spill sites creates a wide range of oil spill situations. Many of these may be mitigated by oil spill response efforts (example in the Mississippi River, or Gulf of Mexico). Spills occurring in swamp forests or marsh land would be difficult to control, however.

Two potentially significant impacts of oil spills on water resources would be the potential for buildup of toxic fractions and depletion of oxygen levels in shallow, poorly flushed water bodies. The most likely location of such impacts would be in swamp forests along the pipeline route to St. James and in marshes located along the lower Mississippi River Delta (including the vicinity of Pass a'Loutre and Delta Wildlife Refuges). Most of the spills would occur in the Mississippi River or from diked areas at the terminals.

Oil spills reaching the Mississippi River or the open Gulf should not have significant impacts on water quality because of the potential for dilution and for oil recovery. Oil which sinks to the bottom or is deposited on the riverbank or shoreline may provide a local source of petroleum hydrocarbons to the water column for several weeks or even months, however.

Oil spills occurring anywhere on land outside diked areas or in the major streams could affect human use of water (industrial, domestic, or recreational).

Should a subsurface spill occur, either from a defective well casing or collapse of a storage cavity, then oil would tend to collect at the water table and migrate laterally along the water surface. Crude oil tends to migrate very slowly through subsurface formations, and then only under pressure. However, some components of the oil, particularly the lighter aromatic hydrocarbons might be sufficiently soluble to impart an objectionable taste and odor to the water.

The impacts to biota due to normal operations of the storage sites are expected to be rather small. Even in the case of occasional small oil spills, impacts are not expected to be widespread or serious. Cumulative spill effects due to development of the full capacity of the Capline Group may be locally significant, especially at inshore transfer sites.

The type of exposure to be expected differs in accordance with the mode of transport and handling. Tanker and barge casualty spills may be quite large but are relatively infrequent. If a large spill reaches the marshes of the lower Mississippi River Delta, impacts could be severe but the chance of such an event is fairly low.

A pipeline spill would likely have the most intensive, localized biological impact. The recurrence interval of an oil spill greater than 1000 gallons, even with oil left in the line during standby storage is 27 years so that it is likely that no large spills would occur during the lifetime of the SPR project.

The small spills accompanying oil transfer operations constitute the vast majority of all spills expected from the SPR program. With appropriate deployment of booms and other oil recovery equipment, effects should be very localized.

Several scenarios may be described to evaluate potential effects of maximum credible spills for various oil spill modes. The bases of selected maximum credible spill sizes are provided in Appendix E. Ecological impacts are quantified on the basis of acres expected to be severly impacted using 25 barrels per acre of fresh crude causing 100 percent loss of vegetation for a period of at least two years in wetlands. In open water bodies, it has been estimated that, on the basis of a damage threshold of 10 ppm hydrocarbon, a contamination of 6 barrels per acre could cause total loss of productivity in shallow waters (2 to 4 feet deep) for periods of two weeks to several months, depending on water circulation and species affected.

Using the above oil spill damage parameters as indicators, the following impacts may be estimated. For a tanker accident of 60,000 barrels, a possible marsh impact on 1680 acres or a shallow water impact on 7000 acres might result. Avifauna, fur animal, and shellfish impacts could be severe in the lower Mississippi River Delta marshes.

For an oil transfer accident of 500 barrels at the tanker docks, a possible marsh impact on 14 acres (highly unlikely) or a shallow water impact on 60 acres might result. Avifauna, fur animal, and shellfish impacts should be small because of the industrial nature and rapid dilution of the Mississippi River.

For a pipeline spill of 10,000 barrels, assuming 20 percent lost to evaporation and none recovered, a possible wetland impact of 320 acres or a shallow water impact of 1340 acres might result. The swamp forests at Napoleonville and west of St. James are potentially vulnerable.

A 30,000 barrel spill of brine from the brine injection system would have serious biological impact. No comparable damage parameters are available to estimate acreage impacts. However, 30,000 barrels is approximately 4 acre- feet of brine. Assuming uniform mixing, it would take several hundred acre-feet of fresh water to dilute the brine a few ppt, a reasonable threshold for measurable salinity effects.

In summary, it may be concluded that the very low frequency of oil and brine spills indicates that chronic biological impacts should generally not be experienced. Very large spills are fairly improbable and represent a small likelihood of regionally significant adverse impact, but the potential for such impact is fairly large depending on spill location. Except for the case of a large spill in the Gulf or lower Mississippi River being transported to nearshore waters and coastal bays prior to recovery, adverse impacts should not be of regional significance.

### 4.2.3 Brine Spill Impacts

A summary of brine spill risk expectations for the candidate SPR sites is provided in tables in Sections 4.4 through 4.8, and in Section C.2 of Appendix C for leaching, oil fill, oil withdrawal, and standby storage. Brine spill exposures occur from pipelines during leaching, oil withdrawal, and standby storage. Brine spill exposure is greatest during cavern fill; fresh water spill exposure is greatest during standby storage because of the assumed continuous exposure. Brine spills could occur from the brine disposal pipeline and from the brine reservoir. A thorough description of possible modes of spills, methodologies of spill calculations quantification of expected spill volumes and frequencies, spill dispersion characteristics, and spill prevention and control measures is provided in Appendix E. Possible effects on water resources are considered with each possible development alternative (Section 4.4 through 4.8).

Spills of brine have less potential for adverse effects on water quality than do oil spills because of the limited spill potential. Except for a very large brine spill, normal flushing of local water bodies would quickly dilute salt concentrations to normal levels, resulting in very temporary water quality degradation. Flushing is not as effective in shallow water bodies or in the swamp forest, however; salinity excesses would continue for several days or weeks and may remain in the substrate.

## 4.3 CAPLINE GROUP SPR OIL DISTRIBUTION - TERMINAL SYSTEMS

### 4.3.1 Introduction

As discussed in Section 2.3.1.1, two possible combinations of terminal systems would provide the distribution facilities needed for the 300 MMB development of the Capline Group. These combinations are shown below:

MAJOR COMPONENTS OF THE CAPLINE GROUP SPR OIL DISTRIBUTION TERMINAL SYSTEMS

| Terminal System | Docks | Oil Surge Tanks | Pipelines |
|---|---|---|---|
| DOE | 1-Described in Weeks Island FES Supplement | 4-200,000 bbl Described in Weeks Island FES Supplement | None |
| | 1-Described in Bayou Choctaw FES | 4-200,000 bbl Described in Bayou Choctaw FES Supplement | |
| | | 4-200,000 bbl | |
| Koch | 1-New @ Koch on east bank | 3-500,000 bbl on west bank | 3.2 mi. from dock on east bank to oil surge tank on west bank |
| | 1-Part-time use of existing @ Koch on west bank | | |
| DOE | 1-Described in Weeks Island Early Storage FES | 4-200,000 bbl Described in Weeks Island FES | None |
| | 1-Described in Bayou Choctaw Early Storage FES Supplement | 4-200,000 bbl Described in Bayou Choctaw FES Supplement | |
| | | 4-200,000 bbl | |
| Nordix | 1-New @ Nordix | 10-150,000 bbl | 7.0 mi. from Nordix to Bayou Choctaw-St. James Pipeline or an alternative 10.0-mile pipeline to the same areas |
| | 1-Part-time use of existing @ Nordix on east bank | | |

The DOE/Koch terminal system combination would utilize both new and proposed industry and DOE facilities at St. James. With this combination, new impacts to be considered would relate to construction of four additional 200,000 barrel tanks at the DOE tank farm and construction of a new Koch dock, three 500,000 barrel tanks and 3.2 miles of pipeline from the new dock on the east bank of the Mississippi River to the oil surge tanks at the Koch terminal on the west bank.

The DOE/Nordix combination would use existing DOE facilities at St. James and would require construction there of four additional 200,000 barrel tanks. Nordix facilities which would be constructed include a new dock, up to ten 150,000 barrel tanks and a 7.0 mile pipeline crossing the Mississippi River to connect with the Bayou Choctaw - St. James pipeline. An alternative 10-mile pipeline could be constructed connecting the same areas.

The new impacts to be considered, therefore, relate to seven possible facilities: the new Koch dock on the east bank, the three 500,000 bbl Koch tanks on the west bank, the 3.2 mile long connecting pipeline, the four new 200,000 bbl DOE tanks at St. James, the new Nordix dock on the east bank, the ten 150,000 bbl Nordix tanks on the east bank, the 7.0-mile long connecting pipeline, and the alternative 10-mile long pipeline.

The following sections detail the expected and potential environmental impacts associated with the new components of each of the two terminal systems combinations. These impacts are addressed as site preparation and construction phase impacts (Section 4.3.2) and operational impacts (Section 4.3.3). These impacts are summarized in Section 4.3.4.

### 4.3.2 Impacts From Site Preparation and Construction

#### 4.3.2.1 Land Features

Construction at the Koch terminal would require the regrading of approximately 27 acres at the Koch tank farm on the west bank of the Mississippi River for the three 500,000 barrel oil surge tanks. Pipeline construction across the Mississippi River would require the dredging of 745,000 cy. Laying of a 3.2 mile pipeline connecting those two components would require approximately 35 acres, and involve 25 acres of construction on cleared lands and 10 acres of construction in the Mississippi River.

New facilities at the Nordix terminal would require regrading of 37 acres for construction of ten 150,000 barrel oil surge tanks. Containment dikes for the tanks would include 82,000 cy of earth fill. Dock construction would occur over 10 acres and require approximately 95,000 cy of dredging. Laying of a 7.0 mile pipeline connection would involve 76 acres on land and 16 acres in the Mississippi River. Pipeline excavation would total 703,000 cy, including 650,000 cy for the river crossing. The alternative 10-mile pipeline would involve 95 acres on land and 1 acre crossing open water. Since a pipeline already crosses the Mississippi River and would be utilized as part of the pipeline, the Mississippi River would not be directly impacted. Pipeline excavation would total 27,400 cy.

Construction at the DOE terminal would require the regrading of approximately 36 acres at the DOE tank farm at St. James for the four 200,000 barrel oil surge tanks. This terminal expansion would require 112,000 cubic yards of fill.

#### 4.3.2.2 Water Resources

Construction of the Koch terminal system, by the Koch Oil Company, would require 15,000 cy of excavation and 745,000 cy of dredging, and involve 57 acres of direct land disturbance. Construction of the pipeline connecting the dock and the oil surge tanks would occur both on dry land and in the Mississippi River. There would be, however, a minimal amount of on-land earth movement; the construction of the dry land portion of the pipeline and the three 500,000 barrel oil surge tanks requires 15,000 cy of excavation. The use of standard engineering practices, such as interceptor ditches, dikes, and sedimentation ponds, would assure the prevention of any significant water quality degradation.

Impacts on water quality would result from dredging of 745,000 cubic yards from the dock site and from laying the pipeline. Most of these impacts on water quality would be locally significant but of short-term duration. These impacts would include increases in turbidity and the release of toxic substances from bottom sediments.

Construction of the Nordix terminal system by Nordix, Inc. would require 53,000 cy of on land excavation and 745,000 cy of dredging and excavation in the Mississippi River, and involve 123 acres of direct land disturbance. Impacts on water quality would be similar to those discussed above for the Koch terminal and would be locally significant but of short-term duration.

Construction of the Nordix terminal and alternative 10-mile pipeline would have excavation of 123,300 cy but would not involve any dredging. Very minor impacts on water quality would result from the excavation on land.

Development of the DOE terminal expansion would have minimal impacts on water quality. Construction of four 200,000 barrel oil surge tanks would involve 112,000 cubic yards of fill and directly impact 36 acres of land. These construction activities would introduce minor quantities of sediment into local surface waters.

#### 4.3.2.3 Air Quality

The quality of air in the vicinity of the terminal facilities to be constructed in the St. James and Sunshine areas would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. The principal pollutant of concern would be hydrocarbon emissions from construction equipment and tank painting. Expected emissions and air quality impacts are detailed in Section C.3.2.3 of Appendix C.

#### 4.3.2.4 Noise

Noise impacts related to proposed construction are minor and of short duration. The major noise producing equipment used during construction of the docks at the Koch and Nordix terminals would be one or two pile drivers and trucks. The oil surge tanks would be prefabricated with sections welded at the site. A concrete footing would be poured to support the tanks.

The impact zone radii, the distance within which sound levels would be raised by 3 dB or more, has been estimated to be 2500 feet for dock construction, 1800 feet for pipeline construction and about 1600 feet for tank construction. Up to 25 residences would be within these impact zone radii at Koch and 30 residences at Nordix.

The four 200,000 bbl tanks to be constructed by the DOE would require a concrete footing and be welded, like the tanks at the Koch facility, at the site. Impact radius is estimated to be 1600 feet.

4.3.2.5 Ecosystems and Species

Construction at the Koch terminal would involve several impacts on the biota of the area including loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects due to forced migration, increased noise, and human disturbance. The regrading of approximately 57 acres on land would severely impact any small invertebrates in the surface vegetation and topsoil. The effects of migration of higher animal forms would be dependent on the availability of space, protective cover, food, and the status of existing animal populations. Noise and human disturbance during construction would discourage wildlife within the area. Upon completion of construction activities, some wildlife species are likely to return to the impacted area.

The effects of pipeline construction on wildlife in cleared land habitats are expected to be minor and short term. Most of the wildlife species found in cleared lands are able to survive despite fluctuating conditions and altered habitats. Some loss of the less mobile species is expected during construction. The loss of habitat and the species supported by the habitat would probably last 6 months to 1 year in pasture and old field areas. Other areas (urban and industrial) would require less recovery time.

Additional impacts on 10 acres of aquatic environment would be caused by dredging approximately 745,000 cy at the dock site and by construction of the pipeline across the Mississippi River. Much of the spoil would be placed in a designated area of the river having water depths greater that 50 feet. Associated effects on benthos and organisms in the water column due to turbidity, siltation, and smothering would be locally severe. In relation to the amount of dredging activity presently occurring in the Mississippi River and the amount of silt transported by the river naturally, the degree of this impact would be small.

Expansion of the Nordix terminal would impact biota within the 139 acres of land directly disturbed by the construction of the dock, oil surge tanks and pipeline. Regrading of 123 acres on land would severely impact small invertebrates in the surface vegetation and topsoil. Higher animal forms would also be affected, as discussed above for the Koch terminal. Loss of habitat and resources provided by the habitat would last 6 months to 1 year in agricultural areas; less recovery time would be required in previously industrialized land.

Excavation and dredging in the Mississippi River of approximately 745,000 cy over 16 acres would severely impact local benthos and organisms in the water column. An additional 50 acres in the spoil disposal area would also be impacted, but to a lesser degree. Both impacts would be small compared to other Mississippi River dredging and silting activity. For the 10-mile alternative pipeline from the Nordix terminal, the impacts would be similar to those stated above minus the adverse impacts on aquatic life associated with dredging for the pipeline.

The development of the DOE terminal expansion would cause several impacts on the biota of this area from the construction of four 200,000 barrel oil surge tanks as a component of the DOE terminal system at St. James, Louisiana. Approximately 36 acres of cleared land would be regraded for the construction of the tanks. This would severely impact any small invertebrates in the surface vegetation and topsoil.

#### 4.3.2.6 Natural and Scenic Resources

Construction of the components of the terminal systems would not significantly affect any natural or scenic areas due to the extensive existing industrial development in the areas surrounding them.

#### 4.3.2.7 Archaeological, Historical and Cultural Resources

There should be no impact on archaeological, historical, or cultural resources resulting from that construction activity as the area has already experienced extensive industrial development.

#### 4.3.2.8 Socioeconomic Environment

Construction of the components of the Koch or Nordix terminals, as well as the four new 200,000 bbl DOE tanks, would not have a major effect on land use. About 216 acres on land in an area previously developed, would be required and would result in a semipermanent conversion to industrial use. Construction of the docks could impact transportation patterns in the vicinity of the site, as the road along the protective levee provides the only access. Barge and/or truck and employee traffic to locations on either bank of the river could cause congestion. Construction of pipelines under the Mississippi River may temporarily curtail or disrupt waterborne traffic. Minimal impacts on population and housing would occur, as the project would utilize local labor pools to the extent practicable. Construction activities would, similarly, provide a temporary stimulant to the local economy, to the extent that local goods and services are used. The removal of acreage from the tax rolls of St. James Parish is the principal impact on the Parish from DOE terminal construction activities. The income generated by construction activity should compensate this loss. No tax losses would result from construction of either the Koch or Nordix terminal. Little use of existing governmental services would be required. Construction of the alternative 10-mile pipeline would result in similar impacts as stated above, however, no interruption in waterborne traffic would be necessary since the pipeline crossing the Mississippi River already exists.

### 4.3.3 Impacts from Operation

Should an oil supply interruption occur while oil is stored in the Capline Group SPR sites, oil would be withdrawn for distribution to the CAPLINE Pipeline or to tankers via the terminal system combination selected for use. Up to five fill/withdrawal cycles have been assumed for the SPR program.

The following sections outline the expected and potential impacts resulting from operation of the terminal system combinations. These impacts reflect those arising from the use of the expanded tankage at the DOE terminal system at St. James in conjunction with either the Koch or Nordix terminal systems. The impacts from operation of the early storage components of the DOE terminal system are also given to provide a perspective on the total impacts of the program. Both the frequency and quantity of potential oil spillage and the quantity of hydrocarbons released to the atmosphere are largely determined by the quantity of crude oil throughput. As this quantity is dependent upon the development alternative and terminal system selected, the impacts of potential oils spills on water resources and hydrocarbon emissions on air quality are presented to reflect those differences. In subject areas where the expected or potential development alternative is not a variable, the environmental impact of the terminal system is presented.

#### 4.3.3.1 Land Features and Geologic Impacts

Effects of operation of either the DOE/Koch or DOE/Nordix terminal system combination on land features are expected to be minimal. No significant disturbance of soils is anticipated after construction is completed. Soils will stabilize soon after they are revegetated. All terminals are seismically located in an area identified as Zone 1, that is with an expectation of minor earthquake damage.

#### 4.3.3.2 Water Resources

The principal potential impact on water resources resulting from operation of either of the two terminal system combinations would be the possibility of oil spills, which would primarily occur during oil transfer operations. The location of these spills would be in the Gulf of Mexico, in the Mississippi River, and from the oil surge tanks at the terminal systems. Quantities of oil expected to be released from all components of the Capline Group SPR program are listed by source and location in tables in Sections 4.4 through 4.7. This section will address only those oil spills attributable to terminal system operation.

Normal operation of the DOE/Koch terminal system combination would involve up to five fill and withdrawal cycles of the stored oil. Because exposures at these two terminal systems are similar, the expected frequency and volume of oil spills is basically a function of the site storage capacity. The frequency and volume of spills will vary for the proposed development (333 MMB) and the alternative groupings (274 MMB to 383 MMB). The DOE/Koch terminal facilities are adjacent to each other on the Mississippi River, therefore, no allowance is necessary for stream mileage for tanker transport as discussed below with the other terminal combination. Total oil spillage projected for the DOE/Koch terminal system combination, when used in conjunction with the proposed development (early storage sites plus Napoleonville) and for the other development alternatives is shown in the table below. The maximum credible spill events are estimated to be 60,000 barrels resulting from a tanker collision in the Mississippi River, 5000 barrels from the terminal systems, and 500 barrels from terminal system transfer operations.

DOE/Koch Terminal System Combination

| | Proposed Development | Alternative Grouping No. 1 | Alternative Grouping No. 2 | Alternative Grouping No. 3 |
|---|---|---|---|---|
| Total Projected Oil Spills (bbls) | 15,794 | 13,476 | 13,772 | 18,001 |
| Percent During Fill | 76 | 72 | 76 | 76 |
| Percent During Withdrawal | 24 | 28 | 24 | 24 |

Two potentially significant impacts of oil spills on water resources would be the potential for buildup of toxic fractions and depletion of oxygen levels in shallow, poorly flushed water bodies, as discussed in Section 4.2.2. Oil spills at the terminal (from the surge tanks) would be controlled onsite. Spills at the docks, or from pipeline ruptures, would enter the Mississippi River where, as soon as oil is released, weathering of the oil would begin. The major weathering processes are evaporation, dissolution, emulsification, sedimentation, biological degradation, and chemical oxidation. (See Section 4.2.2.)

The impacts on water resources of an oil spill from the DOE/Nordix terminal system combination would be very similar to those described for the DOE/Koch terminal system combination. While the potential exists for relatively frequent and possible large crude oil spills, calculations of spill probability and the nature of the local water bodies indicate that significant impacts on water resources should be very infrequent. The increased spill projection for the DOE/Nordix combination results from the location of the Nordix terminal 45 miles further up the Mississippi River from the Koch terminal, presenting a greater exposure to oil spills.

The total oil spillage resulting from normal operation of the DOE/Nordix terminal system is tabulated below:

| DOE/Koch Terminal System Combination | Proposed Development | Alternative Grouping No. 1 | Alternative Grouping No. 2 | Alternative Grouping No. 3 |
|---|---|---|---|---|
| Total Projected Oil Spills (bbls) | 16,778 | 14,196 | 14,506 | 19,129 |
| Percent During Fill | 76 | 72 | 75 | 75 |
| Percent During Withdrawal | 24 | 28 | 25 | 25 |

4.3.3.3 Air Quality

Strategic petroleum reserves are planned to minimize the effects of oil supply interruption. For worst case anaylsis, it has been assumed that five fill/withdrawal cycles would occur over the life of the project. However, it is unlikely that multiple cycles would occur and, therefore, the intermittent and infrequent withdrawal would result in substantially less air quality impact than as presented in the following sections. Variations in the oil movement assumptions with regards to terminal usage would result in changes in the emissions totals that would be within the accuracy of the emission factors used.

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. Data presented in Section 3.2.3 indicate that non-methane hydrocarbon concentrations in the area frequently exceed the national and state standard of 160 $\mu g/m^3$ (3-hour average, 6-9 a.m.). Hydrogen sulfide losses are expected to be minimal since most of the crude oil that is expected to be stored in the Capline system would have weathered sufficently during overseas transit to essentially eliminate the $H_2S$ component.

4.3.3.3.1 Proposed Development - Early Storage Sites Plus Napoleonville

The quality of air during operation would be affected by the following pollution sources:

- o Fugitive Dust
- o Valves, Seals, and Gauges
- o Crude Oil Storage Tanks
- o Tanker and Barge Loading and Unloading Operations

Most fugitive dust emissions during facility operation would be due to general service vehicle travel over unpaved roads. Assuming an average vehicle speed of 40 miles per hour and a road surface silt content of 30 percent, the estimated dust emissions is 0.24 pounds per mile of unpaved road traveled (EPA, 1976e).

There would be a wide variety of valves, seals, and gauges associated with the pumping of crude oil through the pipelines between the terminal facilities and the storage cavities. The small leakage that may occur would be tightly controlled in accordance with standard practice and thus of little consequence. It is estimated that these losses would be less than 5 tons/year during each fill or withdrawal cycle.

Estimated hydrocarbon losses from the crude oil storage tanks and tanker/barge operations over an assumed 22-year period of operation (1979-2000) are presented in Table 4.3-1a for the two maximum terminal combinations. Emissions factors and calculation methodologies utilized are presented in Appendices C and I.

Estimated average storage loss at the DOE, Koch and Nordix tank farms are 54, 21 and 39 tons/year respectively, assuming the total number of crude oil storage tanks at each location are in use continuously. If complete withdrawal occurs during the year, the expected emissions at each location would increase about 60 percent due to elevated crude oil temperatures. (Elevated crude oil temperatures are expected to result from long-term storage in salt domes at temperatures of up to 150$^{o}$F; Appendix J describes how the crude oil temperature will change as it moves to the storage tanks.)

TABLE 4.3-1a Estimated hydrocarbon emissions[a] (tons) at terminal facilities accompanying the transport of oil for the proposed development[b], over the life of the project and assuming five fill/withdrawal cycles.

| Location | Tankers/Barges Fills (5) | Tankers/Barges Withdrawals (5) | Storage Tanks[c] | 150 MMB Expansion Total | Early Storage Total |
|---|---|---|---|---|---|
| A. DOE AND KOCH TERMINALS | | | | | |
| Gulf of Mexico | 11,340 | 0 | 0 | 11,340 | (13,834) |
| Mississippi River[d] | 3,360 | 3,465 | 0 | 6,825 | (7,596) |
| Terminals | 6,615 | 4,600 | 986 | 12,201 | (15,544) |
| | 21,315 | 8,065 | 986 | 30,366 | (36,974) |
| B. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 11,340 | 0 | 0 | 11,340 | (13,834) |
| Mississippi River[d] | 3,832 | 3,938 | 0 | 7,770 | (7,596) |
| Terminals | 6,615 | 4,600 | 1,430 | 12,645 | (15,544) |
| | 21,787 | 8,538 | 1,430 | 31,755 | (36,974) |

[a] Average conditions assuming a Reid vapor pressure of 4 psia. During withdrawal operations, the crude oil at the terminal is assumed to be at 120° F (except that crude stored at Weeks Island is 100° F).

[b] The emissions in this table are for expansion at Napoleonville with the total emissions for early storage at Bayou Choctaw and at Weeks Island given in brackets for comparison.

[c] Storage tank losses estimated to occur continuously for a 22-year period.

[d] Transit emissions, most of which occur along the Mississippi River.

Tanker emissions are substantially larger for oil fill than for withdrawal. Two factors are responsible; first, the substantial emissions accompanying VLCC-tanker transfer operations would only occur during fill; second, during withdrawal only 40 percent of the oil stored would be transported by tankers to the Gulf of Mexico. Therefore, the tanker loading and transit emissions would also be substantially reduced. These factors more than offset the increased emissions due to elevated crude oil temperature during withdrawal.

It should be noted that only 150 MMB of the 333 MMB maximum to be stored under this group alternative is related to SPR expansion. As much as 94 MMB to be stored at Bayou Choctaw and the 89 MMB to be stored at Weeks Island are part of the early storage program described in FES 76-5 and FES 76/77-8. The emissions for the 150 MMB expansion at Napoleonville in Table 4.3-1a represent only about 45 and 46 percent of the total emissions expected for the DOE/Koch and DOE/Nordix terminal combinations, respectively. The emissions related to the early storage program are given in brackets in the table.

The environmental impact of the computed emissions is dependent on the ambient air quality and the dispersal characteristics of the atmosphere (Section 4.2.3). Downwind centerline ground-level concentrations were calculated using the model described in Appendix I. Estimates were made using maximum emission rates and atmospheric conditions corresponding to worst case conditions ("D" stability and a wind speed of 1 meter per second (mps), except 2 mps in the Gulf). These estimates apply to both the SPR expansion at Napoleonville and the early storage phase. Expansion, in most cases, increases the likely frequency and duration of maximum emission rates.

Fugitive dust raised by general service vehicles over unpaved roads would cause less impact than during the construction phase where it was estimated to be small (Section 4.3.2.3).

The minimal HC losses from the crude oil pipelines (valves, seals, and gauges) are assumed to be continuous during the project lifetime since the pipelines would be kept filled and pressurized at all times. Since this leakage occurs over a large area, it would cause little impact on ambient air quality.

Hydrocarbon concentrations from standing storage tank losses are based on the assumption that the total storage tanks available at each tank farm would be in use at one time. Estimated "worst case" HC concentrations for each tank farm, corrected to a 3-hour average are as follows:

| Tank Farm | Total Tanks Available (bbl) | Maximum Emission Rate (g/s) | Downwind Concentrations ($\mu g/m^3$) | | | |
|---|---|---|---|---|---|---|
| | | | 2 km | 5 km | 10 km | Baton Rouge |
| DOE | 12-200,000 | 4.8 | 65 | 22 | 9 | 1 |
| Koch | 3-500,000 | 1.9 | 33 | 10 | 4 | 1 |
| Nordix | 10-150,000 | 3.5 | 58 | 18 | 7 | 4 |

These values are all well below the 3-hour standard of 160 $\mu g/m^3$. However, since the 3-hour HC standard is often exceeded in southern Louisiana, emissions from the storage tanks may cause infrequent additional exceedances nearby (less than 5 km downwind, generally. Baton Rouge is approximately 15 km (9 miles) north of Nordix and 50 km (31 miles) north of St. James.

Although vapor emissions from ship loading and unloading activities are not regulated, downwind hydrocarbon concentrations were calculated to provide an indication of the periodically high levels that may occur. Calculations of HC concentrations from maximum tanker operations (VLCC transfer to two tankers in the Gulf at 100,000 B/H during fill and loading two tankers simultaneously at the terminal docks at 55,200 B/H during withdrawal) were made using the conservative assumption that the emissions at each location are point source releases at ground-level. Estimated maximum downwind distances over which 3-hour hydrocarbon concentrations would exceed 160 $\mu g/m^3$ are as follows:

| Location | Maximum Emission Rate (g/s) | Maximum Downwind Distance (km) 3-Hour Concentration Exceeds 160 $\mu g/m^3$ |
|---|---|---|
| Gulf of Mexico (19 km offshore) | 789 | 34 |
| Terminal Location | 307 | 27 |

During fill, the maximum downwind distance with concentrations exceeding 160 $\mu g/m^3$ (3-hour average) is 34 km (21 miles) but much of this distance is over water. During peak withdrawal operations (2 tankers loading simultaneously) at a terminal location under unfavorable dispersion conditions, excessive hydrocarbon concentrations can be expected as far as 27 km (17 miles) downwind. This includes the Baton Rouge industrial complex for the Nordix terminal operation. During more normal dispersion conditions, downwind concentrations would be less than 20 percent of those during "worst case" conditions (and less than 5 percent of maximum concentrations at the terminals during cavern fill).

Emission sources in close proximity to each other (i.e., DOE and Koch) would contribute to a cumulative effect on existing background HC concentrations. During maximum usage of the DOE and Koch terminal docks, considerable interaction would be expected to occur under certain meteorological conditions (negligible interaction would occur for the DOE/Nordix terminal combination). The maximum tanker transfer case is assumed to be two tankers loading at the DOE docks at the same time a third tanker is loading at the nearest Koch dock, approximately 1.6 km (1 mile) away. Using a peak HC emission rate of 153.5 g/sec from each of the three docks, the maximum downwind distance with concentrations exceeding 160 $\mu g/m^3$ is estimated to be 37 km (23 miles), compared to 27 km (17 miles) for each terminal location alone. However, this interaction would occur very infrequently.

SUMMARY OF IMPACTS AT BATON ROUGE

Baton Rouge, the major industrialized, populated region proximal to the SPR terminals, is presently a non-attainment area for photochemical oxidants. Since hydrocarbon emissions are widely accepted as precursors to oxidant formation, impacts at Baton Rouge from operation of the terminal facilities at Nordix and St. James were addressed. Furthermore, existing hydrocarbon levels are known to high in southeastern Louisiana (Section B.2.3.3.2).

Generally, the DOE/Nordix combination would have a more significant impact upon Baton Rouge since Nordix is only about 15 km (9 miles) south. Effects during static storage (no oil movement) would have little impact upon Baton Rouge. For the DOE/Nordix combination, concentrations greater than 160 $\mu g/m^3$ would be expected at Baton Rouge from transfer operations during withdrawal under "worst case" assumptions. However, these levels would be expected to occur very infrequently. During more normal conditions, concentrations would be about 20 percent of maximum expected levels during withdrawal, but only 5 percent f maximum levels during fill. As previously indicated, it is highl unlikely that multiple withdrawals would occur. Therefore, transfer emissions would be intermittent and infrequent and the peak emission rate used in modelling would only occur during a national emergency.

In conclusion, significant impacts at Baton Rouge due to the DOE Koch combination should be very infrequent. Although significant impacts at Baton Rouge due to the DOE/Nordix combination are more likely, they would be limited primarily to withdrawal operations during poor dispersion conditions.

4.3.3.3.2 <u>Alternate Grouping No. 1 (Early Storage Sites Plus Expansion of Weeks Island)</u>

Generally, the emission sources and air quality impacts during operation of the proposed alternative would be similar to those described in Section 4.3.3.3.1 for development of Napoleonville. However, since expansion capacity at Weeks Island would be 91 MMB compared to 150 MMB storage capacity at Napoleonville, the transfer and transit hydrocarbon emissions over the assumed 22-year period of operation would be substantially less as indicated in Table 4.3-1b.

Maximum HC emissions during fill and withdrawal operations are as previously given in Section 4.3.3.3.1 since peak transfer rates and maximum use of storage tanks are assumed for the purpose of calculating "worst case" downwind concentrations. It was concluded in Section 4.3.3.3.1 that storage tank emissions may cause infrequent additional exceedances of the 3-hour HC standard nearby (less than 5 km downwind, generally). For two tankers loading simultaneously, HC concentrations in excess of 160 $\mu g/m^3$ would be expected up to 27 km (17 miles) downwind of each terminal location.

TABLE 4.3-1b Estimated hydrocarbon emissions[a] (tons) at terminal facilities accompanying the transport of oil for development of alternative # 1[b], over the life of the project assuming 5 fill/withdrawal cycles.

| Location | Tankers/Barges Fills (5) | Tankers/Barges Withdrawals (5) | Storage Tanks[c] | 91 MMB Expansion Total | Early Storage Total |
|---|---|---|---|---|---|
| A. DOE AND KOCH TERMINALS | | | | | |
| Gulf of Mexico | 6,880 | 0 | 0 | 6,880 | (13,834) |
| Mississippi River[d] | 2,040 | 1,486 | 0 | 3,526 | (7,596) |
| Terminals | 4,013 | 2,408 | 906 | 7,327 | (15,544) |
| Total | 12,933 | 3,894 | 906 | 17,733 | (36,974) |
| B. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 6,880 | 0 | 0 | 6,880 | (13,834) |
| Mississippi River[d] | 2,327 | 1,689 | 0 | 4,016 | (7,596) |
| Terminals | 4,013 | 1,486 | 1,315 | 6,814 | (15,544) |
| Total | 13,220 | 3,175 | 1,315 | 17,710 | (36,974) |

[a] Average conditions assuming a Reid vapor pressure of 4 psia. During withdrawal operations, the crude oil at the terminal is assumed to be at 120° F (except that crude stored at Weeks Island is 100° F).

[b] The emissions in this table are for expansion at Weeks Island with the total emissions for early storage at Bayou Choctaw and at Weeks Island given in brackets for comparison.

[c] Storage tank losses estimated to occur continuously for a 22-year period.

[d] Transit emissions, most of which occur along the Mississippi River.

Comments on emission source interaction and impacts at Baton Rouge in Section 4.3.3.3.1 also apply to the Weeks Island expansion.

#### 4.3.3.3.3 Alternate Grouping No. 2 - Early Storage Sites Plus Bayou Choctaw Expansion and Iberia

The emission sources and air quality impacts during operation of the proposed alternative would be similar to those described in Section 4.3.3.3.1 for development of Napoleonville. However, since expansion capacity at Bayou Choctaw plus Iberia would be 106 MMB compared to 150 MMB storage capacity at Napoleonville, the transfer and transit hydrocarbon emissions over the assumed 22-year period of operation would be substantially less (Table 4.3-1c).

Maximum HC emissions during fill and withdrawal operations are as previously given in Section 4.3.3.3.1. Comments on emission source interaction and impacts at Baton Rouge in Section 4.3.3.3.1 also apply to the Bayou Choctaw expansion plus Iberia.

#### 4.3.3.3.4 Alternative Grouping No. 3 (Early Storage Sites Plus Chacahoula)

Generally, the emission sources and air quality impacts during operation of the proposed alternative would be similar to those described in Section 4.3.3.3.1 for development of Napoleonville. However, since expansion capacity at Chacahoula would be 200 MMB compared to 150 MMB storage capacity at Napoleonville, the transfer and transit hydrocarbon emissions over the assumed 22-year period of operation would be subtantially more as indicated in Table 4.3-1d.

Maximum HC emissions during fill and withdrawal operations are as previously given in Section 4.3.3.3.1. Comments on emission source interaction and impacts at Baton Rouge in Section 4.3.3.3.1 also apply to the Chacahoula alternative.

### 4.3.3.4 Noise

Operation of either the DOE/Koch or DOE/Nordix terminal system combination would have no significant noise impact during either fill or withdrawal activities. During a fill cycle, oil would arrive at the docks in tankers. The noise produced by the tankers would be of short

TABLE 4.3-1c Estimated hydrocarbon emissions[a] (tons) at terminal facilities accompanying the transport of oil for development of alternative #2[b], over the life of the project assuming 5 fill/withdrawal cycles.

| Location | Tankers/Barges Fills (5) | Tankers/Barges Withdrawals (5) | Storage Tanks[c] | 106 MMB Expansion Total | Early Storage Total |
|---|---|---|---|---|---|
| A. DOE AND KOCH TERMINALS | | | | | |
| Gulf of Mexico | 8,014 | 0 | 0 | 8,014 | (13,834) |
| Mississippi River[d] | 2,379 | 2,449 | 0 | 4,828 | (7,596) |
| Terminals | 4,675 | 3,250 | 964 | 8,889 | (15,544) |
| Total | 15,068 | 5,699 | 964 | 21,731 | (36,974) |
| B. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 8,014 | 0 | 0 | 8,014 | (13,834) |
| Mississippi River[d] | 2,714 | 2,783 | 0 | 5,497 | (7,596) |
| Terminals | 4,675 | 3,250 | 1,398 | 9,323 | (15,544) |
| Total | 15,403 | 6,033 | 1,398 | 22,834 | (36,974) |

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[a] Average conditions assuming a Reid vapor pressure of 4 psia. During withdrawal operations, the crude oil at the terminal is assumed to be at 120° F (except that crude stored at Weeks Island is 100° F).

[b] The emissions in this table are for expansion at Bayou Choctaw and Iberia with the total emissions for early storage at Bayou Choctaw and at Weeks Island given in brackets for comparison.

[c] Storage tank losses estimated to occur continuously for a 22-year period.

[d] Transit emissions, most of which occur along the Mississippi River.

TABLE 4.3-1d Estimated hydrocarbon emissions[a] (tons) at terminal facilities accompanying the transport of oil for development of alternative #3[b], over the life of the project and assuming five fill/withdrawal cycles.

| Location | Tankers/Barges Fills (5) | Tankers/Barges Withdrawals (5) | Storage Tanks[c] | 200 MMB Expansion Total | Early Storage Total |
|---|---|---|---|---|---|
| A. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 15,120 | 0 | 0 | 15,120 | (13,834) |
| Mississippi River[d] | 4,482 | 4,620 | 0 | 9,102 | (7,596) |
| Terminals | 8,820 | 6,132 | 1,005 | 15,957 | (15,544) |
| Total | 28,422 | 10,752 | 1,005 | 40,179 | 36,974 |
| B. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 15,120 | 0 | 0 | 15,120 | (13,834) |
| Mississippi River[d] | 5,112 | 5,250 | 0 | 10,362 | (7,596) |
| Terminals | 8,820 | 6,132 | 1,458 | 16,410 | (15,544) |
| Total | 29,052 | 11,382 | 1,458 | 41,892 | (36,974) |

[a] Average conditions assuming a Reid vapor pressure of 4 psia. During withdrawal operations, the crude oil at the terminal is assumed to be at 120° F (except that crude stored at Weeks Island is 100° F).

[b] The emissions in this table are for expansion at Chacahoula with the total emissions for early storage at Bayou Choctaw and at Weeks Island given in brackets for comparison.

[c] Storage tank losses estimated to occur continuously for a 22-year period.

[d] Transit emissions, most of which occur along the Mississippi River.

duration, low frequency, and low intensity. The withdrawal cycle would involve the filling of tankers at the docks. Noise levels produced by the tankers, measured on land, would be negligible and of short duration.

#### 4.3.3.5 Ecosystems and Species

Normal operation of either the DOE/Koch or DOE/Nordix terminal system combination would have little additional impact on the ecological aspects of the sites. Marine transport operations could affect the marine life in the Mississippi River, since ship passages may cause increased turbidity and shoreline erosion. Existing turbidity levels in the river due to natural conditions, maintenance dredging, and existing ship traffic are high. Therefore, it is expected that impacts directly attributable to the tankers connected with the Capline Group SPR and early storage facility operations would be minor in comparison to the total impact from all ship traffic and dredging within the area.

Other operational impacts on the biological resources in the area would be principally related to the potential for oil spills as discussed in Section 4.2. Because of the design safeguards provided in the system and the relatively infrequent spill expectation, the potential biological impact from small, chronic spills is expected to be small. The oil surge tanks utilized in this terminal system combination would be diked to prevent escape of the oil in the event of a major spill. Tanker casualty spills may be quite large but are relatively infrequent. If a large spill reaches the marshes of the lower Mississippi River Delta, impacts could be severe but the chance of such an event is fairly low. Effects on marsh inhabitants, such as waterfowl and fur animals, in addition to primary productivity, could be severe. The small spills accompanying oil transfer operations constitute the vast majority of oil spills expected from the SPR program. With appropriate deployment of booms and other oil recovery equipment, effects should be localized.

#### 4.3.3.6 Natural and Scenic Resources

Normal operation of the DOE/Koch or DOE/Nordix terminal system combination is not anticipated to cause additional impacts on scenic, recreational, or natural resources. The one possible significant exception to this is the potential which does exist for oil spills during the transportation of oil. Possible effects include the oiling of marshlands in the lower Mississippi River Delta, which are important for waterfowl and fur production (e.g. Pass a Loutre State Waterfowl Management Area and Delta National Wildlife Area).

#### 4.3.3.7 Archaeological, Historical and Cultural Resources

Normal operation of either the DOE/Koch or DOE/Nordix terminal system combinations would have no further impact on any of these resources.

#### 4.3.3.8 Socioeconomic Environment

Operation of either the DOE/Koch or DOE/Nordix terminal system combination would have little impact on the socioeconomic environment. Primarily industrialized land would be utilized for terminal system components for the life of the project. Although tanker traffic on the Mississippi River would increase, particularly during fill and withdrawal operations, it is not expected that undue congestion or safety hazards would result. As only a small number of workers would be required at the terminal system during fill and withdrawal operations, and considering the availability of a large work force nearby, it is unlikely that any in-migration of workers or increase in housing demand would result. The operation activities would have an insignificant impact on the local economy, as total payroll and purchases are expected to be small in comparison to the economic activity in the area. No increased demand on governmental services is expected.

### 4.3.4 Summary of Adverse and Beneficial Impacts

Development and operation of the Capline Group oil distribution terminal systems would not be likely to generate significant regional environmental impacts except for the possibility of a major oil spill and the uncontrolled release of hydrocarbon vapors during oil transportation operations.

Tables 4.3-2 and 4.3-3 provide summary tabulations of the findings of the various discipline analyses of impacts of terminal system development and operation. The data provided are in both qualitative and quantitative form, as appropriate.

TABLE 4.3-2 Summary of environmental impacts caused by construction of terminal facilities for proposed or alternative Capline storage site groupings.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT - PROPOSED TERMINAL FACILITIES |
|---|---|---|
| Geology and Land Features | DOE terminal facility site and immediate vicinity (near St. James) | Site Preparation<br>112,000 cy of fill for oil surge tanks, access roads, and other surface facilities. Direct impacts on 36 acres. |
| | Koch terminal facility site and immediate vicinity (near St. James) | Site Preparation and Pipeline Connections<br>15,000 cy of excavation and 745,000 cy of dredging for pipelines, tanker dock and other surface facilities. Direct impacts on 57 acres. |
| | Nordix terminal facility site and immediate vicinity (near Sunshine) | Site Preparation and Pipeline Connections<br>82,000 cy of fill for oil surge tanks, 53,000 cy of excavation and 745,000 cy of dredging for pipelines, tanker dock and other surface facilities. Direct impacts on 139 acres. |
| | | Site Preparation and Alternative Pipeline<br>82,000 cy of fill for oil surge tanks, 123,300 cy of excavation and dredging for pipelines, surface facilities and tanker dock. Direct impacts on 96 acres. |
| Water Resources | Mississippi River | Koch Terminal Construction<br>Dredging of Mississippi River for dock and pipeline crossing near St. James would have locally significant, short-term impact. Pipeline and terminal construction would induce minor local increases in sediment in local tributaries.. |
| | | Nordix Terminal Construction<br>Dredging of Mississippi River for dock and pipeline crossing near Sunshine would have locally significant, short-term impact. Pipeline and terminal construction would induce minor local increases in sediment in local tributaries. |
| | | Nordix Terminal and Alternative Pipeline Construction<br>Some dredging of Mississippi River for dock near Sunshine would have locally significant, short term impact. Pipeline and terminal construction would induce minor local increases in sediment in local tributaries. |
| | | DOE Terminal Construction<br>Pipeline and terminal construction near St. James would induce minor local increases in sediment in local tributaries. |
| Air Quality | All terminal sites | Site Preparation and Painting<br>Minor quantitites of particulates - $SO_2$, CO, HC, and $NO_2$ released from construction equipment. Minimal effect. Short-term HC concentrations of up to 104 $\mu g/m^3$ at one kilometer downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 1 to 3 month period. |

TABLE 4.3-2 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT - PROPOSED TERMINAL FACILITIES |
|---|---|---|
| Noise Level | DOE terminal facility site vicinity (near St. James) | Site Preparation<br>Maximum zone of noise impact, 1600 feet; 10 to 15 residences may be affected. |
| | Koch terminal facility site vicinity (near St. James) | Site Preparation<br>Maximum zone of noise impact, 2500 feet; up to 25 residences may be affected. |
| | Nordix terminal facility site vicinity (near Sunshine) | Site Preparation and Proposed or Alternative Pipeline<br>Maximum zone of noise impact, 2500 feet; up to 30 residences may be affected. |
| Species and Ecosystems | Terrestrial: | |
| | Agricultural or Cleared Land | DOE terminal site preparation<br>Loss of 36 acres for terminal site construction. |
| | | Koch terminal site preparation<br>Loss of 57 acres for terminal site construction. |
| | | Nordix terminal site preparation<br>Loss of 68 acres for terminal site and pipeline construction. |
| | | Nordix terminal site and alternative pipeline preparation<br>Loss of 21 acres for construction. |
| | Bottomland Forest | Nordix terminal site perparation<br>Loss of 55 acres for terminal site and pipeline construction. |
| | | Nordix terminal site and alternative pipeline preparation<br>Loss of 74 acres for construction. |
| | Aquatic: | |
| | Mississippi River (and local tributaries) | DOE, Koch and Nordix terminal site preparation<br>Minimal local impacts due to erosion and runoff. |
| | | Koch and Nordix dock and pipeline construction<br>Significant, short-term impact due to dredging. (See water resources, above.) |
| | | Nordix dock and alternative pipeline<br>Minimal and local impacts due to erosion and runoff. Small, short term impact due to dredging for dock. |
| Natural and Scenic Resources | All Construction Areas | Locally significant impact due to construction of terminals. |
| Socioeconomic Conditions | Land Use | DOE terminal<br>Alteration of land use on a total of 36 acres in St. James parish. |
| | | Koch terminal<br>Alteration of land use on a total of 57 acres in St. James parish. |

TABLE 4.3-2 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT - PROPOSED TERMINAL FACILITIES |
|---|---|---|
| | | Nordix terminal<br>Alteration of land use on a total of 123 acres in Iberville parish. |
| | | Nordix terminal and alternative pipeline<br>Alternation of land use on a total of 95 acres in Iberville parish. |
| | Economy | DOE terminal<br>Construction wages approximately $0.6 million, much of which would be spent outside the local area. |
| | | Koch terminal<br>Construction wages approximately $1.3 million, much of which would be spent outside the local area. |
| | | Nordix terminal and proposed or alternative pipeline<br>Construction wages approximately $0.8 million, much of which would be spent outside the local area. |
| | Government | Possibly significant loss of property and severance tax revenues. |

TABLE 4.3-3 Summary of environmental impacts caused by operation of terminal facilities for proposed and alternative site groupings.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT - PROPOSED TERMINAL FACILITIES |
|---|---|---|
| Water Resources | Mississippi River | Oil Spills (all terminals)<br>Could have significant local impacts. |
| | Ground Water | Oil Spills (all terminals)<br>Very slight chances of local ground water pollution due to surface oil spill. |
| Air Quality | Terminal Sites, Mississippi River and Gulf of Mexico | Emissions from terminal, transfer, and transit<br>a) Proposed storage site grouping (Napoleonville dome, plus early storage at Weeks Island and Bayou Choctaw)<br>Total emissions from 330 MMB oil storage facility for 5 fill/withdrawal cycles range from approximately 67,300-68,700 tons; 46% due to the Napoleonville expansion. Distribution of emissions includes: 37% in the Gulf of Mexico, 22% in transit and at the docks, and 44% at the terminals.<br>b) Alternative storage site grouping No. 1 (Expansion of Weeks Island dome, plus early storage at Weeks Island and Bayou Choctaw)<br>Total emissions from 274 MMB oil storage facility for 5 fill/withdrawal cycles are approximately 54,700 tons; 32% due to the Weeks Island expansion. Distribution of emissions includes: 38% in the Gulf of Mexico, 20% in transit and at the docks, and 42% at the terminals.<br>c) Alternative storage site grouping No. 2 (Expansion of Bayou Choctaw plus Iberia dome, and early storage at Weeks Island and Bayou Choctaw)<br>Total emissions from 289 MMB oil storage facility for 5 fill/withdrawal cycles range from 58,700 - 59,800 tons; 38% due to the Bayou Choctaw expansion and Iberia. Distribution of emissions includes: 37% in the Gulf of Mexico, 21% in transit and at the docks, and 42% at the terminals.<br>d) Alternative storage site grouping No. 3 (Chacahoula dome plus early storage at Weeks Island and Bayou Choctaw)<br>Total emissions from 200 MMB oil storage facility for 5 fill/withdrawal cycles range from 77,200 - 78,900 tons; 53% due to the Chacahoula facilities. Distribution of emissions includes: 37% in the Gulf of Mexico, 22% in transit and at the docks, and 41% at the terminals. |

TABLE 4.3-3 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT - PROPOSED TERMINAL FACILITIES |
|---|---|---|
| Noise | All Terminal Sites and immediate vicinity | No significant increase in ambient sound levels on or adjacent to the terminal sites due to operation of terminals. |
| Species and Ecosystems | Terrestrial: | Oil Spills |
| | Agricultural or Cleared Land | Possible oil spills would have local, short-term adverse impacts. |
| | Aquatic: | Oil Spills |
| | Mississippi River | Potential oil spill impacts could be locally significant, especially at dock site and in lower delta. |
| | Gulf of Mexico | Expected oil spill volumes could significantly affect marine biota. Estimated total 1250 barrels of oil from all SPR operations in the Gulf during project lifetime.<br>Possibly very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. |
| Natural and Scenic Resources | | Oil Spills |
| | | Adverse impacts associated with possible large oil spill which could foul swamp forest and marshes and contaminate water with oil. |

## 4.4 PROPOSED DEVELOPMENT - EARLY STORAGE SITES PLUS NAPOLEONVILLE DOME

### 4.4.1. Group Discussion

This section summarizes the expected and potential environmental impacts associated with the proposed development of the Capline Group, that is, early phase development of Bayou Choctaw and Weeks Island storage sites, and development of additional storage at Napoleonville. A detailed discussion of the expected and possible impacts is presented in Section C.4 of Appendix C. Impacts associated with development and use of the Bayou Choctaw and Weeks Island early storage sites are treated in detail in previously published EISs and are summarized only briefly here. Impacts associated specifically with the Napoleonville site and with those significant cumulative impacts which are associated with full development of the Capline Group are discussed in Section 4.4.2. Impacts related to terminal facilities are described in Section 4.3. These impacts are summarized along with the pipeline and storage site impacts in Section 4.4.3 (Tables 4.4-1 through 4.4-5).

#### 4.4.1.1 Bayou Choctaw

Environmental impacts related to the development of Bayou Choctaw dome as an early storage site having a capacity of up to 94 MMB are discussed in Section 3.0 of FES 76-5 and its Supplement of May 1977. Construction impacts include those associated with the following activities:

- o onsite grading and construction of surface facilities;
- o construction of a 39 mile pipeline to the Mississippi River near St. James;
- o construction of a tanker dock/storage tank and associated terminal facilities at St. James.

Significant operation impacts would include:

- o Possible oil and brine spills;
- o Withdrawal of surface water for oil displacement;
- o Disposal of brine during oil fill;
- o Hydrocarbon emissions during oil transport and handling;
- o Maintenance clearing on project lands.

#### 4.4.1.2 Weeks Island

Development of Weeks Island dome as an early storage site having a capacity of 89 MMB will have anticipated environmental impacts as detailed in Section 4.0 of FES 76/77-8 and its Supplement of August 1977. Construction of proposed facilities would have impacts associated with the following activities:

- o temporary shutdown of Morton Salt Mine and loss of employment for local workers;
- o onsite grading and construction of surface facilities;
- o construction of a 64.4-mile pipeline to the Mississippi River near St. James;
- o construction of a tanker dock/storage tank, and associated terminal facilities at St. James.

Significant operational impacts would include:

- o possible oil spills;
- o hydrocarbon emissions during oil transport and handling;
- o maintenance clearing on project lands.

### 4.4.2 Impacts of Napoleonville Development

Development of 150 MMB storage facility at Napoleonville would have impacts similar in type to those at Bayou Choctaw. Facilities required for SPR site expansion are discussed in Section 2.3.2 . This section considers impacts associated with construction and operation of these new facilities and with expanded use of the early storage development terminal facilities. Particular attention is given to analyses of cumulative oil spill and air quality impacts which would be caused by the full 333 MMB Capline Group development. Details of impacts to be anticipated from proposed or alternative developments are presented in Section C.4.3 of Appendix C.

#### 4.4.2.1 Impacts of Site Preparation and Construction

Quantities of material to be excavated or filled and acreages of land to be affected by grading and other construction activities at the Napoleonville dome, along pipeline routes, and at the distribution terminal are listed in Table 2.4-1. A summary of the construction impacts is presented in Section 4.4.3.

#### 4.4.2.1.1 Land Features

Onsite grading at the Napoleonville site would be confined to about 63 acres of undisturbed areas within the 437-acre fenced area. Plant area construction would require 144,000 cy excavation and 261,000 cy of fill.

Offsite facilities would require the disturbance of 150 acres on land and 2 acres in open water, 200,000 cy of fill, and 480,000 cy excavation for grading and pipeline ROW. The brine disposal system affects 76 acres, while the raw water system requires 14 acres and the crude oil distribution system, 62 acres.

Offsite pipeline construction would temporarily disturb 140 acres of land and require 624,000 cubic yards of earth excavation and the brine disposal wellhead pads and pump station would require an additional 10 acres. Before revegetation of disturbed areas is complete, some erosion of the soil may be expected.

Leaching of 10 new storage cavities and expansion of up to 7 existing cavities in the Napoleonville salt dome would involve removal of about 120 MMB of salt by leaching for disposal in deep salt water bearing sands. Sufficient wall thickness would be maintained between cavities to maintain cavern integrity.

With regard to alternate facilities, obtaining water from Grand Bayou would substantially reduce the amount of land and soil excavated. Use of the Mississippi River for a raw water source would mean construction of a pipeline along the crude oil distribution pipeline. Use of the Gulf of Mexico for brine disposal or raw water supply would result in a seven-fold increase in excavation quantities. Construction of an onsite power plant would moderately increase the amount of land disturbance.

#### 4.4.2.1.2 Water Resources

Site preparation and construction of the proposed facilities at Napoleonville may directly affect several water bodies, including: Grand Bayou; canals and small water bodies onsite; Bayou Lafourche; small bayous and canals crossed by the pipeline ROW; the Mississippi River; and ground water aquifers. Most of these effects would be short-term and of local significance (see Section C.4.3 of Appendix C).

#### 4.4.2.1.3 Air Quality

The quality of air in the vicinity of Napoleonville dome, the St. James terminal, and along the pipeline rights-of-way would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. The principal pollutant of concern would be hydrocarbon emissions. Expected emissions and air quality impacts are discussed in Section C.4.3.1.3 of Appendix C. (Hydrocarbon emissions at the terminals are discussed in Section 4.3.2.3.)

#### 4.4.2.1.4 Noise

Construction activities at the site and along the pipeline routes would raise noise levels in the vicinity of the construction activity. Most of the impacts would be short-term and local in nature. Exceptions to this pattern would occur where drilling rigs would be near settled areas such as the village of Grand Bayou for several months.

#### 4.4.2.1.5 Impact on Ecosystems and Species

Development of the Napoleonville site would involve several impacts on the biota of the area, including loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. The total area involved for each habitat is presented in Table 2.4-1. General effects of construction activities on the various ecosystems are discussed in Section 4.1.2.5.

Of the total 215 acres of wildlife habitat temporarily disturbed due to grading and excavation both in the plant area and offsite, 147 acres of bottomland forest and deciduous swamp would be cleared and removed, severely impacting small invertebrates in the surface vegetation and topsoil. Populations of nematodes, mites, collembola (springtails), insect larvae, spiders, and oligochaetes (worms) would be destroyed. Secondary productivity by these groups, while unknown exactly for the site, is probably moderate due to the characteristic of gradual nutrient turnover in the habitat. Loss of primary and secondary terrestrial production would be localized but permanent.

Within the 437 acre fenced storage site, 39 acres of deciduous swamp and 24 acres of bottomland forest would be affected. Offsite construction operations would result in the disturbance of 66 acres of cleared land, and 86 acres of swamp and open water habitat. Most benthic invertebrates (an integral part of the aquatic food web) covered by fill would be eliminated and most fish would be displaced to new habitats.

Since 437 acres would be enclosed by fencing and 152 acres disturbed offsite, it can be assumed that, except in the case of avifauna, the available resources provided by the habitat would be lost to many other wildlife groups, totaling 589 acres during construction.

The expectation of the quantity of brine accidentally spilled from the retention pond onsite or from the brine injection system during leaching is 50 barrels (Table 4.4-3). These spills would not be anticipated to have significant adverse impacts on more than an acre or two of terrestrial or aquatic habitat in the vicinity of the site. A maximum credible spill of up to 30,000 barrels of brine could have significant local impacts on both the vegetation and animals in the spill area; however, the probability of such a spill is extremely small.

Effects of construction activities required by alternative facilities are discussed in Section C.4 of Appendix C. These effects are largely related to alternative raw water or brine disposal systems. Terrestrial effects can be related to pipeline length and the habitat type (see Table 2.4-2). The alternative to draw raw water from Grand Bayou would result in less terrestrial impacts but would impact on a more sensitive aquatic environment.

#### 4.4.2.1.6 Natural and Scenic Resources

Construction at the storage site would diminish the quality of the natural and scenic resources in the immediate vicinity of the dome. Loss of trees and other vegetation would occur due to construction of well pads, roads, and the plant area. Grading and filling at the site would further alter the natural terrain. Dust, noise, fumes, and siltation would have a significant adverse effect during construction. For the most part, these impacts would not be visible from Route 70 or from the town of Grand Bayou.

The pipeline construction activities would have significant adverse impact on the natural areas crossed. The dust, noise, fumes, and vibration of construction would also have negative impacts on the aesthetic quality of the areas crossed particularly on the Lafourche ridge. These effects would be temporary in most cases.

#### 4.4.2.1.7 Archaeological, Historical, and Cultural Resources

There are numerous sites of historic, archaeological or cultural significance in the area immediately surrounding the storage site. While no direct impact on any of these resources is anticipated, new sites may be discovered during development. If any archaeological or historic material were found, it would be immediately reported to State officials so that appropriate action could be taken to salvage or stabilize the material. Should this site be developed studies would be conducted to assure that areas of value would be preserved or recorded.

#### 4.4.2.1.8 Socioeconomic Environment

Construction activities would alter 63 acres within the 437-acre fenced area. Much of this area has been previously disrupted during brining operations. Conversion of existing facilities and development in new areas would impact some previously undisturbed wooded areas. Offsite facilities would require an additional 152 acres.

Construction at the Napoleonville storage site would have a significant impact on traffic in the surrounding area. During peak construction months (200 onsite workers) the traffic in the area could increase by 50 percent or more due to employees commuting and increased truck traffic supplying materials to the site.

The increase in daytime population in Assumption Parish related to storage site construction for the Napoleonville site would stimulate the local economy significantly. In the Grand Bayou area, local retail services such as gas and food sales would experience significant increased demand.

To the extent that local contractors or workers are employed, further stimulation to the local economy would occur. The surrounding parishes, such as Iberville, Ascension, Lafourche and St. Mary's would also be affected. The Baton Rouge area would also recieve the benefits from construction because firms and workers skilled in this type of construction are located in that area.

Project employment would be greatest during the first eight months of construction. The peak in employment would occur during the second month when 746 workers would be employed. The payroll during the peak period would approach $4.6 million, while the total wages paid throughout construction would be approximately $14.2 million. During the latter months of construction, employment and wages would drop to a level of 60 workers and $105,000 in wages for months 21-52 and to 15 workers and $26,500 in wages for months 53-57.

The project would displace some Dow Chemical employees currently working in the brine field. Depending on the number of employees involved and their place of residence, the impact could be locally significant (especially if many of these employees are residents of Grand Bayou). The project would further remove an important site of brine production from operation. It is expected that additional brining operations would be initiated by Dow so that employment losses would be temporary.

#### 4.4.2.2 Impacts for Operation and Standby Storage

SPR development at Napoleonville would not introduce any new or unique operational impacts to the program but would require extended use of systems at the terminals to accommodate a capacity increase from approximately 183 MMB to 333 MMB (82 percent increase). Principal impacts of the Napoleonville SPR operation are associated with hydrocarbon emissions and oil or brine spills (see Tables 4.4-1 through 4.4-3 in Section 4.4.3).

##### 4.4.2.2.1 Land Features and Geologic Impacts

Effects of operation and standby of the Napoleonville storage site on land features are expected to be minimal. Compared to the 589 acres required during construction offsite and within the 437-acre fenced area, 531 acres would be maintained during operation. No significant disturbance of site soils is expected after construction is completed. Soils will stabilize soon after they are revegetated.

4.4.2.2.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling, and possible oil or brine spills.

Operational water requirements for the storage site would about 65 cfs (29,200 GPM) used for crude oil displacement during withdrawal. This rate is slightly higher than the 58 cfs used during the leaching cycle, but is expected to have no significant impact on Mississippi River flow conditions.

The additional pumpage of 65 cfs into Bayou Lafourche from the Mississippi would increase the average daily flow (velocity) of the bayou between Donaldsonville and the water supply intake structure at Klotzville by approximately 26 percent. The increase in stage of the bayou would be approximately 0.25 feet at Donaldsonville, and less downstream toward the water supply intake structure. The increased velocity may result in increased water turbidity over this reach of the bayou. Below the intake structure, impacts on water quality or supply in the bayou would occur only when the pumps are shutdown occasionally.

During project operation, oil spills could occur in the Gulf of Mexico, in the Mississippi River, from the oil surge tanks at the terminals, from pipelines connecting the storage site with the surge tanks, and from the wellheads at Napoleonville. Brine spills could occur from the brine disposal pipeline and from the brine reservoir (see Section 4.2, Tables 4.4-1 through 4.4-3, and Appendix E).

4.4.2.2.3 Air Quality

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. These emissions would be realized primarily at the terminal sites and along tanker transport routes. Hydrocarbon vapor losses from floating roof storage tanks and from tanker loading and unloading operations are described in Section 4.3.3.3 (see also Section C.4.3.2.3 of Appendix C).

Emissions at the Napoleonville storage site would include fugitive dust, leakage from valves, seals and gages and hydrocarbon emissions from the brine pond and oil surge tank. Of these, dust and equipment leakage would be of only minor consequence. Surge tank emissions would also be minor, totaling about 35 tons over the life of the project.

Brine displaced during cavern filling would emit over 50 percent of entrapped hydrocarbons during detention in the brine pond. Even though the 3-hour hydrocarbon standard of 160 $\mu g/m^3$ is frequently exceeded in the area, the low concentrations expected from brine pond emissions during each fill cycle would have little impact on ambient air quality. Over the 22-year life of the project, brine pond emissions are anticipated to total 375 tons from up to five fill cycles.

4.4.2.2.4 Noise

Principal sound sources during the operation of the storage facility would be material handling equipment such as pumps for filling and emptying the storage facility in a pump house with corrugated steel sides and roof. No significant impact from any equipment used during standby or fill withdrawal is expected.

4.4.2.2.5 Species and Ecosystems

Operational impacts of the proposed SPR facilities on biological resources in the area are principally related to the potential for oil or brine spills. Impacts from such spills are discussed in Section 4.2 and in Section C.4.3 of Appendix C (see also Tables 4.4-1 through 4.4-3). Also, raw water must be withdrawn from Bayou Lafourche (and in turn pumped from the Mississippi River) to displace oil from the caverns; brine is discharged to deep sands during oil filling, with no resulting effects on aquatic resources. Normal surface activities at the 437-acre storage site and in the 94 acres of pipeline rights-of-way offsite would exclude wildlife from those immediate areas. This is an expansion of the existing industrial use of the project lands but is not a new or significantly adverse impact.

#### 4.4.2.2.6 Natural and Scenic Resources

Normal operation of the Napoleonville site and associated facilities is not anticipated to bring additional impacts on scenic, recreational, or natural resources. In some cases the impacts would be reduced during this stage as some areas at the storage site and along the pipelines would be allowed to revegetate.

#### 4.4.2.2.7 Archaeological, Historical, and Cultural Resources

Following construction, none of the operational characteristics of any of the facilities are expected to negatively impact any of these resources.

#### 4.4.2.2.8 Socioeconomic Environment

The operation of the storage site would have some effect on population in the surrounding area. The project would have a total of 60 employees on-site in three shifts during fill and withdrawal operations. During standby operations, only about 25 employees would work at the site. Most of these workers may come from the existing labor pool in the parishes around the site.

The operation of the SPR project would have a significant positive effect on the economy of the region. Supplies for some operations may be purchased from existing petrochemical and service industries. In some local areas such as Grand Bayou, a large beneficial effect would result from the increased purchases by employees. Maintenance and operation of the project would require a small work force relative to construction. Most of the workers are expected to come from the local labor pool, although some may relocate in the area for the duration of filling, approximately two years.

### 4.4.3 Summary of Adverse and Beneficial Impacts

Development of the Napoleonville salt dome as an oil storage facility is not likely to generate significant regional environmental impacts except for the remote possibility of a major oil spill (Tables 4.4-1 and 4.4-2). Brine spills (Table 4.4-3) would not cause significant impacts. The uncontrolled release of hydrocarbon vapors during oil transportation would also be a significant impact. Expected emissions are summarized in Section 4.3.

Findings of the various discipline analyses related to impacts of project construction are summarized in Table 4.4-4. Those related to project operation are included in Table 4.4-5.

TABLE 4.4-1a Expected crude oil spill during cavern fill operations - proposed system - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 27.8 | 450 | 61.7 | 999 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.016 | 17.8 | 0.036 | 39.5 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.510 | 218 | 0.484 | 207 | 0.815 | 349 | 1.81 | 774 | 60,000 |
| Koch Transfers | 27 | --- | --- | --- | --- | 4.57 | 123 | 4.57 | 123 | 500 |
| DOE Transfers | 27 | 3.48 | 94 | 3.30 | 89 | 0.99 | 27 | 7.77 | 210 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.029 | 31.6 | 0.042 | 46,5 | 0.024 | 25.8 | 0.095 | 103.9 | 5,000 |
| Terminals | | | | | | | | | | |
| Koch | 1100 | --- | --- | --- | --- | 0.0615 | 67.7 | 0.062 | 67.7 | 5,000 |
| DOE | 1100 | 0.047 | 51.7 | 0.0445 | 49.0 | 0.0135 | 14.9 | 0.105 | 115.6 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.075 | 37.5 | 0.167 | 83.3 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.52 | 711.9 | 20.43 | 691.4 | 34.37 | 1112.7 | 76.32 | 2,516 | |
| Total | | | | | | | | | | |
| 5 Fills | | 107.6 | 3560 | 102.1 | 3457 | 171.9 | 5564 | 381.6 | 12,581 | |

TABLE 4.4-7b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectation - proposed system - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.001 | 1.2 | 0.0082 | 9.2 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.324 | 139 | 0.324 | 139 | 0.097 | 41.4 | 0.745 | 319.4 | 60,000 |
| Koch Transfers | 80.6 | - | - | 1.49 | 120 | - | - | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | 1.49 | 120 | - | - | 0.44 | 36 | 1.93 | 156 | 500 |
| Bull Bay | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | - | - | - | - | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | - | - | - | - | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.008 | 8.8 | 0.014 | 15.6 | 0.004 | 4.6 | 0.026 | 29.0 | 5,000 |
| Terminals | | | | | | | | | | |
| Koch | 1100 | - | - | 0.030 | 33 | - | - | 0.030 | 33.0 | 5,000 |
| DOE | 1100 | 0.030 | 33 | - | - | 0.009 | 9.9 | 0.039 | 42.9 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.075 | 37.5 | 0.167 | 83.3 | 3,000 |
| Total | | | | | | | | | | |
| Single Withdrawal | | 6.08 | 344.6 | 1.91 | 333.9 | 0.63 | 130.6 | 8.61 | 809.1 | |
| Total | | | | | | | | | | |
| 5 Withdrawals | | 30.4 | 1723 | 9.5 | 1670 | 3.2 | 653 | 43.1 | 4,046 | |
| Project Total | | | | | | | | | | |
| 5 Cycles | | 138.0 | 5283 | 111.6 | 5127 | 175.1 | 6217 | 424.7 | 16,627 | |

TABLE 4.4-2a Expected crude oil spill during cavern fill operations - proposed system - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 27.8 | 450 | 61.7 | 999 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.016 | 17.8 | 0.036 | 39.5 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.657 | 281 | 0.484 | 207 | 0.995 | 426 | 2.136 | 914 | 60,000 |
| Nordix Transfers | 27 | 3.48 | 94 | --- | --- | 3.38 | 91 | 6.86 | 185 | 500 |
| DOE Transfers | 27 | --- | --- | 3.30 | 89 | 2.18 | 59 | 5.48 | 148 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.013 | 14.6 | 0.42 | 46.5 | 0.53 | 58.1 | 0.108 | 119 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.047 | 51.7 | --- | --- | 0.0455 | 50.1 | 0.093 | 102 | 5,000 |
| DOE | 1100 | --- | --- | 0.0455 | 49.0 | 0.0295 | 32.5 | 0.074 | 81.5 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.075 | 37.5 | 0.167 | 83.3 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.65 | 757.9 | 20.43 | 691.4 | 34.57 | 1222 | 76.65 | 2,671 | |
| Total | | | | | | | | | | |
| 5 Fills | | 108.3 | 3790 | 102.1 | 3457 | 172.9 | 6110 | 383.3 | 13,357 | |

TABLE 4.4-2b Expected crude oil spill during emergency oil withdrawal operations and total system spill expectation - proposed system - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.001 | 1.2 | 0.0082 | 9.2 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.418 | 179 | 0.324 | 139 | 0.097 | 41.4 | 0.839 | 359.4 | 60,000 |
| Nordix Transfers | 80.6 | 1.49 | 120 | -- | -- | -- | -- | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | -- | -- | 1.49 | 120 | 0.44 | 36 | 1.93 | 156 | 500 |
| Bull Bay | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | -- | -- | -- | -- | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | -- | -- | -- | -- | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.009 | 10.4 | 0.014 | 14.9 | 0.005 | 5.4 | 0.028 | 30.7 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.030 | 33.0 | -- | -- | -- | -- | 0.030 | 33.0 | 5,000 |
| DOE | 1100 | -- | -- | 0.030 | 33 | 0.009 | 9.9 | 0.039 | 42.9 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.075 | 37.5 | 0.167 | 83.3 | 3,000 |
| Total | | | | | | | | | | |
| Single Withdrawal | | 6.17 | 386.2 | 1.91 | 333.2 | 0.63 | 131.4 | 8.71 | 850.8 | |
| Total | | | | | | | | | | |
| 5 Withdrawals | | 30.9 | 1931 | 9.5 | 1666 | 3.2 | 657 | 43.6 | 4254 | |
| Project Total | | | | | | | | | | |
| 5 Cycles | | 139.2 | 5721 | 111.6 | 5123 | 176.1 | 6767 | 426.9 | 17,611 | |

Table 4.4-3 Expected brine spill during leaching and fill operations - Proposed System [a,b]

| | Leaching | Cavern Fill | Program Total 5 cycles + leach | Average Spill Size (BBL) |
|---|---|---|---|---|
| Napoleonville | | | | |
| No. Spills | .016 | .099 | .016 | |
| Barrels | 48.8 | 27.6 | 186.8 | 3000 |
| Bayou Choctaw | | | | |
| No. Spills | - | .003 | .015 | |
| Barrels | - | 7.7 | 38.5 | 3000 |
| TOTAL | | | | |
| No. Spills | .016 | .012 | .076 | - |
| Barrels | 48.8 | 35.3 | 225.3 | - |

[a]Maximum credible spill 30,000 BBL

[b]Weeks Island early storage is non-contributing

TABLE 4.4-4 Summary of environmental impacts caused by development of the Napoleonville SPR facilities - proposed Capline Group development.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Napoleonville dome and immediate vicinity | Site Preparation<br>144,000 cy of excavation of 261,000 cy of fill for pipelines, access roads, and other onsite surface facilities. Direct impacts on 63 acres.<br>Cavern Leaching<br>Up to 25 x $10^6$ cy of salt removed from the dome by leaching.<br>Brine Disposal<br>Pressurization of brine disposal aquifers. | |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| | Pipeline Corridors between Napoleonville and Terminal Facilities | Crude Oil Distribution<br>Temporary excavation of 300,000 cy of earth and clearing of vegetation from 61 acres in the pipeline ROW. | |
| | Bayou LaFourche | Raw Water Supply<br>74,000 cy of excavation (mostly temporary) from 12 acres in pipeline ROW. | |
| | Grand Bayou | | Raw Water Supply<br>2100 cy of temporary excavation from 4 acres in pipeline ROW. |
| | Mississippi River | | Raw Water Supply<br>Temporary excavation of 300,000 cy of earth and clearing of vegetation from 61 acres in the pipeline ROW |
| | Gulf of Mexico | | Raw Water Supply<br>653,000 cy of excavation (mostly temporary) and clearing of vegetation from 92 acres in pipeline ROW.<br>Brine Disposal<br>1,129,000 cy of excavation (mostly temporary) and clearing of 92 acres of vegetation in pipeline ROW. |
| | Ground Water | | Raw Water Supply<br>78,000 cy of excavation (mostly temporary), 110,000 cy of fill and clearing of vegetation from 26 acres in pipeline ROW.<br>Possible surface subsidence over well field. |
| Water Resources | Grand Bayou, Lake Verret, and wetlands adjacent to the storage site | Site Preparation<br>Significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff.<br>Oil and Brine Spills<br>Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Raw Water Supply<br>Withdrawal from Grand Bayou could significantly affect water levels in local streams and wetlands during periods of low flow; pipeline construction impacts very minor. |

TABLE 4.4-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Water bodies and wetlands crossed by pipeline ROW, including Bayou Lafourche | Site Preparation and Pipeline Construction<br>Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | |
| | Bayou Lafourche | Raw Water Supply<br>885,000 BPD pumped from Mississippi River would increase turbidity and bank erosion from Donaldsonville to Klotzville (12 miles) and occasionally downstream; minimal effect on water quality/quantity expected. | |
| | Mississippi River | Raw Water Supply<br>Diversion of 885,000 BPD to Bayou Lafourche would not significantly affect river quality or flow rate.<br><br>Terminal Construction<br>(see Table C.3-2) | Raw Water Supply<br>Withdrawal of 885,000 BPD would not significantly affect river quality or flow rate. |
| | Gulf of Mexico | | Raw Water Supply<br>Withdrawal from Gulf (West Cote Blanche Bay) no significant effect on water quality; construction of supply pipeline would have significant local affects for most of its 42 mile length.<br><br>Brine Disposal<br>Disposal of brine in Gulf could cause local salinity excesses of 12 percent or less over several hundred acres; pipeline construction could alter surface water quality on-land and in the Gulf. |
| | Subsurface aquifers | Brine Disposal<br>Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. | |
| | | | Raw Water Supply<br>Withdrawal from subsurface aquifers could affect water table and induce surface subsidence, though considered unlikely; construction effect locally significant. |
| Air Quality | All construction sites | Site Preparation<br>Minor quantities of particulates, $SO_2$, CO, HC, and $NO_2$ released from construction equipment; minimal effect. | |
| | Napoleonville Dome | Site Preparation and Painting<br>Short term HC concentrations of up to 104 $\mu g/m^3$ at 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Napoleonville. | |
| | | | Raw Water Supply<br>Development of a well field for raw water supply may reduce emission at Napoleonville (except HC from painting) by 50 percent.<br><br>Construction of raw water supply lines to Grand Bayou or the Gulf of Mexico would alter the direction and location of construction emission but not the degree of impact. |

TABLE 4.4-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | | Brine Disposal<br>Construction of a brine disposal pipeline to the Gulf eliminates locally continuous emissions at Napoleonville and adds dispersed pipeline emissions. |
| | Terminal Facilities | Site Preparation and Painting<br>(see Table C.3-2) | |
| Noise Level | Storage Site | Site Preparation and Cavern Well Drilling<br>Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 75 residences may be affected. | |
| | Pipeline Routes | Pipeline Construction<br>Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | |
| | | | Raw Water Supply<br>Grand Bayou Water supply would not affect noise sensitive areas.<br>Ground water supply well field would raise noise levels for 100 or more residences near Klotzville. |
| | | | Brine Disposal<br>Brine disposal pipeline and raw water supply pipeline would affect noise levels for over one hundred residences, especially at Franklin. |
| | Terminal Facilities | Site Preparation<br>Maximum zone of noise impact, 1600 feet; 10 to 15 residences may be affected. | |
| Species and Ecosystem | Terrestrial<br>Agricultural Land | Site Preparation and Pipelines<br>Temporary loss of 66 acres due to facility construction. Minimal impact importance. | |
| | | Raw Water Supply<br>Loss of 11 acres (mostly temporary) due to construction of pipeline and pump station. | Raw Water Supply<br>Loss of 26 acres due to raw water well field. Loss of 39 acres due to pipeline to Mississippi River. Loss of 17 acres due to pipeline to Gulf. |
| | | Terminal Construction<br>(see Table C.3-2) | |
| | Bottomland and Swamp Forest | Site Preparation<br>Loss of 147 acres due to facility construction. Revegegation of 94 acres likely. Minimal impact importance. | |
| | | Brine Spills<br>Large brine spill could destroy several acres near Napoleonville dome. | |
| | | | Brine Disposal<br>Loss of 50 acres of mostly swamp forest habitat due to construction of brine disposal or raw water lines to Gulf. |
| | | | Raw Water Supply<br>Loss of 4 acres of swamp forest due to use of Grand Bayou as water source. Loss of 22 acres of swamp forest due to use of Mississippi River as source. |

TABLE 4.4-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Aquatic | | |
| | Bayou Lafourche | Raw Water Supply<br>Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. | |
| | Grand Bayou and local water bodies near construction sites | Site Preparation<br>Minimal local impacts due to erosion and runoff.<br>Brine Spills<br>Major brine spill remotely possible near Grand Bayou; significant loss of biota would follow. | |
| | Mississippi River | Raw Water Supply<br>Minor additional displacement of plankton to Bayou Lafourche through lift pumps. | Raw Water Supply<br>Small number of organisms destroyed as a result of them being entrained. |
| | Gulf of Mexico | | Brine Disposal<br>Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce productivity. |
| Natural and Scenic Resources | All Pipeline Construction | ROW Clearing<br>Locally significant impact due to clearing along pipeline right-of-way. | |
| Socioeconomic Conditions | | All Sites | |
| | Cultural Resources | Possibly loss or disruption of significant cultural resources. | |
| | Land Use | Alteration of land use on total of 589 acres in Assumption and St. James Parishes. | |
| | Transportation | Total construction wages, $14.2 million, much of which would be spent outside the local area; loss of Dow Company jobs at Napoleonville brining operations. | |
| | Government | Possibly significant loss of property and severance tax revenues. | |

TABLE 4.4-5 Summary of environmental impacts caused by operation of the Napoleonville SPR facilities - proposed Capline Group.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Land Surface | Cavern Collapse: Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | |
| Water Resources | Grand Bayou and small water bodies near Napoleonville dome | Oil and Brine Spills: Impacts from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months. | Raw Water Supply: Withdrawal from Grand Bayou could significantly lower water level and increase drainage rates from adjacent wetlands; inflow to Lake Verret increased. |
| | Bayou Lafourche | Raw Water Supply: Pumping of up to 1,000,000 BPD through Bayou Lafourche would increase stage, erosion, and turbidity; 26 percent increase over average flow rate.<br>Oil Spills: Small potential for oil spills | |
| | Mississippi River | Raw Water Supply: Withdrawal of up to 1,000,000 BPD for oil displacement over 183-day period expected to have no measurable effect on water quality or quantity.<br>Oil Spills: Could have significant local impacts.<br>Terminal Facilities (see Table C.3-3) | Raw Water Supply: Withdrawal of up to 1,000,000 BPD for oil displacement over 183-day period expected to have no measurable effect on water quality or quantity. |
| | Gulf of Mexico | | Raw Water Supply or Brine Disposal: No effect on Gulf of Mexico water quality and quantity due to withdrawal; local alteration of salinity and water quality near brine diffuser; increased brine spill exposure. |
| | Ground Water | Brine Disposal: Brine injection should have no adverse impact.<br>Oil and Brine Spills: Very slight chance of local ground water pollution due to surface or brine oil spill; collapse or cavity roof could seriously degrade ground water supplies for Napoleonville area but such an occurrence is highly unlikely. | Raw Water Supply: Surface subsidence potential expected to be small due to ground water withdrawal of up to 1,000,000 BPD. |
| Air Quality | Oil Handling and Storage | Total Emissions: Emissions from 330 MMB oil storage facility for 5 fill and withdrawal cycles equal 67,300 to 66,700 tons 46 percent due to the expansion, 410 tons at Napoleonville.<br>Storage in Surge Tanks (see Table C.3-3)<br>Dock Transfers (see Table C.3-3) | |

TABLE 4.4-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Noise | | Storage Site Operation<br>No significant increase in ambient sound levels on or adjacent to the site with either proposed or alternative facilities. | |
| Speices and Ecosystems | Terrestrial<br>Agricultural Land | Oil and Brine Spills<br>Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | |
| | | | Raw Water Supply<br>Withdrawal of water from wells would add 9 acres of pipeline ROW maintenance but eliminate possibility of adverse effects on Bayou Lafourche or Grand Bayou. Use of the Mississippi River as a source would require maintenance of a larger number of acres. |
| | | Purchase of Commercial Power<br>Would require maintenance of a 4-mile transmission line ROW. | |
| | Bottomland and Swamp Forest | Oil and Brine Spills<br>Possible oil or brine spill from pipelines could have locally significant adverse impacts.<br>Storage Site Maintenance Clearing<br>Continued maintenance of 41 acres would reduce available habitat in region by an insignificant amount. | |
| | Aquatic<br>Grand Bayou and local water bodies near Napoleonville dome | Oil and Brine Spills<br>Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life. | |
| | | | Raw Water Supply<br>Withdrawal of water from Grand Bayou could significantly reduce habitat and standing crop of plankton and other small organisms. |
| | Bayou Lafourche | Raw Water Supply<br>Average flow rate increased by about 30 percent from Donaldsonville to Klotzville during oil withdrawal (180 day period, expected five times in project life); increased turbidity; impact on aquatic biota not expected to be of regional significance. | |
| | Mississippi River | Oil Spills<br>Potential oil spill impacts could be locally significant, especially at dock site and in lower delta.<br>Raw Water Supply<br>No measurable impact on aquatic life due to water withdrawal. | Raw Water Supply<br>No measurable impact on aquatic life due to water withdrawal. |
| | Gulf of Mexico | Oil Spills<br>Expected oil spill volumes could significantly affect marine biota. Estimated total 5,230 barrels of oil from all SPR operations in the Gulf during project lifetime.<br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if sp[illegible]aches shore before cleanup. | |

TABLE 4.4-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | | Raw Water Supply<br>Use of Gulf of Mexico for water supply would increase maintenance acreage required along pipelines.<br><br>Brine Disposal<br>Brine could destroy benthic habitats and reduce productivity. Small impact on nekton and plankton. Possible alteration of migration route. |
| Natural and Scenic Resources | | Oil Spills<br>Adverse impacts associated with possible large oil spill which could foul swamp forest and marshes and contaminate water with oil.<br><br>Operation and Maintenance<br>Pipeline ROW maintenance would have adverse aesthetic impacts. | |
| | | Purchase of Commercial Power<br>4-mile transmission corridor alignment would have adverse impact. | Raw Water Supply or Brine Disposal<br>Pipelines to Gulf Coast would have additional adverse resource impact. |
| Socioeconomic Environment | Economy | Storage Site Employment<br>Total wages expected to be approximately $113,000 during each month of oil fill and withdrawal; $18,000 during standby. | |

## 4.5 ALTERNATIVE GROUPING NO. 1 - EARLY STORAGE SITES PLUS EXPANSION OF OF WEEKS ISLAND

### 4.5.1 Introduction

The following sections summarize the expected and potential environmental impacts associated with the development of this alternative for the Capline Group. Impacts of development of early storage at Bayou Choctaw and Weeks Island were reviewed in Section 4.4.1. Details of such development have been discussed in detail in the EISs and supplements for these sites (FES 76-5 and FES 76/77-8, respectively). Section 4.5.2 considers impacts associated specifically with the expansion of the Weeks Island storage site. This section also describes significant cumulative impacts associated with full development of the Capline Group. Impacts related to terminal facilities are described in Section 4.3. These impacts are summarized, along with pipeline and storage site impacts in Section 4.5.3 (Tables 4.5-1 through 4.5-5).

### 4.5.2 Impacts of Weeks Island Expansion Alternative

#### 4.5.2.1 Impacts of Site Preparation and Construction

Quantities of material to be excavated or filled and acreages of land to be affected by grading and other construction activities at the Weeks Island salt dome, along pipeline routes, and at the distribution terminal are listed in Table 2.4-1. Quantities of material to be excavated or filled and acreages affected by development of alternative facilities for Weeks Island are listed in Table 2.4-2. A summary of construction impacts is presented in Section 4.5.3.

##### 4.5.2.1.1 Land Features

Of the 100-acre enclosed site area, grading at the Weeks Island site would be confined to about 32 acres, of which only a small portion would occur in undisturbed areas. Plant area construction would require 35,000 cy excavation and 137,000 cy of fill.

Offsite facilities would require the disturbance of 68 acres on land and 778 acres offshore with 18,300 cy of fill, and 592,300 cy excavation for grading and pipeline rights-of-way. The brine disposal systems affect 837 acres while the raw water system requires 9 acres.

The 37.6-mile brine disposal pipeline would require an estimated 832 acres for construction, assuming an 80-foot wide right-of-way onshore and a 200-foot wide right-of-way offshore. An estimated 575,300 cy of temporary excavation would be required. Three back-up brine disposal wells would be located along a 2.3-mile pipeline parallel to the brine and oil right-of-way. An estimated 12,000 cy of excavation for the pipeline, 13,300 cy of fill for the well pads, and 5 acres of construction disturbance would be required.

The raw water supply line from the Intracoastal Waterway just west of the site would require 5000 cy of excavation, a like amount of fill, and 9 acres of construction right-of-way.

Leaching of 10 storage cavities in the Weeks Island salt dome would involve removal of about 91 MMB of salt by leaching for disposal in deep salt water bearing sands. This is equivalent to 19 x $10^6$ cy of salt. Sufficient wall thickness would be maintained between cavities to maintain cavern structural integrity.

4.5.2.1.2 Water Resources

Site preparation and development of proposed facilities at Weeks Island would affect several water bodies, including: the Intracoastal Waterway; the Gulf of Mexico (including West and East Cote Blanche Bays); small ponds, canals, and tidal creeks on and adjacent to the dome (e.g., Plantation Lake, Warehouse Bayou); Bayou Cypremort; and deep aquifers. Potential impacts are treated according to specific aspects of storage facility development.

The site preparation and construction activity at Weeks Island would involve a significant amount of earth movement. Because of the high level of annual precipitation encountered in the region, a significant amount of sediment may be transported from the disturbed surface areas into the surrounding surface water system. This sediment should pass initially into the swamps and marshes in the vicinity of the dome. A small amount of the sediments could move into Plantation Lake (Figure 2.4-2) which is located just north of the onsite oil, water, and brine pipelines. Sediments could also be transported west to the ICW and eventually to the coastal bays and Gulf of Mexico. Standard engineering practices such as interceptor ditches, dikes, and sedimentation ponds would be utilized where necessary to prevent any significant degradation of water quality due to plant site runoff.

Use of the ICW as the source of raw water would cause no changes in water quality or quantity since a free interchange of water takes place between the waters of Weeks Bay and the ICW under natural conditions.

The proposed brine diffuser for the Weeks Island site is located in the coastal waters of the Gulf of Mexico, approximately 11 miles south of South Point, Marsh Island, at a depth of about 20 feet. During the construction (cavity leaching), an average of approximately 570 to 600 MBPD of brine with a salinity 200 parts per thousand (ppt) greater than ambient (about 30 to 35 ppt) would be discharged. Possible impacts are discussed in Section 4.1.2.

Onshore construction of the proposed brine disposal system would require the installation of approximately 5.5 miles of buried pipeline between the site and the coast. Effects of construction would be localized and short term.

The three back up brine disposal wells would require 2.3 miles of pipelines from Weeks Island along the oil and brine pipeline ROW.

4.5.2.1.3 Air Quality

During site preparation and construction, the air quality impacts for site expansion at Weeks Island would be very similar to the air quality impacts for Napoleonville. The expected emissions and air quality impacts would generally be short-term and over a small area. (Hydrocarbon emissions at the terminals are discussed in Section 4.3.2.3).

4.5.2.1.4 Noise

Construction activities at the site and along the pipeline routes would raise noise levels in the vicinity of the construction activity. Most of the impacts would be short term and local in nature. Exceptions to this pattern would occur where drilling rigs would be near settled areas for several months.

4.5.2.1.5 Impact on Ecosystems and Species

The expansion of the Weeks Island site would involve several impacts on the biota of the area. These impacts include loss of terrestrial habitat and indirect effects on the wildlife due to forced migration, noise and human disturbance. The total area involved for each habitat is presented in Section B.4.2.5 in Appendix B.

The expansion of the site should not have any significant effects on the aquatic environment. Some minor amounts of sediment may be carried into Plantation Lake, the Intracoastal Waterway, and nearby marshes. Effects should be minor and of short duration.

Of the total 878 acres of wildlife habitat disturbed due to grading and excavation both in the plant area and offsite, only 30 acres of swamp and marsh would be affected, while 63 acres of cleared land, 7 acres of forest would be required, as well as 778 acres offshore for pipeline rights-of-way.

Within the 100-acre fenced area, 32 acres of mostly cleared land would be required for onsite facilities. Offsite facilities require 846 acres for a total of 946 acres of restricted habitat. The raw water supply system would require 9 acres of cleared land.

The proposed brine disposal system to the Gulf of Mexico would include 5.5 miles of pipeline on shore, associated roads, and three disposal well pads, covering a total of 59 acres (see Section 2.5). In addition, there would be 32.1 miles of offshore pipeline involving about 778 acres of bottom disturbance. Impacts from this system include loss of terrestrial and aquatic habitat, increases in turbidity, brine discharge effects, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. Possible impacts of brine disposal through Gulf diffusers are discussed in Section 4.1.2.

Pipeline construction impacts in West Cote Blanche Bay, East Cote Blanche Bay, and nearshore Gulf waters include direct destruction of benthic habitat within the pipeline ROW, indirect stress on adjacent benthic habitat and portions of the water column due to temporary increases in turbidity and siltation, and possible reduction in dissolved oxygen levels. Increased turbidity would reduce plankton productivity and cause nekton to avoid the region. As the nearshore bays are naturally turbid, it is unlikely that indirect effects on benthos would be significant. Some increased uptake of resuspended trace metals and other pollutants may also occur. There are no reported oyster beds in the vicinity of the proposed pipeline ROW.

4.5.2.1.6 Natural and Scenic Resources

Construction at the storage site would require removal of natural wooded vegetation and some cultivated crops on 32 acres of land. The conversion of natural wooded areas and cultivated crops to industrial usage would have a permanent and significantly adverse impact on the natural and scenic resources of Weeks Island. Perhaps half of the construction acreage would be visible from Route 83 on the east edge of the dome. Most of the pipeline and pumping facilities necessary for water supply would be constructed in areas of low natural and scenic resource value which have already been converted to industrial uses for early storage.

4.5.2.1.7 Archaeological, Historical, and Cultural Resources

Weeks Island has two known archaeological sites and excellent potential for others (Section 3.4.2.7). A cultural resources survey would be conducted prior to final selection of pipeline and surface facility locations.

4.5.2.1.8 Socioeconomic Environment

The addition of ten new caverns and associated oil, brine and raw water facilities on 32 acres of land within the 100-acre fenced area would result in a significant change in land use over the dome. This area, currently a mixture of cultivated land, woodlands, and marsh, would be converted to industrial use. Revegetation would be allowed on approximately 25 acres of this land (Table 2.5-1). Offsite facilities would require an additional 846 acres.

Surface road access to the storage site is limited to a single two-lane highway, State Highway 83. This medium duty road currently carries 1280 vehicle trips in an average day and would experience a significant increase in traffic during construction. During peak construction activities, slightly more than 500 workers would travel to and from the site each day and truck traffic related to construction would rise. This traffic is not expected to cause excessive congestion, however.

The largest percentage of the total labor force employed for the Weeks Island project would be involved with construction of the 10 new caverns at the storage site. The major local benefit of storage site construction would be to temporarily relieve unemployment (4.4% in Iberia and 4.6% in St. Mary). Over half of the workers are expected to come from within commuting distance of Weeks Island. Employment levels would vary significantly during project construction, from a peak of 512 in the third month down to 60 in the nineteenth through forty-sixth month.

Local contractors could be expected to provide some of the supplies and labor necessary for storage site construction; however, no new business is expected to open in the area as a result of this activity alone, due to its short duration. Most of the goods and services required for the project would be brought in from larger market areas, such as Lafayette, Morgan City, or Baton Rouge. Storage site construction would increase local income through employment and purchases of local goods and services.

4.5.2.2 Impacts from Operation and Standby Storage

SPR expansion at Weeks Island would not introduce any new or unique operational impacts to the program but would require extended use of terminals and existing systems at Weeks Island to accommodate a capacity increase from approximately 183 MMB to 274 MMB (50 percent increase). Principal impacts of the Weeks Island SPR operation are associated with hydrocarbon emissions and oil or brine spills. Operational impacts are summarized in Section 4.5.3.

4.5.2.2.1 Land Features and Geologic Impacts

Effects of operation and standby storage of the Weeks Island storage site on land features are expected to be minimal. Compared to the 946 acres required during construction offsite and within the 100-acre enclosed area, only 143 acres would be maintained during operation. No significant distrubance of site soils is expected after construction is completed. Soils would stabilize soon after they are revegetated.

#### 4.5.2.2.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling (Section 4.1.3), and possible oil or brine spills.

The proposed source of raw water for the Weeks Island facilities is the ICW. The maximum water withdrawal rate during the oil extraction cycle is 1,000,000 B/D, as compared to 672,000 B/D during the mining cycle. Accordingly, the impacts as a result of displacement water withdrawal would be similar in kind, but greater than those described in Section 4.4.2.1.2. The supply and quality of water in the Intracoastal Waterway should not be adversely affected by this withdrawal.

During project operation, oil spills could occur in the Gulf of Mexico, in the Mississippi River, from the oil surge tanks at St. James, from pipelines connecting the storage site with the surge tanks, and from the wellheads at Weeks Island (see Tables 4.5-1 and 4.5-2). Brine spills could occur from the brine disposal pipeline and from the brine resevoir (Table 4.5-3).

#### 4.5.2.2.3 Air Quality

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. Hydrocarbon emissions from terminal operation and tanker transfers are the principal source and are described in Section 4.3.3.3.

On-site sources at Weeks Island would be similar to those described for Napoleonville in Section 4.4.2.2.3 except that a smaller brine pond and brine throughput would be utilized. Over the project lifetime, brine pond emissions are anticipated to total up to 228 tons.

#### 4.5.2.2.4 Noise

Principal sound sources during the operation of the storage facility would be material handling equipment such as pumps for filling and emptying the storage facility. These electric motor driven pumps would be mounted in a pump house with corrugated steel sides and roof. The impact would be negligible.

#### 4.5.2.2.5 Species and Ecosystems

Operational impacts of the proposed SPR facilities on biological resources in the area are principally related to the potential for oil or brine spills (Sections 4.2.2 and 4.2.3). Also, raw water must be withdrawn from the ICW to displace oil from the caverns and brine must be discharged to the Gulf of Mexico during oil filling (Section 4.1.3). Normal surface activities at the 100-acre storage site and in the 43 acres of pipeline rights-of-way offsite would exclude wildlife from the immediate project vicinity. This is an expansion of the existing industrial use of the project lands but is not a new or significantly adverse impact.

#### 4.5.2.2.6 Natural and Scenic Resources

Normal operation of the Weeks Island site and associated facilities is not anticipated to bring additional impacts on scenic, recreational, or natural resources. In some cases the impacts would be reduced during this stage as some areas at the storage site and along the pipelines would be allowed to revegetate.

#### 4.5.2.2.7 Archaeological, Historical, and Cultural Resources

Following construction none of the operational characteristics of any of the facilities are expected to negatively impact any of these resources.

#### 4.5.2.2.8 Socioeconomic Environment

There would be no additional impacts on land use during operation. The land at the site would already have been converted to developed use during construction. Some of the land disturbed during construction would be allowed to revegetate. Less traffic related to the project would be generated during operation than during construction. The operation of the storage site would have minor effects on population in the surrounding area. The project would have a total of 60 employees on-site in three shifts during fill and withdrawal operations. During standby operations, only about 25 employees would work at the site. Most of these workers may come from the existing labor pool in the parishes surrounding the site.

The operation of the SPR project would have a positive effect on the economy of the region. Supplies for some operations may be purchased from existing petrochemical and service industries. In some local areas such as Jeanerette, a minor beneficial effect would result from the increased purchases by employees.

4.5.3 Summary of Adverse and Beneficial Impacts

Development of the Weeks Island salt dome as an oil storage facility is not likely to generate significant regional environmental impacts except for the possibility of a major oil spill (Tables 4.5-1 and 4.5-2) and the uncontrolled release of hydrocarbon vapors during oil transportation. Expected emissions are summarized in Section 4.3. Brine spill expectations are summarized in Table 4.5-3.

Findings of the various discipline analyses related to impacts of project construction are summarized in Table 4.5-4. Those related to project operation are included in Table 4.5-5.

TABLE 4.5-1.a Expected crude oil spills during cavern fill operations - alternative site grouping #1 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Weeks Island Expansion | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 16.8 | 273 | 50.7 | 822 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.0097 | 10.8 | 0.029 | 32.5 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.510 | 218 | 0.484 | 207 | 0.494 | 211 | 1.488 | 636 | 60,000 |
| Koch Transfers | 27 | 3.48 | 94 | - | - | 0.48 | 13 | 3.96 | 107 | 500 |
| DOE Transfers | 27 | - | - | 3.30 | 89 | 2.89 | 78 | 6.19 | 167 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.031 | 34.0 | 0.023 | 25.7 | 0.024 | 26.2 | 0.078 | 85.9 | 5,000 |
| Terminals | | | | | | | | | | |
| Koch | 1100 | 0.047 | 51.7 | - | - | 0.0065 | 7.2 | 0.054 | 58.9 | 5,000 |
| DOE | 1100 | - | - | 0.0045 | 49.0 | 0.039 | 42.9 | 0.084 | 91.4 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.0455 | 22.8 | 0.137 | 68.6 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.52 | 714.3 | 20.41 | 670.6 | 20.79 | 684.9 | 62.72 | 2,070 | |
| Total | | | | | | | | | | |
| 5 Fills | | 107.6 | 3572 | 102.1 | 3353 | 104.0 | 3425 | 313.6 | 10,349 | |

TABLE 4.5-1b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectation - alternative site grouping #1 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Weeks Island Expansion | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| **Gulf of Mexico** | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0021 | 2.4 | 0.0022 | 2.4 | 0.008 | 8.8 | 60,000 |
| **Mississippi River** | | | | | | | | | | |
| Vessel Casualty | 428 | 0.324 | 139 | 0.191 | 81.8 | 0.196 | 83.9 | 0.711 | 304.7 | 60,000 |
| Koch Transfers | 80.6 | 1.49 | 120 | -- | -- | -- | -- | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | -- | -- | 0.88 | 71.2 | 0.90 | 72.8 | 1.78 | 144 | 500 |
| **Bull Bay** | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | -- | -- | -- | -- | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | -- | -- | -- | -- | 4.17 | 15 | 500 |
| **Pipelines** | | | | | | | | | | |
| Pumping | 1100 | 0.009 | 9.5 | 0.008 | 8.9 | 0.009 | 9.1 | 0.025 | 27.5 | 5,000 |
| **Terminals** | | | | | | | | | | |
| Koch | 1100 | 0.030 | 33 | -- | -- | -- | -- | 0.30 | 33 | 5,000 |
| DOE | 1100 | -- | -- | 0.018 | 19.6 | 0.018 | 20 | 0.036 | 39.6 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.046 | 50.1 | 0.138 | 95.9 | 3,000 |
| **Total** | | | | | | | | | | |
| Single Withdrawal | | 6.07 | 345.3 | 1.14 | 206.2 | 1.17 | 238.3 | 8.39 | 789.8 | |
| **Total** | | | | | | | | | | |
| 5 Withdrawals | | 30.4 | 1726 | 5.7 | 1031 | 5.8 | 1191 | 42.0 | 3949 | |
| **Project Total** | | | | | | | | | | |
| 5 Cycles | | 138.0 | 5298 | 107.8 | 4384 | 109.8 | 4616 | 355.6 | 14,298 | |

TABLE 4.5-2a Expected crude oil spills during cavern fill operations - alternative site grouping #1 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Weeks Island Expansion | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 16.8 | 273 | 50.7 | 822 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.0097 | 10.8 | 0.029 | 32.5 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.657 | 281 | 0.484 | 207 | 0.580 | 248 | 1.721 | 736 | 60,000 |
| Nordix Transfers | 27 | 3.48 | 94 | - | - | 2.03 | 55 | 5.51 | 149 | 500 |
| DOE Transfers | 27 | - | - | 3.30 | 89 | 1.33 | 36 | 4.63 | 125 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.018 | 20.2 | 0.031 | 33.6 | 0.031 | 34.5 | 0.080 | 88.3 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.047 | 51.7 | - | - | 0.0275 | 30.3 | 0.075 | 82.0 | 5,000 |
| DOE | 100 | - | - | 0.0445 | 49.0 | 0.0180 | 19.8 | 0.063 | 68.8 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.0455 | 22.8 | 0.137 | 68.6 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.66 | 763.5 | 20.41 | 678.5 | 20.86 | 730.2 | 62.95 | 2,172 | |
| Total | | | | | | | | | | |
| 5 Fills | | 108.3 | 3817 | 102.1 | 3393 | 104.3 | 3651 | 314.8 | 10,861 | |

TABLE 4.5-2b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectation - alternative site grouping #1 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Weeks Island Expansion | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0021 | 2.4 | 0.0022 | 2.4 | 0.008 | 8.8 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.418 | 179 | 0.191 | 81.8 | 0.196 | 83.9 | 0.805 | 344.7 | 60,000 |
| Nordix Transfers | 80.6 | 1.49 | 120 | --- | --- | --- | --- | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | --- | --- | 0.88 | 71.2 | 0.90 | 72.8 | 1.78 | 144 | 500 |
| Bull Bay | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | --- | --- | --- | --- | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | --- | --- | --- | --- | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.009 | 10.4 | 0.008 | 9.3 | 0.009 | 9.5 | 0.026 | 29.2 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.030 | 33.0 | --- | --- | --- | --- | 0.030 | 33 | 5,000 |
| DOE | 1100 | --- | --- | 0.018 | 19.6 | 0.018 | 20.0 | 0.036 | 39.6 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.046 | 50.1 | 0.138 | 95.9 | 3,000 |
| Total | | | | | | | | | | |
| Single Wighdrawal | | 6.17 | 386.2 | 1.14 | 206.6 | 1.19 | 238.7 | 8.49 | 831.5 | |
| Total | | | | | | | | | | |
| 5 Withdrawals | | 30.9 | 1931 | 5.7 | 1033 | 5.9 | 1194 | 42.5 | 4,158 | |
| Project Total | | | | | | | | | | |
| 5 Cycles | | 139.2 | 5748 | 107.8 | 4426 | 110.2 | 4845 | 357.2 | 15,019 | |

TABLE 4.5-3 Expected brine spill during leaching and fill operations - Alternative Group 1 [a,b]

| | Leaching | Cavern Fill | Program total 5 cycles + leach | Average Spill size (BBL) |
|---|---|---|---|---|
| Weeks Island Expansion | | | | |
| No. Spills | .009 | .003 | .024 | |
| Barrels | 45.3 | 17.2 | 131.3 | 5000 |
| Bayou Choctaw | | | | |
| No. Spills | - | .003 | .015 | |
| Barrels | - | 7.7 | 38.5 | 3000 |
| TOTAL | | | | |
| No. Spills | .009 | .006 | .039 | |
| Barrels | 45.3 | 24.9 | 169.8 | - |

[a]Maximum credible spill 30,000 BBL

[b]Weeks Island early storage is non-contributing

TABLE 4.5-4 Summary of environmental impacts caused by development of Weeks Island SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Weeks Island dome and immediate vicinity | Site Preparation<br>35,000 cy of excavation and 137,000 cy of fill for on-site, pipelines, access roads, and other surface facilities. Direct impacts on 32 acres.<br><br>Cavern Leaching<br>Up to 19 x $10^6$ cy of salt removed from the dome by leaching. | |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| | Pipeline Corridors - between Weeks Island and: | | |
| | Intracoastal Waterway | Raw Water Supply<br>5000 cy of excavation (mostly temporary) and clearing of vegetation from 9 acres in pipeline ROW. | |
| | Gulf of Mexico | Brine Disposal<br>587,300 cy of excavation (mostly temporary) and clearing of 59 acres of vegetation in pipeline ROW onshore; disturbance to 788 acres offshore. | Brine Disposal<br>820,800 cy of excavation (mostly temporary) and clearing of 54 acres of vegetation in pipeline raw onshore<br><br>Raw Water Supply<br>98,500 cy of excavation (mostly temporary) and clearing of vegetation from 17 acres in pipeline ROW. |
| | Brine Disposal Wells | | Brine Disposal<br>151,000 cy of excavation (mostly temporary) and clearing of 125 acres of vegetation in pipeline ROW.<br><br>Pressurizaiton of brine disposal aquifers. |
| | Terminal Facility | | Terminal Facility<br>(see Table C.3-2) |
| Water Resources | Plantation Lake, Warehouse Bayou, ICW, and wetlands adjacent to the storage site and along pipeline ROW. | Site Preparation<br>Potentially large volumes of sediment and construction pollutants carried into water bodies by rainfall runoff.<br><br>Oil and Brine Spills<br>Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | |
| | Intracoastal Waterway | Raw Water Supply<br>Withdrawal of 650,000 BPD for cavern leaching would not significantly affect water quality or quantity. | |
| | Mississippi River | Terminal Construction<br>(see Table C.3-2) | |

TABLE 4.5-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Gulf of Mexico | Brine Disposal<br>Disposal of 650,000 BPD of brine in Gulf could raise salinity by 5 ppt in immediate vicinity of diffuser, and by 1 ppt over as much as 2200 acres and could alter surface water quality.<br>Pipeline construction would create locally significant levels of turbidity and possibly reduced oxygen levels. Resuspension of pollutants from sediments. | Brine Disposal<br>Disposal of 650,000 BPD of brine in Gulf could raise salinity by 5 ppt in immediate vicinity of diffuser, and by 1 ppt over as much as 2200 acres and could alter surface water quality.<br>Pipeline construction would create locally significant levels of turbidity and possibly reduced oxygen levels. Resuspension of pollutants from sediments. |
| | | | Raw Water Supply<br>Withdrawal from Gulf (West Cote Blanche Bay) should have no significant effect on water quality. |
| | Subsurface Aquifers | | Brine Disposal<br>Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. |
| Air Quality | All construction sites | Site Preparation<br>Minor quantities of particulates, $SO_2$, CO, HC, and $NO_2$, released from construction equipment; minimal effect. | |
| | Weeks Island Dome | Site Preparation and Painting<br>Short term HC concentrations of up to 104 $\mu g/m^3$ at 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Weeks Island. | |
| | | | Brine Disposal<br>Development of a well field for brine disposal may decrease emission at Weeks Island (except HC from painting) by 50 percent.<br>Construction of raw water supply lines in the Gulf of Mexico would increase the direction and location of construction emission but not the degree of impact. |
| | Terminal Facilities | Site Preparation and Painting (see Table C.3-2) | |
| Noise Level | Storage Site | Site Preparation and Cavern Well Drilling<br>Maximum radius of noise impact (3 dB increase over ambient), 4500 feet; no residences affected. | |
| | Pipeline Routes | Pipeline Construction<br>Maximum zone of noise impact, 1800 feet; 19 structures may be affected. | |
| | | | Raw Water Supply<br>Construction would affect noise-sensitive areas on Cypremort levee for less than 1 week. |

TABLE 4.5-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | | Brine Disposal: Brine disposal well field construction would affect noise levels for several residences in Cypremort levee. |
| | Terminal Facilities | Site Preparation (see Table C.3-2) | |
| Species and Ecosystems | Terrestrial | | |
| | Agricultural Land | Site Preparation and Pipelines: Temporary loss of 63 acres due to facility construction. Minimal impact importance. | Brine Disposal: Loss of 125 acres (mostly agricultural land) due to brine injection well field. |
| | | Terminal Construction (see Table C.3-2) | |
| | Bottomland and Swamp Forest | Site Preparation and Pipelines: Loss of 22 acres due to facility construction. Revegetation of 8 acres likely. Minimal impact importance. | |
| | | Brine Spills: Large brine spill could destroy several acres near Weeks Island dome. | |
| | | | Raw Water Supply: Loss of 3 acres of swamp forest due to use of Gulf of Mexico as water source. |
| | | Brine Disposal: Loss of acres due to construction of brine disposal pipeline to Gulf | Brine Disposal: Same as proposed. |
| | Aquatic | | |
| | Plantation Lake, ICW, and local water bodies near construction sites | Site Preparation: Minimal local impacts due to erosion and runoff. | |
| | | Brine Spills: Major brine spill remotely possible; significant loss of biota would follow. | |
| | Intracoastal Waterway | Raw Water Supply: Destruction of phytoplankton and zooplankton during the 3-year leaching period. Impact on regional biotic resources considered insignificant. | |
| | Gulf of Mexico | Brine Disposal: Temporary loss of 778 acres due to pipeline installation. Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce productivity. | Brine Disposal: Same as proposed. |
| | | Terminals (see Table C.3-2) | |

TABLE 4.5-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT<br>PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Natural and Scenic Resources | All Pipeline Construction | ROW Clearing<br>Locally significant impact due to clearing of forest land on Weeks Island and along pipeline right-of-way, especially through coastal marsh. | |
| Socioeconomic Conditions | Cultural Resources | All Sites<br>Possible loss or disruption of significant cultural resources. | |
| | Land Use | All Sites<br>Alteration of land use on total of 100 acres in Iberia, St. Mary and St. James Parishes. | |
| | Transportation | All Sites<br>Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. | |
| | Economy | Total Construction Wages<br>$8.2 million, much of which would be spent outside the local area. | |
| | | | Marine Terminal<br>Significant increase in employment, both locally and regionally. |
| | Government | Taxes<br>Minor loss of property tax revenues. | |

TABLE 4.5-5 Summary of environmental impacts caused by operation of Weeks Island SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Land Surface | Cavern Collapse<br>Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | |
| Water Resources | Plantation Lake, Warehouse Bayou and small water bodies near Weeks Island dome. | Oil and Brine Spills<br>Impacts from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months. | |
| | Intracoastal Waterway | Raw Water Supply<br>Withdrawal of up to 1,000,000 BPD for oil displacement over 180-day period expected to have no measureable effect on water quality or quantity.<br>Oil Spills<br>Could have significant local impacts. | |
| | Mississippi River | Terminal Facilities<br>(see Table C.3-3) | Oil Spills<br>Could have significant local impacts. |
| | Gulf of Mexico | Brine Disposal<br>Local alteration in salinity and water quality near brine diffuser. | Brine Disposal<br>Same as proposed. |
| | Ground Water | Brine Disposal<br>Brine injection should have no adverse impact.<br>Oil and Brine Spills<br>Very slight chance of local ground water pollution due to surface or brine oil spill; collapse of cavity roof could seriously degrade ground water supplies for Weeks Island area but such an occurrence is highly unlikely. | |
| Air Quality | Oil Handling and Storage | Total Emissions<br>Emissions from 274 MMB oil storage facility for 5 fill and withdrawal cycles equal approximately 54,700 tons, 32 percent due to expansion, 263 tons at Weeks Island.<br>Terminal Facilities<br>(see Table C.3-3) | Onsite Power Generation<br>Would cause significant HC emissions at Weeks Island. |
| Noise | | Storage Site Operation<br>No significant increase in ambient sound levels on or adjacent to the site with either proposed or alternative facilities. | |

TABLE 4.5-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT | |
|---|---|---|---|
| | | PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
| Species and Ecosystems | **Terrestrial** | | |
| | Agricultural Land | Oil and Brine Spills: Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | |
| | | | Brine Disposal: Brine injection in wells would add 45 acres of pipeline ROW maintenance. |
| | | | Raw Water Supply: Use of Gulf of Mexico would slightly increase pipeline ROW maintenance. |
| | | Terminal Facilities (see Table C.3-3) | |
| | Bottom Land, Swamp Forest and Marsh | Brine Spills: Possible brine spill from pipelines could have locally significant adverse impacts. No additional oil spill exposure off dome. | |
| | | Storage Site Maintenance Clearing: Continued maintenance of 7 acres would reduce available habitat in region by an insignificant amount. | |
| | | | Raw Water Supply: Use of Gulf of Mexico for water supply would slightly increase pipeline ROW maintenance. |
| | **Aquatic** | | |
| | Plantation Lake, Warehouse Bayou and local water bodies near Weeks Island dome | Oil and Brine Spills: Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life. | |
| | | | Raw Water Supply: Withdrawal of water from Grand Bayou could significantly reduce habitat and standing crop of plankton and other small organisms. |
| | Intracoastal Waterway | Raw Water Supply: No measureable impact on aquatic life due to water withdrawal. | |
| | Mississippi River | Oil Spills: Potential oil spill impacts could be locally significant, especially at dock site and in lower delta. | |
| | Gulf of Mexico | Oil Spills: Expected oil spill volumes could significantly affect marine biota. Estimated total 4,306 barrels of oil from all SPR operations in the Gulf during project lifetime.<br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. | |

TABLE 4.5-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | Brine Disposal<br>Brine could destroy benthic habitats and reduce productivity. Small impact on nekton and plankton. Possible alteration of migration routes. | Brine Disposal<br>Same as proposed. |
| | | | Raw Water Supply<br>Use of Gulf of Mexico for water supply should have little regional effect on standing crop of plankton and other small organisms. |
| Natural and Scenic Resources | | Oil Spills<br>Adverse impacts associated with possible large oil spill which could foul swamp forest and marshes and contaminate water with oil. | |
| | | Operation and Maintenance<br>Pipeline ROW maintenance would have some adverse aesthetic impacts. | |
| | | | Onsite Power Generation<br>Would add a highly visible emissions stack to Weeks Island. |
| Socioeconomic Environment | Economy | Storage Site Employment<br>Total wages expected to be approximately $113,000 during each month of oil fill and withdrawal; $44,000 during standby. | |

## 4.6 ALTERNATIVE GROUPING NO. 2 - EARLY STORAGE SITES PLUS EXPANSION OF BAYOU CHOCTAW PLUS DEVELOPMENT OF IBERIA

### 4.6.1 Introduction

Expected and potential environmental impacts associated with the development of this alternative for the Capline Group are summarized in this section. Types of impacts associated with development and use of the Bayou Choctaw and Weeks Island early storage sites were briefly summarized in Section 4.4.1. Impacts at these sites are treated in detail in previously published EISs. Sections 4.6.2 and 4.6.3 consider impacts associated specifically with the expansion of Bayou Choctaw and development of Iberia, respectively. These sections also describe significant cumulative impacts associated with full development of the Capline Group. Impacts related to terminal facilities are described in Section 4.3. These impacts are summarized along with pipeline and storage site impacts in Section 4.6.4 (Tables 4.6-1 through 4.6-5).

### 4.6.2 Impacts of Expansion of Bayou Choctaw

#### 4.6.2.1 Impacts of Site Preparation and Construction

Quantities of material to be excavated or filled and acreages of land to be affected by grading and other construction activities for the Bayou Choctaw expansion, along pipeline routes, and at the distribution terminals are listed in Table 2.6-1. Quantities of material to be excavated or filled and acreages of land to be affected by construction of alternative facilities for Bayou Choctaw are listed in Table 2.5-2. A summary of construction impacts is presented in Section 4.6.4.

##### 4.6.2.1.1 Land Features

Onsite grading at the Bayou Choctaw site would cover the total enclosed area of 27 acres, of which only a small portion would occur in areas already disturbed. Plant area construction would require 19,000 cy excavation and 62,400 cy of fill.

Offsite facilities would require the disturbance of 88 acres on land and 2 acres offshore, 116,000 cy of fill, and 99,000 cy excavation for grading and pipeline rights-of-way. The brine disposal systems affect 36 acres, while the raw water system requires 54 acres.

Pipeline construction would temporarily disturb 83 acres of land and require 99,000 cubic yards of earth excavation, and the brine disposal wellhead pads require 7 acres. Before revegetation of disturbed areas is complete, some erosion of the soil may be expected.

Leaching of 6 additional cavities in the Bayou Choctaw salt dome would involve removal of about 50 MMB of salt by leaching for disposal in deep saline acquifers. This is equivalent to about $10 \times 10^6$ cy of salt. Sufficient wall thickness would be maintained between cavities to maintain cavern integrity.

The alternative action of obtaining water from Port Allen Canal (ICW) would reduce the amount of land and soil excavated. Use of the Gulf of Mexico for raw water supply would result in approximately 40 times as much excavation as the primary raw water supply system for the Mississippi River.

4.6.2.1.2 Water Resources

Site preparation and construction of facilities at Bayou Choctaw may directly affect several water bodies, including: Bayou Bourbeaux, Bull Bay, Port Allen Canal/ICW, Bayou Choctaw; the on-site lake; the Mississippi River; and ground water aquifers.

The site preparation and construction activity at Bayou Choctaw would involve a significant amount of earth movement. Because of the high level of annual precipitation in the region, a significant amount of sediment may be transported from the disturbed surface areas into the surrounding surface water system. This sediment should pass initially into the swamps and canals on the dome. Some of the sediments would move into Bayou Bourdeaux, the on-site lake or other canals that run through the site (Figure 2.6-2). Most of the on-site construction would be on the southern portion of the site resulting in sediments reaching Port Allen Canal from some of the natural bayous. Standard engineering practices such as an interceptor ditches, dikes, and sedimentation ponds would be utilized where necessary to prevent any significant degradation of water quality due to plant site runoff.

#### 4.6.2.1.3 Air Quality

The quality of air in the vicinity of Bayou Choctaw dome, at the terminals, and along the pipeline rights-of-way would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. (Hydrocarbon emissions at the terminals are discussed in Section 4.3.2.3).

#### 4.6.2.1.4 Noise

Construction activities at the site, and along the pipeline routes would raise noise levels in the vicinity of the construction activity. Most of the impacts would be short term and local in nature. Exceptions to this pattern would occur where drilling rigs would be near settled areas for several months.

#### 4.6.2.1.5 Impact on Ecosystems and Species

Expansion of the Bayou Choctaw site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. The total area involved for each habitat is presented in Table 2.6-1.

The total 117 acres of wildlife habitat lost due to site development both in the plant area and offsite would severely impact any small invertebrates in the surface vegetation and topsoil (see Section 4.4.2.1.5), approximately 50 acres of deciduous swamp would removed, 3 acres of open water bodies would be needed for pipeline rights-of-way, and the remaining 64 acres is cleared industrial land associated with brining operations and existing oil field development.

Leach pads, roads, and other construction operations would result in the filling of about 25 acres of aquatic (swamp) habitat. Most benthic invertebrates (an integral part of the aquatic food web) covered by fill would be eliminated and most fish would be displaced to new habitats.

The proposed brine disposal system would include 3.9 miles of pipeline, associated roads, disposal well pads and other construction operations covering a total of 36 acres.

The proposed raw water supply system from the Mississippi River has a 5.4-mile-long pipeline which will use 53 acres of cleared terrestrial habitat (Table 2.6-1).

The primary aquatic impacts related to the raw water supply system would be the entrainment of plankton, drifting invertebrates, and larval fish from the Mississippi River and the impingement of juvenile fish on the intake screen (see Section 4.1.2.5).

4.6.2.1.6 Natural and Scenic Resources

Expansion at the Bayou Choctaw site would slightly diminish the quality of the natural and scenic resources in the immediate vicinity of the dome. Effects at the site would be limited to loss of trees and other vegetation as a result of construction of well pads, pipelines and roads to the six new caverns. Dust, noise, fumes and siltation would have a slight adverse effect during construction. These impacts would not be visible from local highways or towns.

Construction of a raw water pipeline to the Gulf of Mexico would cause a significant increase in the adverse impact of the project on natural and scenic resources. Although the pipeline would follow existing pipeline rights-of-way, the construction impacts would affect many miles of natural marshland, coastal swamps, agricultural land, and transportation corridors.

4.6.2.1.7 Archaeological, Historical and Cultural Resources

There are numerous sites of historic, archaeological or cultural significance in the area immediately surrounding the storage site but none in the pipeline rights-of-way. While no direct impact on any of these resources is anticipated, new sites may be discovered during development. If any archaeological or historic material were found, it would be immediately reported to State officials so that appropriate action could be taken to salvage or stabilize the material. Further studies would be conducted to assure no areas of value would be disturbed.

4.6.2.1.8 Socioeconomic Impact of Construction

Onsite land use impacts of the expansion of the Bayou Choctaw storage facility would be relatively minor. Only 27 acres of additional land would be enclosed for the new caverns, pipelines and roads. Offsite facilities would require 90 additional acres.

Increased commuting traffic to the storage site would occur on Route 1 especially between Baton Rouge and Plaquemine, and some minor increases in existing traffic problems may occur in localized areas. Much of the delivery of materials and equipment would utilize Bayou Plaquemine and the Port Allen Canal portions of the Intracoastal Waterway. This would add to existing traffic on those waterways but decrease potential surface road congestion.

Little, if any, population impact is anticipated from construction at the storage site. Housing, like population, is not expected to be significantly impacted during the construction phase.

The construction project at the storage site would have no adverse impact upon the highly developed economic base of the Baton Rouge area. There would be a beneficial impact resulting from employment and purchases of materials and supplies, but it is not anticipated to be highly significant in relation to the magnitude of existing economic activity. Increased economic activity in Plaquemine would be likely to be more significant though much smaller in absolute magnitude.

The project is not expected to significantly alter the employment picture in the project area. Due to the large construction labor force in the Baton Rouge area and the relatively small size of the project work force, the project is not expected to cause any manpower shortages, although it should have a slight beneficial effect on employment.

#### 4.6.2.2 Impacts from Operation and Standby Storage

SPR development at Bayou Choctaw would not introduce any new or unique operational impacts to the program but would require extended use of terminals and existing systems at Bayou Choctaw to accommodate a capacity increase from approximately 183 MMB to 289 MMB (58 percent increase). Principal impacts of the Bayou Choctaw SPR operation are associated with hydrocarbon emissions and oil or brine spill. Impacts are summarized in Section 4.6.4.

#### 4.6.2.2.1 Land Features and Geologic Impacts

Effects of operation and standby of the Bayou Choctaw storage site expansion on land features are expected to be minimal. Compared to the 117 acres required for construction, only 85 acres would be needed during operation. No significant disturbance of site soils is expected after construction is completed. Soils would stabilize soon after they are revegetated.

#### 4.6.2.2.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling, and possible oil or brine spills. Most of these are expected to be local and short term (see Section B.6.2.2.2 of Appendix B).

During project operation, oil spills could occur in the Gulf of Mexico, in the Mississippi River, from the oil surge tanks at St. James, from pipelines connecting the storage site with the surge tanks, and from the well heads at Bayou Choctaw. Brine spills could occur from the brine disposal pipeline and from the brine reservoir (see Section 4.2 and Tables 4.6-1 through 4.6-3).

#### 4.6.2.2.3 Air Quality

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. Hydrocarbon emissions from terminal operation and tanker transfers are the principal source and are described in Section 4.3.3.3.

On-site sources at Bayou Choctaw would be similar to those described for Napoleonville in Section 4.4.2.2.3 except that brine pond throughput would be reduced. Over the project lifetime, brine pond emissions resulting from the expansion are anticipated to total up to 140 tons. Emissions from facilities constructed for the early storage phase would be up to 376 for the brine pond and oil surge tank.

#### 4.6.2.2.4 Noise

Principal sound sources during the operation of the storage facility would be material handling equipment such as pumps for filling and emptying the storage facility. These electric motor driven pumps would be mounted in a pump house with corrugated steel sides and roof. Impacts would be negligible.

4.6.2.2.5 Species and Ecosystems

Operational impacts of the proposed SPR facilities on biological resources in the area are principally related to the potential for oil or brine spills. Also, raw water must be withdrawn from the Mississippi River to displace oil from the caverns; brine is discharged to deep salt water bearing snads during oil filling, with no resulting effects on aquatic resources. Normal surface activities at the storage site and in the vicinity of the tanker docks would exclude wildlife from the immediate 27-acre project area, and pipeline right-of-way acreage required to be maintained is 58 acres. This is an expansion of the existing industrial use of the project lands but is not a new or significantly adverse impact. Effects of oil and brine spills have been discussed in Section 4.2.3.

4.6.2.2.6 Natural and Scenic Resources

Normal operation of the Bayou Choctaw site and associated facilities is not anticipated to bring additional impacts on scenic, recreational, or natural resources. In some cases the impacts would be reduced during this stage as some areas at the storage site and along the pipelines would be allowed to revegetate.

4.6.2.2.7 Archaeological, Historical, and Cultural Resources

Following construction, none of the operational characteristics of any of the facilities are expected to negatively impact any of these resources.

4.6.2.2.8 Socioeconomic Environment

There would be no additional impacts on land use during operation. The land at the site would already have been converted to developed use during construction. Some of the land disturbed during construction would be allowed to revegetate. Less traffic related to the project would be generated during operation than during construction.

### 4.6.3 Impacts of Development of Iberia

#### 4.6.3.1 Impacts of Site Preparation and Construction

Quantities of material to be excavated or filled and acreages of land to be affected by grading and other construction activities at the Iberia dome, along pipeline routes, and at the distribution terminal are listed in Table 2.5-4. A summary of construction impacts is presented in Section 4.6.4.

##### 4.6.3.1.1 Land Features

Within the 160-acre fenced area, onsite grading at the Iberia site would be confined to about 49 acres, of which only a small portion would occur in undisturbed areas. Plant area construction would require 16,000 cy excavation and 79,500 cy of fill.

Offsite facilities would require the disturbance of 240 acres on land and 1 acre in open water, 68,000 cy of fill, and 355,000 cy excavation for grading and pipeline rights-of-way. The brine disposal system affects 55 acres, while the raw water system requires 16 acres, and the crude oil distribution system, 170 acres.

Offsite pipeline construction would temporarily disturb 228 acres of land and require 355,000 cubic yards of earth excavation, and 13 acres would be disturbed for the wellhead pads and pump station. Before revegetation of disturbed areas is complete, some erosion of the soil may be expected.

Leaching of 6 storage cavaties in the Iberia salt dome would involve removal of about 50 MMB of salt by leaching for disposal in deep salt water bearing sands. This is equivalent to as much as $10 \times 10^6$ cy of salt. Sufficient wall thickness would be maintained between cavities to maintain cavern integrity (Appendix A).

Quantities of material to be excavated or filled and acreages affected by alternative construction activities for Iberia are listed in Table 2.5-5. Obtaining water from Lake Fausse Pointe would substantially increase the amount of land and soil excavated. Use of the Gulf of Mexico for brine disposal or raw water supply would result in a sevenfold increase in excavation quantities. Construction of an onsite power plant would moderately increase the amount of land disturbance.

4.6.3.1.2 Water Resources

Site preparation and construction of the proposed facilities at Iberia may directly affect Bayou Tete, which passes over the dome, Lake Fausse Pointe, Weeks Bayou, Bayou Teche, the ICW near Weeks Island, and ground water aquifers. Potential impacts are treated according to specific aspects of facility development.

The site preparation and construction activity at Iberia dome would involve a significant amount of earth movement. Because of the high level of annual precipitation encountered in the region, a significant amount of sediment may be transported from the disturbed surface areas into the surrounding surface water system. This sediment should pass into Bayou Tete adjacent to the dome. Some of the sediments might move into Lake Fausse Pointe which is about 6 miles east of the site. Standard engineering practices such as interceptor ditches, dikes, and sedimentation ponds would be utilized where necessary to prevent any significant degradation of water quality due to plant site runoff.

The proposed source of raw water for leaching the Iberia SPR facilities during the mining cycle is Bayou Teche. Water would be obtained through a 1.5 mile pipeline terminating at an intake structure on the north bank of the channel about four miles upstream from Jeanerette and 1.5 miles downstream from Olivier. The average water supply rate during the mining cycle would be 640,000 barrels per day (B/D), or approximately 42 cfs. The average daily flow of the bayou is about 500 cfs. Therefore water supply (and water quality) impacts would be slight under typical flow conditions. However, a minimum flow of zero has been recorded several times during the 17-year period of record. Under such extreme low flow conditions, the withdrawal of water during the leaching period might not be possible.

4.6.3.1.3 Air Quality

The quality of air in the vicinity of Iberia and along the pipeline rights-of-way would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. (Hydrocarbon emissions at the terminals are discussed in Section 4.3.2.3).

#### 4.6.3.1.4 Noise

Construction activities at the site, and along the pipeline routes would raise noise levels in the vicinity of the construction activity. Most of the impacts would be short term and local in nature. Exceptions to this pattern would occur where drilling rigs would be near settled areas for several months.

#### 4.6.3.1.5 Impact on Ecosystems and Species

Development of the Iberia site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. The total area involved for each habitat is presented in Table 2.5-4.

Of the 290 acres of wildlife habitat disturbed due to grading and excavation both in the plant area and offsite, 80 acres of marsh, swamp and open water would be filled, and 8 acres of bottomland forest and 202 acres of cleared land would be required, affecting small invertebrates in the surface vegetation and topsoil (see Section 4.4.2.1.5). Since 160 acres would be enclosed by fencing, and 241 acres would be offsite, it can be assumed that, except in the case of avifauna the available resources provided by the habitat would be lost to many other wildlife groups during construction, totaling 401 acres.

Earth moving activities for leach pad construction, roads, and other construction operations would increase turbidity and add nutrients to Bayou Tete. Increases in turbidity from construction would affect most of the surface water onsite by decreasing light penetration and hence possibly reducing plankton production. However, an influx of nutrients from the sediments and fill could increase phytoplankton, periphyton, and macrophyte production in areas not buried by fill, thus mitigating the effects of reduced light levels on plant productivity. Community composition also could be affected since different species have different physiological tolerances and ecological dependencies.

The primary aquatic effects related to the raw water supply system would be the entrainment of plankton, drifting invertebrates, and larval fish from Bayou Teche, and the impingement of juvenile fish on the intake screen. Entrained organisms would be lost since they would be unable to withstand the high salinity within the cavities. Assuming an even distribution of entrainable organisms, about 10 percent will be lost, based on an average daily flow in Bayou Teche of 500 and a maximum intake rate to the storage site of 18,700 gpm (42 cfs). This would impact no more than one mile of the Bayou, therefore, the overall impact would be moderate to low for the overall system.

4.6.3.1.6 Natural and Scenic Resources

Construction at the Iberia Dome would diminish the quality of the natural and scenic resources in the immediate vicinity of the dome only slightly because of the agricultural nature of the site and the surrounding petroleum facilities. Loss of some trees and other vegetation would occur due to construction of the well pads and associated roads. Grading and filling at the site would further alter the natural terrain. Dust, noise, fumes and siltation would have a slightly adverse effect during construction. For the most part, these impacts would not be visible to residents along Bayou Teche.

The pipeline construction activities would have significant adverse impact on the natural areas crossed. The dust, noise, fumes and vibration of construction would also have negative impacts on the aesthetic quality of the areas crossed particularly on Bayou Teche. These effects would be temporary in most cases.

4.6.3.1.7 Archaeological, Historical and Cultural Resources

There are numerous sites of historic, archaeological or cultural significance in the area immediately surrounding the storage site. While no direct impact on any of these resources is anticipated, new sites may be discovered during development. If any archaeological or historic material were found, it would be immediately reported to State officials so that appropriate action could be taken to salvage or stabilize the material. Further studies would be conducted to assure no areas of value would be disturbed.

#### 4.6.3.1.8 Socioeconomic Environment

Construction activities would alter land use at the storage site. Most of the land has been previously cleared for pasture. Development would impact some previously undisturbed wooded areas. The project would require fencing of a 160 acre tract of land at the storage site for the plant area, roadways, wellheads, pipelines, and brine pond. Approximately 49 acres of land within this tract would be directly developed with facilities. An additional 241 acres would be developed offsite.

Construction at the Iberia site would have a slight impact on traffic in the surrounding area and would probably not significantly change population in Iberia. While the daytime population might increase, most of the construction workers are expected to commute from their current residences in nearby parishes leaving the permanent local population unchanged for the most part.

The large increase in daytime population in Iberia Parish related to storage site construction for the Iberia site would stimulate the local economy significantly. In the local area retail services such as gas and food sales would experience significant increased demand. To the extent that local contractors or workers are employed, further stimulation to the local economy would occur. The surrounding parishes such as Iberia and St. Mary's would also be affected.

Construction at the site would remove 160 acres from the Parish and State tax rolls. Ownership and operation by the Federal government would make the property tax-exempt. Personal income related to the project may bring a slight increase in sales and property taxes in the Parish.

### 4.6.3.2 Impacts from Operation and Standby Storage

Operational impacts associated with Iberia dome and with associated raw water and brine disposal pipelines are considered in this section. Operation of the oil pipeline from Iberia to the tie-in with the 36-inch line to St. James at Weeks Island is also considered.

4.6.3.2.1 Land Features and Geologic Impacts

Effects of operation and standby of the Iberia storage site on land features are expected to be minimal. The 160-acre fenced area and 153 acres offsite would be required for operation compared to the total 401 acres required for construction. No significant disturbance of site soils is expected after construction is completed. Soils would stabilize soon after they were revegetated.

4.6.3.2.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling, and possible oil or brine spills (see Section 4.2.3).

Operational water requirements for the storage site would be based on the 22 cfs (9700 GPM) used for crude oil displacement during the 195-day withdrawal period. As expected for the 60 cfs withdrawal necessary for a period of about two years during the leaching cycle, the higher rate should not have significant impact on Bayou Teche during normal flow conditions. However, during low flow conditions, an excessive drawdown may occur locally, reducing flow upstream from the site.

4.6.3.2.3 Air Quality

The largest potential effects on air quality associated with the operation of the proposed oil distribution system would result from hydrocarbon emissions during fill and withdrawal cycles. Hydrocarbon emissions from terminal operation and tanker transfers are the principal source and are described in Section 4.3.3.3.

On-site sources at Iberia would be similar to those described in Section 4.4.2.2.3 for Napoleonville except that a smaller brine pond and brine throughput would be utilized. Over the project lifetime, brine pond emissions are anticipated to total up to 125 tons.

4.6.3.2.4 Noise

The impacts associated with operation of the SPR facility at Iberia dome are essentially identical to those for the Bayou Choctaw site.

#### 4.6.3.2.5 Species and Ecosystems

Operation of the storage facility and associated raw water, brine disposal and oil delivery systems at Iberia would have little environmental impact in addition to that caused by construction. Total pipeline right-of-way acreage required to be maintained is 153 acres. However, of this total all but 5 acres of bottomland forest and 50 acres of marsh and swamp forest are cleared agricultural land.

#### 4.6.3.2.6 Natural and Scenic Resources

Operation and maintenance of the storage site area would have fewer impacts on the scenic and natural resources than construction. Some areas would be allowed to revegetate although this would be routinely maintained. Some operational fume, dust, and traffic would occur, but at a much lower level during routine operations.

Normal maintenance of the pipeline route would have minimal impact on natural resources. In some areas, natural vegetation such as trees would not be allowed to return, but some grass would grow instead.

#### 4.6.3.2.7 Archaeological, Historical, and Cultural Resources

Following construction, none of the operational characteristics of any of the facilities are expected to negatively impact any of these resources.

#### 4.6.3.2.8 Socioeconomic Impacts

Land use at the storage site would remain industrialized during operation and maintenance. The area would be fenced and not be available for cultivation. Traffic to and from the site would be significantly reduced with the elimination of most materials deliveries and a smaller work force.

### 4.6.4 Summary of Adverse and Beneficial Impacts

Development of the Iberia and Bayou Choctaw salt domes as oil storage facilities is not likely to generate significant regional environmental impacts except for the possibility of a major oil spill (Tables 4.6-1 and 4.6-2) and the uncontrolled release of hydrocarbon vapors during oil transportation (Section 4.3). Table 4.6-3 summarizes information on possible brine spills.

Findings of the various discipline analyses related to impacts of project construction are summarized in Table 4.6-4. Those related to project operation are included in Table 4.6-5.

TABLE 4.6-1a Expected crude oil spills during cavern fill operations - alternative grouping #2 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Bayou Choctaw Expansion | | Iberia | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 10.4 | 168 | 9.2 | 150 | 53.5 | 867 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.0060 | 6.6 | 0.0053 | 5.9 | 0.031 | 34.1 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.510 | 218 | 0.484 | 207 | 0.303 | 130 | 0.272 | 117 | 1.569 | 672 | 60,000 |
| Koch Transfers | 27 | --- | --- | 2.11 | 57 | --- | --- | 1.87 | 50 | 3.98 | 107 | 500 |
| DOE Transfers | 27 | 3.48 | 94 | 1.19 | 32 | 2.07 | 56 | --- | --- | 6.74 | 182 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.029 | 31.6 | 0.049 | 53.5 | 0.002 | 2.0 | 0.008 | 9.0 | 0.088 | 96.1 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Koch | 1100 | --- | --- | 0.029 | 31.9 | --- | --- | 0.025 | 27.5 | 0.054 | 59.4 | 5,000 |
| DOE | 1100 | 0.047 | 51.7 | 0.016 | 17.6 | 0.028 | 30.8 | --- | --- | 0.091 | 100.1 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.028 | 14.0 | 0.025 | 12.5 | 0.145 | 72.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Fill | | 21.52 | 711.9 | 20.43 | 698.8 | 12.84 | 407.4 | 11.41 | 371.9 | 66.20 | 2,190 | |
| Total | | | | | | | | | | | | |
| 5 Fills | | 107.6 | 3560 | 102.1 | 3494 | 64.2 | 2037 | 57.1 | 1859 | 331.0 | 10,950 | |

TABLE 4.6-1b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectations - alternative site grouping #2 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Bayou Choctaw Expansion | | Iberia | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0022 | 2.5 | 0.0036 | 4.0 | 0.0014 | 1.6 | --- | --- | 0.007 | 8.1 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.198 | 84.9 | 0.324 | 139 | 0.126 | 53.9 | --- | --- | 0.648 | 277.8 | 60,000 |
| Koch Transfers | 80.6 | 0.91 | 73.6 | --- | --- | 0.58 | 47.0 | --- | --- | 1.49 | 120.6 | 500 |
| DOE Transfers | 80.6 | --- | --- | 1.49 | 120 | --- | --- | --- | --- | 1.49 | 120 | 500 |
| Bull Bay | | | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | --- | --- | --- | --- | --- | --- | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | --- | --- | --- | --- | --- | --- | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.005 | 5.9 | 0.014 | 14.9 | 0.003 | 3.5 | 0.003 | 3.4 | 0.025 | 27.7 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Koch | 1100 | 0.018 | 20.2 | --- | --- | 0.012 | 12.9 | --- | --- | 0.030 | 33.1 | 5,000 |
| DOE | 1100 | --- | --- | 0.030 | 33.0 | --- | --- | --- | --- | 0.030 | 33.0 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.028 | 14.0 | 0.025 | 12.5 | 0.145 | 72.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Withdrawal | | 5.35 | 226.9 | 1.91 | 333.2 | 0.75 | 132.9 | 0.03 | 15.9 | 8.04 | 708.9 | |
| Total | | | | | | | | | | | | |
| 5 Withdrawals | | 26.7 | 1135 | 9.5 | 1666 | 3.8 | 665 | 0.2 | 79 | 40.2 | 3,545 | |
| Project Total | | | | | | | | | | | | |
| 5 Cycles | | 134.3 | 4695 | 111.6 | 5160 | 68.0 | 2702 | 57.3 | 1938 | 371.2 | 14,495 | |

TABLE 4.6-2a Expected crude oil spills during cavern fill operations - alternative grouping #2 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Bayou Choctaw Expansion | | Iberia | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 10.4 | 168 | 9.2 | 150 | 53.5 | 867 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.0060 | 6.6 | 0.0053 | 5.9 | 0.031 | 34.1 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.657 | 281 | 0.502 | 215 | 0.391 | 167 | 0.272 | 117 | 1.822 | 780 | 60,000 |
| Nordix Transfers | 27 | 3.48 | 94 | 0.41 | 11 | 2.07 | 56 | -- | -- | 5.96 | 161 | 500 |
| DOE Transfers | 27 | -- | -- | 2.89 | 78 | -- | -- | 1.87 | 50 | 4.75 | 128 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.013 | 14.6 | 0.050 | 55.4 | 0.013 | 14.2 | 0.008 | 9.0 | 0.084 | 93.2 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Nordix | 1100 | 0.047 | 51.7 | 0.006 | 6.1 | 0.028 | 30.8 | -- | -- | 0.081 | 88.6 | 5,000 |
| DOE | 1100 | -- | -- | 0.039 | 42.9 | -- | -- | 0.025 | 27.5 | 0.064 | 70.4 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.028 | 14.0 | 0.025 | 12.5 | 0.145 | 72.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Fill | | 21.65 | 757.9 | 20.45 | 708.2 | 12.94 | 456.6 | 11.41 | 371.9 | 66.44 | 2294.6 | |
| Total | | | | | | | | | | | | |
| 5 Fills | | 108.2 | 3790 | 102.3 | 3541 | 64.7 | 2283 | 57.1 | 1859 | 332.2 | 11,473 | |

TABLE 4.6-2b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectations - alternative site grouping #2 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Bayou Choctaw Expansion | | Iberia | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0022 | 2.5 | 0.0036 | 4.0 | 0.0014 | 1.6 | --- | --- | 0.007 | 8.1 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.256 | 110 | 0.324 | 139 | 0.162 | 69.4 | --- | --- | 0.742 | 318.4 | 60,000 |
| Nordix Transfers | 80.6 | 0.91 | 73.6 | --- | --- | 0.58 | 47.0 | --- | --- | 1.49 | 120.6 | 500 |
| DOE Transfers | 80.6 | --- | --- | 1.49 | 120 | --- | --- | --- | --- | 1.49 | 120 | 500 |
| Bull Bay | | | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | --- | --- | --- | --- | --- | --- | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | --- | --- | --- | --- | --- | --- | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.006 | 6.5 | 0.014 | 15.6 | 0.004 | 3.9 | 0.003 | 3.4 | 0.027 | 29.4 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Nordix | 1100 | 0.018 | 20.2 | --- | --- | 0.012 | 12.9 | --- | --- | 0.030 | 33.1 | 5,000 |
| DOE | 1100 | --- | --- | 0.030 | 33.0 | --- | --- | --- | --- | 0.030 | 33.0 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.028 | 14.0 | 0.025 | 12.5 | 0.145 | 72.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Withdrawal | | 5.41 | 252.6 | 1.91 | 33.9 | 0.79 | 148.8 | 0.03 | 15.9 | 8.13 | 751.2 | |
| Total | | | | | | | | | | | | |
| 5 Withdrawals | | 27.1 | 1263 | 9.5 | 1670 | 3.9 | 744 | 0.2 | .79 | 40.7 | 3,756 | |
| Project Total | | | | | | | | | | | | |
| 5 Cycles | | 135.3 | 5053 | 111.8 | 5211 | 68.6 | 3027 | 57.3 | 1938 | 372.9 | 15,229 | |

TABLE 4.6-3 Expected brine spill during leaching and fill operations - Alternative Group 2 [a,b].

| | Leaching | Cavern Fill | Program Total 5 cycles + leach | Average Spill Size ((BBL) |
|---|---|---|---|---|
| Bayou Choctaw Expansion | | | | |
| No. Spills | .005 | .002 | .015 | |
| Barrels | 16.2 | 4.7 | 39.7 | 3000 |
| Iberia Dome | | | | |
| No. Spills | .008 | .002 | .018 | |
| Barrels | 23.1 | 5.3 | 49.6 | 3000 |
| Bayou Choctaw | | | | |
| No. Spills | - | .003 | .015 | |
| Barrels | - | 7.7 | 38.5 | 3000 |
| Total | | | | |
| No. Spills | .013 | .007 | .048 | |
| Barrels | 39.3 | 17.7 | 127.8 | |

[a]maximum credible spill 30,000 BBL

[b]Weeks Island early storage is non-contributing

TABLE 4.6-4 Summary of environmental impacts caused by development of Bayou Choctaw and Iberia SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Bayou Choctaw dome and immediate vicinity | Site Preparation<br>19,000 cy of excavation and 62,400 cy of fill for cavern wellhead drill pads, containment dikes, access roads, and other surface facilities. Direct impacts on 27 acres.<br><br>Cavern Leaching<br>Up to $12 \times 10^6$ cy of salt removed from the dome by leaching.<br><br>Brine Disposal<br>Pressurization of brine disposal aquifers. | |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| | Pipeline Corridors Between Bayou Choctaw and: ICW | | Raw Water Supply<br>5300 cy of temporary excavation from 8 acres in pipeline ROW. |
| | Mississippi River | Raw Water Supply<br>29,000 cy of excavation (temporary) and clearing of vegetation from 53 acres in pipeline right-of-way. | |
| | Gulf of Mexico | | Raw Water Supply<br>1,301,000 cy of excavation (mostly temporary) and clearing of vegetation from 672 acres pipeline ROW to Gulf.<br><br>Brine Disposal<br>1,643,100 cy of excavation (mostly temporary) and clearing of 672 acres of vegetation in pipeline ROW to Gulf. |
| | Ground Water | | Raw Water Supply<br>25,000 cy of excavation (mostly temporary) and clearing of vegetation from 12 acres in pipeline ROW.<br><br>Possible surface subsidence over well field. |
| Water Resources | Bull Bay, ICW, and wetlands near the storage site | Site Preparation<br>Significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff.<br><br>Oil and Brine Spills<br>Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Raw Water Supply<br>Withdrawal from ICW would only lower water levels and increase drainage rates from adjacent wetlands insignificantly; pipeline construction impacts very minor. |
| | Water bodies and wetlands crossed by pipeline ROW | Site Preparation and Pipeline Construction<br>Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Mississippi River | Raw Water Supply Withdrawal of up to 1,000,000 BPD would not significantly affect river quality or flow rate.<br><br>Terminal Construction (see Table C.3-2) | |
| | Gulf of Mexico | | Raw Water Supply Withdrawal from Gulf; no significant effect on water quality; construction of supply pipeline would have significant local affects for most of its 98.3 mile length.<br><br>Brine Disposal Disposal of brine in Gulf could cause local salinity excesses of 12 percent or less over several hundred acres; pipeline construction could alter surface water quality on land and in the Gulf. |
| | Subsurface aquifers | Brine Disposal Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. | Raw Water Supply Withdrawal from subsurface aquifers could affect water table and induce surface subsidence, though considered unlikely; construction effect locally significant. |
| Air Quality | All construction sites | Site Preparation Minor quantities of particulates, $SO_2$, CO, HC, and $NO_2$ released from construction equipment; minimal effect. | |
| | Bayou Choctaw | Site Preparation and Painting Short term HC concentrations of up to 104 $\mu g/m^3$ at 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Bayou Choctaw. | Raw Water Supply Development of a well field for raw water supply may decrease emission at Bayou Choctaw (except HC from painting) by 50 percent.<br><br>Construction of raw water supply lines to ICW or the Gulf of Mexico would alter the direction and location of construction emission but not the degree of impact.<br><br>Brine Disposal Construction of a brine disposal pipeline to the Gulf eliminates locally continuous emissions at Bayou Choctaw and adds dispersed pipeline emissions. |
| | Terminal Facilities | Site Preparation and Painting (see Table C.3-2) | |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Noise Level | Storage Site | Site Preparation and Cavern Well Drilling<br>Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 20 residences may be affected. | |
| | Pipeline Routes | Pipeline Construction<br>Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected | |
| | | | Raw Water Supply<br>ICW water supply would not affect noise sensitive areas.<br>Ground water supply well field would raise noise levels for 25 or more residences. |
| | | | Brine Disposal<br>Brine disposal and raw water supply pipeline to Gulf would affect noise levels for up to 50 residences. |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| Species and Ecosystem | Terrestrial<br>Agricultural Land | Site Preparation and Pipeline Construction<br>Temporary loss of 64 acres due to facility construction. Minimal impact importance. | |
| | | | Raw Water Supply<br>Loss of 12 acres (agricultural land) due to raw water well field.<br>Temporary loss of 8 acres agricultural land due to raw water pipeline and pumping station at ICW.<br>Temporary loss of 133 acres due to raw water pipeline to Gulf. |
| | | Terminal Construction<br>(see Table C.3-2) | |
| | | | Brine Disposal<br>Temporary loss of 10 acres agricultural land due to brine injection well field construction along raw water pipeline. Temporary loss of 139 acres due to brine disposal in Gulf. |
| | Bottomland and Swamp Forest | Site Preparation<br>Loss of 50 acres due to facility construction. Revegetation of 14 acres likely. Minimal impact importance. | |
| | | Brine Spills<br>Large brine spill could destroy several acres near Bayou Choctaw dome. | |
| | | | Brine Disposal or Raw Water Supply<br>Loss of 241 acres of mostly swamp forest habitat due to construction of brine disposal or raw water supply pipeline to Gulf. |
| | Marsh | | Brine Disposal or Raw Water Supply<br>Temporary loss of 298 acres of marsh due to construction of raw water or brine disposal pipeline to Gulf. |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Aquatic | | |
| | ICW | | Raw Water Supply<br>Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. |
| | Local water bodies near construction sites | Site Preparation<br>Minimal local impacts due to erosion and runoff.<br><br>Brine Spills<br>Major brine spill remotely possible: significant loss of biota would follow. | |
| | Mississippi River | Raw Water Supply<br>Minor additional displacement of plankton through lift pumps. | |
| | Gulf of Mexico | | Brine Disposal<br>Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce productivity.<br><br>Raw Water<br>No effect on Gulf of Mexico water quality or quantity due to withdrawal. |
| Natural and Scenic Resources | All Pipeline Construction | ROW Clearing<br>Locally significant impact due to clearing along pipeline right-of-way. | |
| Socioeconomic Conditions | Cultural Resources | All Sites<br>Possibly loss or disruption of significant cultural resources. | |
| | Land Use | Alteration of land use on total of 117 acres. | |
| | Transportation | Total construction wages, $6.5 million, much of which would be spent outside the local area. | |
| | Government | Possibly significant loss of property and severance tax revenues. | |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT<br>PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT<br>ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Iberia dome and immediate vicinity | Site Preparation<br>16,000 cy of excavation, 79,500 cy of fill for onsite, pipelines, access roads, and other surface facilities. Direct impacts on 49 acres.<br><br>Cavern Leaching<br>Up to 10 million cy of salt removed from the dome by leaching.<br><br>Brine Disposal<br>Pressurization of brine disposal aquifers. | |
| | Terminal Facilities | Site Preparation<br>(see Table C. 3-2) | |
| | Pipeline Corridors - between Iberia and: Terminal | Crude Oil Distribution<br>Temporary excavation of 324,000 cy of earth and clearing of vegetation from 169 acres in the pipeline ROW. | Crude Oil Distribution<br>Temporary excavation of 449,000 cy of earth and clearing of vegetation from 332 acres in pipeline ROW for pipeline route via Napoleonville. |
| | Bayou Teche | Raw Water Supply<br>8,000 cy of temporary excavation from 15 acres in pipeline ROW. | |
| | Gulf of Mexico | | Raw Water Supply; Brine Disposal<br>742,000 cy of excavation (mostly temporary) and clearing of vegetation from 201 acres in pipeline ROW. |
| | Ground Water | Brine Disposal<br>23,000 cy of excavation (mostly temporary) 63,000 cy of fill, and clearing of vegetation from 55 acres in pipeline ROW. | Raw Water Supply<br>19,500 cy of excavation (mostly temporary) and clearing of vegetation from 9 acres in pipeline ROW.<br>Possible surface subsidence over well field. |
| | Lake Fausse Point | | Raw Water Supply<br>42,000 cy of excavation (mostly temporary) and clearing of vegetation from 72 acres in pipeline ROW. |
| Water Resources | Teche Bayou and wetlands adjacent to the storage site | Site Preparation<br>Significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff.<br><br>Oil and Brine Spills<br>Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | |
| | Water bodies and wetlands crossed by pipeline ROW, including Bayou Teche. | Site Preparation and Pipeline Construction<br>Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | Pipeline Construction<br>Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. |
| | Bayou Teche | Raw Water Supply<br>641,000 BPD pumped from Bayou Teche during cavern leaching; minimal effect on water quality/quantity expected. | |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT<br>PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Lake Fausse Point | | Raw Water Supply<br>Withdrawal from Lake Fausse Point could lower water level a small amount and increase drainage from adjacent wetlands during low flow process. |
| | Mississippi River | Terminal Construction<br>(see Table C.3-2) | |
| | Gulf of Mexico | | Raw Water Supply<br>Withdrawal from Gulf would have no significant effect on water quality; construction of supply pipeline would have significant local affects for most of its 22.1 mile length.<br><br>Brine Disposal<br>Disposal of brine in Gulf could cause local salinity excesses of 12 percent or less over several hundred acres; pipeline construction could alter surface water quality on land and in the Gulf. |
| | Subsurface aquifers | Brine Disposal<br>Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration of old wells. | |
| | | | Raw Water Supply<br>Withdrawal from subsurface aquifers could affect water table and induce surface subsidence, though considered unlikely; construction effect locally significant. |
| Air Quality | All construction sites | Site Preparation<br>Minor quantities of particulates, $SO_2$, CO, HC, and $NO_2$ released from construction equipment;minimal effect. | |
| | Iberia Dome | Site Preparation and Painting<br>Short term HC concentrations of up to 104 $\mu g/m^3$ at 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Iberia. | |
| | | | Raw Water Supply<br>Development of well field for raw water supply may decrease emission at Iberia (except HC from painting) by 50 percent.<br><br>Construction of raw water supply lines to Lake Fausse Point or the Gulf of Mexico would alter the direction and location of construction emission but not the degree of impact.<br><br>Brine Disposal<br>Construction of brine disposal pipeline to the Gulf eliminates locally continuous emissions at Iberia and adds dispersed pipeline emissions. |
| | Terminal Facilities | Site Preparation and Painting<br>(see Table C.3-2) | |

TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Noise Level | Storage Site | Site Preparation and Cavern Well Drilling<br>Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 25 structures may be affected. | |
| | Pipeline Routes | Pipeline Construction<br>Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | |
| | | | Raw Water Supply<br>Lake Fausse Point Water supply would affect less than 10 structures.<br>Ground water supply well field would affect noise levels of up to 10 structures. |
| | | | Brine Disposal<br>Brine disposal pipeline and raw water supply pipeline would affect noise levels for up to 50 structures. |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| Species and Ecosystems | Terrestrial<br>Agricultural Land | Site Preparation & Offsite<br>Temporary loss of 202 acres due to facility construction. Minimal impact importance. | |
| | | Raw Water Supply<br>Temporary loss of 16 acres due to pipeline to Bayou Teche. | Raw Water Supply<br>Temporary loss of 9 acres agricultural land due to raw water well field.<br>Temporary loss of 69 acres due to pipeline to Lake Fausse Pointe.<br>Temporary loss of 117 acres due to pipeline to Gulf. |
| | | Brine Disposal<br>Loss of 48 acres due to construction of injection well field. | |
| | | | Crude Oil Distribution<br>Temporary loss of 68 acres due to pipeline to Napoleonville area. |
| | | Terminal Construction<br>(see Table C.3-2) | |
| | Bottomland and Swamp Forest | Site Preparation & Offsite<br>Loss of 48 acres due to facility construction. Revegetation of 17 acres likely. Minimal impact importance. | |
| | | Brine Spills<br>Large brine spill could destroy several acres along pipeline route. | |
| | | Brine Disposal<br>Loss of 7 acres due to construction of injection well field (mostly temporary). | Brine Disposal and Raw Water Supply<br>Loss of 66 acres swamp forest habitat due to construction of brine disposal or raw water supply lines to Gulf. |
| | | | Raw Water Supply<br>Loss of 3 acres of bottomland forest due to use of Lake Fausse Point water source |
| | | | Crude Oil Distribution<br>Loss of 264 acres due to construction of pipeline to Napoleonville area. |

# TABLE 4.6-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Aquatic | | |
| | Bayou Teche | Raw Water Supply<br>Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. | |
| | Tete Bayou and local water bodies near construction sites | Site Preparation<br>Minimal local impacts due to erosion and runoff. | |
| | | Brine Spills<br>Major brine spill remotely possible near Tete Bayou significant loss of biota would follow. | |
| | Gulf of Mexico | | Brine Disposal<br>Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brind diffuser. Dredging could destroy benthic habitats and reduce productivity. |
| Natural and Scenic Resources | All Pipeline Construction | ROW Clearing<br>Locally significant impact due to clearing along pipeline right-of-way. | |
| Socioeconomic Conditions | Cultural Resources | All Sites<br>Possibly loss or disruption of significant cultural resources. | |
| | Land Use | Alteration of land use on total of 290 acres in Iberia and St. Mary Parishes. | |
| | Transportation | Total construction wages, $5.8 million, much of which would be spent outside the local area. | |
| | Government | Possibly significant loss of property and severance tax revenues. | |

TABLE 4.6-5 Summary of environmental impacts caused by operation of Bayou Choctaw and Iberia SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Land Surface | Cavern Collapse<br>Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | |
| Water Resources | Bull Bay, ICW, and small water bodies near Bayou Choctaw dome | Oil and Brine Spills<br>Impacts from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months. | Raw Water Supply<br>Withdrawal from ICW would only lower water level and increase drainage rates from adjacent wetlands insignificantly. |
| | Mississippi River | Raw Water Supply<br>Withdrawal of up to 627,000 BPD for oil displacement over 150 day period expected to have no measurable effect on water quality or quantity.<br><br>Oil Spills<br>Could have significant local impacts.<br><br>Terminal Facility<br>(see Table C.3-3) | |
| | Gulf of Mexico | | Raw Water Supply or Brine Disposal<br>No effect on Gulf of Mexico water quality and quantity due to withdrawal; local alteration of salinity and water quality near brine diffuser; increased brine spill exposure. |
| | Ground Water | Brine Disposal<br>Brine injection should have no adverse impact.<br><br>Oil and Brine Spills<br>Very slight chance of local ground water pollution due to surface or brine oil spill; collapse of cavity roof could seriously degrade ground water supplies for Plaquemine area but such an occurrence is highly unlikely. | Raw Water Supply<br>Surface subsidence potential expected to be small due to ground water withdrawal of up to 640,000. |
| Air Quality | Oil Handling and Storage | Total Emissions<br>Emissions from 289 MMB oil storage facility for 5 fill and withdrawal cycles equal 53,700 to 59,800 tons, 38 percent due to expansion, 140 tons at Bayou Choctaw, 160 Tons at Iberia.<br><br>Storage in Surge Tanks<br>(see Table C.3-3)<br><br>Dock Transfers<br>(see Table C.3-3) | |

TABLE 4.6-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Noise | | Storage Site Operation<br>No significant increase in ambient sould levels on or adjacent to the site with either proposed or alternative facilities. | Onsite Power Generation<br>Would cause significant hydrocarbon emissions at Bayou Choctaw. |
| Species and Ecosystems | Terrestrial<br>Agricultural Land | Oil and Brine Spills<br>Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | |
| | | | Raw Water Supply<br>Withdrawal of water from wells would reduce area of pipeline ROW maintenance by 25 acres. |
| | | | Raw Water Supply or Brine Disposal<br>Use of Gulf of Mexico for raw water supply or brine disposal would greatly increase acreage required for right-of-way maintenance and would increase exposure to brine spills. |
| | | Terminal Facilities<br>(see Table C.3-3) | |
| | Bottomland and Swamp Forest | Oil and Brine Spills<br>Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Raw Water Supply and Brine Disposal<br>Use of Gulf of Mexico for raw water supply or brine disposal would greatly increase required acreage for right-of-way maintenance, and would increase exposure to brine spills. |
| | | Storage Site Maintenance Clearing<br>Continued maintenance of 36 acres would reduce available habitat in region by an insignificant amount. | |
| | Marsh | | Raw Water Supply and Brine Disposal<br>Use of Gulf of Mexico for raw water supply or brine disposal would greatly increase required acreage for right-of-way maintenance, and would increase exposure to brine spills. |
| | Aquatic<br>Bull Bay, ICW, and local water bodies near Bayou Choctaw dome | Oil and Brine Spills<br>Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life. | |
| | | | Raw Water Supply<br>Withdrawal of water from ICW could significantly reduce standing crop of plankton and other small organisms. |
| | Mississippi River | Oil Spills<br>Potential oil spill impacts could be locally significant, especially at dock site and in lower delta. | |
| | | Raw Water Supply<br>No measurable impact on aquatic life due to water withdrawal. | |

TABLE 4.6-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT<br>PROPOSED PHYSICAL FACILITY | <br>ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Gulf of Mexico | <u>Oil Spills</u><br>Expected oil spill volume could significantly affect marine biota. Estimated total 4541 barrels of oil from all SPR operations in the Gulf during project lifetime.<br><br>Possibly very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. | <u>Brine Disposal</u><br>Brine could destroy benthic habitats and reduce productivity. Small impact on plankton and nekton. Possible alteration of migration routes. |
| <u>Natural and Scenic Resources</u> | | <u>Oil Spills</u><br>Adverse impacts associated with possible large oil spill which could foul swamp forest and marshes and contaminate water with oil.<br><br><u>Operation and Maintenance</u><br>Pipeline ROW maintenance would have small adverse aesthetic impacts. | <u>Raw Water Supply or Brine Disposal</u><br>Pipelines to Gulf Coast would have additional adverse resource impact.<br><br><u>Onsite Power Generation</u><br>Would require a 200 foot emissions stack at Bayou Choctaw. |
| <u>Socioeconomic Environment</u> | Economy | <u>Storage Site Employment</u><br>Total wages expected to be approximately \$68,000 during each month of oil fill and withdrawal; \$44,000 during standby. | |

TABLE 4.6-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Land Surface | Cavern Collapse<br>Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | |
| Water Resources | Tete Bayou and small water bodies near Iberia dome and along oil pipeline to Weeks Island. | Oil and Brine Spills<br>Impacts from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months. | |
| | Pipeline Corridor between Iberia and terminal | | Crude Oil Distribution<br>Maintained area of 207 acres. Possible impact from oil spill. |
| | Bayou Teche | Raw Water Supply<br>Withdrawal of up to 333,000 BPD for oil displacement over 150-day period expected to have no measureable effect on water quality or quantity.<br>Oil Spills<br>Could have significant local impacts. | |
| | Lake Fausse Point | | Raw Water Supply<br>Withdrawal from Lake Fausse Point could lower water level a small amount and increase drainage from adjacent wetlands during low flow periods. |
| | Mississippi River | Terminal Facilities<br>(see Table C.3-3) | |
| | Gulf of Mexico | | Raw Water Supply or Brine Disposal<br>No effect on Gulf of Mexico water quality and quantity due to withdrawal; local alteration of salinity and water quality near brine diffuser; increased brine spill exposure. |
| | Ground Water | | Brine Disposal<br>Brine injection should have no adverse impact.<br>Oil and Brine Spills<br>Very slight chance of local ground water pollution due to surface or brine oil spill; collapse of cavity roof could seriously degrade ground water supplies for Iberia area but such an occurrence is highly unlikely. |
| Air Quality | Oil Handling and Storage | Total Emissions<br>Minor release of hydrocarbons from onsite brine pond and oil surge tanks, Total - 160 tons. | |
| | | | Onsite Power Generation<br>Would cause significant increase in pollutant emissions at dome. |

TABLE 4.6-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSCIAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Noise | | Storage Site Operation<br>No significant increase in ambient sound levels on or adjacent to the site with either proposed or alternative facilities. | |
| Species and Ecosystems | *Terrestrial*<br>Agricultural Land | Oil and Brine Spills<br>Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | Oil Spills<br>Possible oil spills would have local, short-term, adverse effects on productivity.<br><br>Raw Water Supply<br>Withdrawal of water from wells would slightly reduce pipeline ROW maintenance.<br>Use of Gulf of Mexico for raw water supply would increase maintenance acreage along pipelines. |
| | Bottomland, Swamp Forest and Marsh | Oil and Brine Spills<br>Possible oil or brine spill from pipelines could have locally significant adverse impacts.<br><br>Facility and ROW Maintenance Clearing<br>Continued maintenance of 56 acres would reduce available habitat in region by an insignificant amount. | Oil Spills<br>Possible oil spills would have local, short-term, adverse effects on productivity. |
| | Aquatic<br>Tete Bayou and local water bodies along oil pipeline ROW to Weeks Island | Oil and Brine Spills<br>Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life. | Oil Spills<br>Would cause locally significant impacts on aquatic life. |
| | Bayou Teche | Raw Water Supply<br>No significant impact on aquatic life due to water withdrawal. | Raw Water Supply<br>Withdrawal of water from wells would eliminate possibility of adverse effects on Bayou Teche. |
| | Lake Fausse Point | | Raw Water Supply<br>Withdrawal of water from Lake Fausse Point should have little regional effect on standing crop of plankton and other small organisms. |
| | Gulf of Mexico | | Raw Water Supply<br>Withdrawal of water from the Gulf of Mexico should have little regional effects on standing crop of plankton and other small organisms.<br><br>Brine Disposal<br>Brine could destroy benthic habitats and reduce productivity. Small impact on plankton and nekton. Possible alteration of migration routes. |

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Natural and Scenic Resources | | Oil Spills<br>Adverse impacts associated with possible large oil spill which could foul swamp forest and marshes and contaminate water with oil. | Oil Spills<br>Adverse impacts associated with possible large oil spill which could foul swamp, forest and marshes and contaminate water with oil. |
| | | Operation and Maintenance<br>Pipeline ROW maintenance would have adverse aesthetic impacts. | |
| | | — | Raw Water Supply or Brine Disposal<br>Pipelines to Gulf Coast would have additional adverse resource impact. |
| | | | Onsite Power Generation<br>Would add a highly visible emissions stack to Iberia dome. |
| Socioeconomic Environment | Economy | Stroage Site Employment<br>Total wages expected to be approximately $56,000 during each month of oil fill and withdrawal; $26,000 during standby. | |

## 4.7 ALTERNATIVE GROUPING NO. 3 - EARLY STORAGE SITES PLUS CHACAHOULA DOME

### 4.7.1 Introduction

Expected and potential environmental impacts associated with the third alternative development plan for the Capline Group are summarized in this section. Types of impacts associated with the development and use of the Bayou Choctaw and Weeks Island early storage sites, which are treated in detail in previously published EIS are briefly discussed in Section 4.4.1.5. Section 4.7.2 considers impacts associated specifically with the Chacahoula SPR development and also with significant cumulative impacts associated with full development of the Capline Group. Impacts related to terminal facilities are described in Section 4.3. These impacts, as well as those associated with pipelines and storage sites, are summarized in Section 4.7.3.

### 4.7.2 Impacts of Development at Chacahoula Dome

#### 4.7.2.1. Impacts of Site Preparation and Construction

Quantities of material to be excavated or filled and acreages of land to be affected by grading and other construction activities at Chacahoula dome, along pipeline routes, and at the distribution terminal are listed in Table 2.6-1. Summary of construction impacts is presented in Section 4.7.3.

##### 4.7.2.1.1 Land Features

Within the 450-acre fenced area, onsite grading at the Chacahoula site would be confined to about 191 acres of undisturbed swampland. Plant area construction would require 71,000 cy excavation and 354,000 cy of fill.

Offsite facilities would require the disturbance of 629 acres on land and 574 acres offshore, 60,000 cy of fill, and 1,370,700 cy excavation for grading and pipeline rights-of-way. The brine disposal systems affect 969 acres,while the raw water system requires 20 acres, and the crude oil system, 214 acres.

Offsite pipeline construction would temporarily disturb 1201 acres of land and require about 1,370,700 cubic yards of earth excavation and the pump station would require an additional 2 acres. Before revegetation of disturbed areas is complete, some erosion of the soil may be expected.

Leaching up to 24 storage cavities in the Chacahoula salt dome would involve removal of about 200 MMB of salt by leaching for disposal in deep salt water bearing sands. This is equivalent to as much as 42 x $10^6$ cy of salt. Sufficient wall thickness would be maintained between cavities to maintain cavern integrity.

Quantities of material to be excavated or filled and acreages of land to be affected by construction activities for Chacahoula are listed in Table 2.6-2. Brine disposal to deep salt water bearing sands would substantially reduce the amount of land and soil excavated. Use of the Mississippi River, the Gulf of Mexico, or subsurface aquifers for a raw water supply would increase the amount of land required for the project.

4.7.2.1.2 Water Resources

Site preparation and construction of the proposed facilities at Chacahoula may directly affect several water bodies, including: canals and small water bodies on site; Bayou Lafourche; small bayous and canals crossed by the pipeline right-of-way; the Mississippi River; the Gulf of Mexico; and ground water aquifers.

The proposed brine disposal location for the Chacahoula site is located in the coastal waters of the Gulf of Mexico, approximately 26 miles south of Pointe Au Fer at a depth of about 30 feet. Pipeline construction impacts are summarized in Section 4.1.2.

During the construction phase, an average of approximately 1.25 MMBCD of brine with a salinity 200 parts per thousand (ppt) greater than ambient (about 30 to 35 ppt) would be disposed. Possible effects are summarized in Section 4.1.2.

4.7.2.1.3 Air Quality

The quality of air in the vicinity of Chacahoula and along the pipeline rights-of-way would be slightly affected during site preparation and construction. The sources of emissions would generally be short-term and over a small area. (Hydrocarbon emissions at the terminals are discussed in Section 4.3.2.3.)

4.7.2.1.4 Noise

Construction activities at the site, and along the pipeline routes would raise noise levels in the vicinity of the construction activity. Most of the impacts would be short term and local in nature. Exceptions to this pattern would occur where drilling rigs would be near settled areas for several months.

4.7.2.1.5 Impact on Ecosystems and Species

Development of the Chacahoula site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. The total area involved for each habitat is presented in Table 2.6-1.

Of the total 1394 acres of wildlife habitat disturbed due to grading and excavation both in the plant area and offsite, 422 acres of swamp, 298 acres of marsh, and 574 acres of open water bodies would be disturbed. The remaining 100 acres is land already disturbed.

Since 450 acres would be enclosed by fencing and 1203 acres disturbed offsite, it can be assumed that, except in the case of avifauna, the available resources provided by the habitat would be lost to many other wildlife groups during construction, totalling 1653 acres.

Impacts to ecosystems and species at Chacahoula dome are expected to be similar to those discussed for the development of Napoleonville. The differences would be related to the relative areas and volumes disturbed during construction of the facility. The impacts of constructing the brine disposal pipeline and of disposing the leach water to the Gulf of Mexico would be similar in type to those discussed in Section 4.1.2.

Water bodies that would be affected by pipeline construction include the swamp to the south of the site, Bubbling Bayou, Bayou Lafourche, and several smaller creeks and canals. The proposed raw water supply pipeline from Bayou Lafourche has a 6.5 mile long pipeline which will use 17 acres of terrestrial habitat and 1 acre of aquatic habitat. Since a major portion of the area used by this system would be on cleared or developed land, or deciduous swamp, the terrestrial impacts would be minimal in these areas.

The primary aquatic impact related to the raw water supply system would be the entrainment of plankton, drifting invertebrates, and larval fish from Bayou Lafourche, and the impingement of juvenile fish on the intake screen. Entrained organisms would be lost since they would be unable to withstand the high salinity within the cavities. Assuming an even distribution of entrainable organisms, about 39 percent wou l be lost, based on an average daily flow in Bayou Lafourche of 414 cf . (including increased pumped capacity) and a maximum intake rate to the storage site of 162 cfs. Although this is a high proportion of the total flow in Bayou Lafourche, it is only a small fraction of a percent of the flow of the Mississippi River (from which most of the water in Bayou Lafourche is pumped). Therefore, the overall impact would be moderate to low for the overall system.

4.7.2.1.6 Natural and Scenic Resources

Construction at the storage site would diminish the quality of the natural and scenic resources in the immediate vicinity of the dome. Loss of trees and other vegetation would occur due to construction of well pads, roads and the plant area. Grading and filling at the site would further alter the natural terrain. Dust, noise, fumes and siltation would have a significant adverse effect during construction. For the most part, these impacts would not be noticable from Route 20 or from the towns of Chacahoula or Thibodaux.

The oil pipeline to Chacahoula would be 21.9 miles long. This segment would be in a natural state before construction. Construction activities would disrupt natural vegetation with the right-of-way. Sections of the pipeline would be visible at some points from public roadways (Highways 20 and 308).

The pipeline construction activities would have significant adverse impact on the natural areas crossed. The dust, noise, fumes and vibration of construction would also have negative impacts on the aesthetic quality of the areas crossed, particularly on the Lafourche ridge. These effects would be temporary.

The brine disposal system and its backup wells would impact both cleared land areas and natural swamp environments with 42.3 miles of pipeline right-of-way on land. This construction would significantly affect the natural qualities of the area by clearing vegetation and disrupting habitat. For the limited number of individuals passing the area during construction, the scenic qualities of the area would be significantly diminished. However, this area does not offer any unique habitat types that could not be found elsewhere.

#### 4.7.2.1.7 Archaeological, Historical and Cultural Resources

There are numerous sites of historic, archaeological or cultural significance in the area immediately surrounding the storage site. While no direct impact on any of these resources is anticipated, new sites may be discovered during development. If any archaeological or historic material were found, it would be immediately reported to State officials so that appropriate action could be taken to salvage or stabilize the material. Further studies would be conducted to assure no areas of value would be disturbed.

#### 4.7.2.1.8 Socioeconomic Environment

Construction activities would alter land use at the storage site. Some of the land has been previously disrupted during brining operations. Conversion of existing facilities and development in new areas would impact some previously undisturbed wooded areas. The project would require fencing of a 450 acre tract of land at the storage site for the plant area, roadways, wellheads, pipelines and brine pond. Approximately 191 acres of land within this tract would be directly developed with facilities. An additional 1203 acres would be developed offsite.

Project construction activities at the storage site would require most of the peak work force of over 900 employees during the third and fourth months of construction. Routes 309, 20, and 1 would be the most heavily impacted roads. While peak capacity is not expected to be exceeded, some congestion could occur, especially during the first six months of construction.

The peak construction work force would number over 600 workers for the entire project with most employed at the storage site. Most workers are expected to commute from nearby communities such as Morgan City and Houma, others may commute from as far as New Orleans. The impacts on population in Terrebonne and Lafourche Parishes should not be significant. However, the increase in daytime population should produce a significant impact on small towns such as Chacahoula. Thibodaux would also feel the effects of the large work force since it is the closest community with a variety of urban services.

The availability of both permanent and temporary housing is low in the project area. Communities such as Morgan City, Houma, and Thibodaux would experience a substantial increase in demand for housing (especially temporary) during the first six months of the project. Demand would lessen considerably after that, as labor force levels decline.

Construction employment for the project including the storage site would have a beneficial impact on the local economy and employment levels. Louisiana has limited industrial development and the project would therefore exert a beneficial influence. Project payroll would total over $12 million (over three years) with over 40 percent ($5.2 million) paid during the first six months.

The project would increase the demand for public services near the storage site. Increased traffic surveillance and road maintenance would be provided, if necessary, by the parishes involved. The impact on health facilities would be minor due to the availability of facilities in the neighboring communities and the site's proximity to New Orleans and Baton Rouge. The parishes will not receive any severance or property taxes from the project, but would indirectly receive sales tax revenues from worker spending which would help offset incremental costs related to the project.

4.7.2.2 Impacts from Operation and Standby Storage

SPR development at Chacahoula would not introduce any new or unique operational impacts to the program, but would require extended use of terinal systems to accommodate a capacity increase from approximately 183 MMB to 383 MMB (109 percent increase). Principal impacts of the Chacahoula SPR operation are associated with hydrocarbon emissions and oil or brine spills. Impacts expected to accompany early storage facility operation and Chacahoula facility operation are both given where appropriate to provide a perspective on program expansion impact significance.

4.7.2.2.1 Land Features and Geologic Impacts

Effects of operation and standby of the Chacahoula storage site on land features are expected to be minimal. Compared to the 1653 acres required during construction offsite and within the 450-acre fenced area, only 844 acres would be maintained during operation. No significant disturbance of site soils is expected after construction is completed. Soils would stabilize soon after they were revegetated. Continued maintenance of pipeline right-of-way would impact acreage as summarized in Table 2.7-1.

4.7.2.2.2 Water Resources

Impacts to water resources during facility operation may occur as a result of raw water withdrawal for oil displacement, brine disposal during oil filling (Section 4.1.3), and possible oil or brine spills (see Section 4.2 and Tables 4.7-1 and 4.7-2).

4.7.2.2.3 Air Quality

During operation, the air quality impacts for 200 MMB storage capacity at Chacahoula would be very similar to the air quality impacts for Napoleonville. The largest potential effects on air quality would be those resulting from hydrocarbon emissions during fill and withdrawal cycles as discussed in Section 4.3.3.3.

On-site emissions at Chacahoula would be increased over Napoleonville (see Section 4.4.2.2.3) by the larger brine pond and brine throughput. Over the project lifetime, brine pond emissions are anticipated to total up to 500 tons.

4.7.2.2.4 Noise

Noise impacts associated with the operation of an SPR facility at the Chacahoula site would be negligible.

4.7.2.2.5 Species and Ecosystems

Operational impacts of the proposed SPR facilities on biological resources in the area are principally related to the potential for oil or brine spills (see Section 4.2 and Tables 4.7-1 and 4.7-2). Also, raw water must be withdrawn from Bayou Lafourche (and in turn pumped from the Mississippi River) to displace oil from the caverns, and brine must be discharged to the Gulf of Mexico during oil filling (Section 4.1.3) with no resulting effects on aquatic resources. Normal surface activities at the storage site and in the vicinity of the tanker docks would exclude wildlife from the immediate project vicinity, and pipeline rights-of-way to be maintained would total 394 additional acres. This is an expansion of the existing industrial use of the project lands but is not a new or significantly adverse impact.

4.7.2.2.6 Natural and Scenic Resources

Normal operation of the Chacahoula site and associated facilities is not anticipated to bring additional impacts on scenic, recreational, or natural resources. In some cases the impacts would be reduced during this stage, as some areas at the storage site and along the pipelines would be allowed to revegetate.

4.7.2.2.7 Archaeological, Historical and Cultural Resources

Following construction none of the operation characteristics of any of the facilities are expected to negatively impact any of these resources.

4.7.2.2.8 Socioeconomic Environment

The operation of the storage site would have some effect on population in the surrounding area. The project would have a total of 60 employees on-site in three shifts during fill and withdrawal operations. During standby operations, only about 25 employees would work at the site. Most of these workers may come from the existing labor pool in the parishes surrounding the site.

The operation of the SPR project would have a significant positive effect on the economy of the region. Supplies for some operations may be purchased from existing petrochemical and service industries. In some local areas a large beneficial effect would result from the increased purchases by employees.

### 4.7.3 Summary of Adverse and Beneficial Impacts

Development of the Chacahoula salt dome as an oil storage facility is not likely to generate significant regional environmental impacts except for the possibility of a major oil spill (Tables 4.7-1 and 4.7-2) and the uncontrolled release of hydrocarbon vapors during oil transportation. Expected emissions are summarized in Section 4.3. Brine spill expectations are summarized in Table 4.7-3.

Findings of the various discipline analyses related to impacts of project construction are summarized in Table 4.7-4. Those related to project operation are included in Table 4.7-5.

TABLE 4.7-1a Expected crude oil spills during cavern fill operations - alternative grouping #3 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Chacahoula | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 37.1 | 600 | 71.0 | 1,149.0 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.0213 | 23.7 | 0.041 | 45.3 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.510 | 218 | 0.484 | 207 | 1.087 | 465 | 2.081 | 890 | 60,000 |
| Koch Transfers | 27 | 3.48 | 94 | - | - | 1.78 | 48 | 5.26 | 142 | 500 |
| DOE Transfers | 27 | - | - | 3.30 | 89 | 5.63 | 152 | 8.93 | 241 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.029 | 31.6 | 0.042 | 46.5 | 0.024 | 26.7 | 0.095 | 104.8 | 5,000 |
| Terminals | | | | | | | | | | |
| Koch | 1100 | 0.047 | 51.7 | - | - | 0.024 | 26.4 | 0.071 | 78.1 | 5,000 |
| DOE | 1100 | - | - | 0.045 | 49.0 | 0.076 | 83.6 | 0.121 | 132.6 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.100 | 50.0 | 0.192 | 95.8 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.52 | 711.9 | 20.42 | 691.3 | 45.84 | 1475.4 | 87.79 | 2,878.6 | |
| Total | | | | | | | | | | |
| 5 Fills | | 107.6 | 3559 | 102.1 | 3457 | 229.2 | 7377 | 438.9 | 14,393 | |

[a]383 MMB total capacity distributed as follows: 200 MMB expansion capacity at Chacahoula dome
94 MMB early storage capacity at Bayou Choctaw
89 MMB early storage capacity at Weeks Island

TABLE 4.7-1b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectations - alternative site grouping #3 - DOE/Koch terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Chacahoula | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.0022 | 2.4 | 0.009 | 10.4 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.324 | 139 | 0.324 | 139 | 0.194 | 82.9 | 0.842 | 360.9 | 60,000 |
| Koch Transfers | 80.6 | 1.49 | 120 | - | - | - | - | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | - | - | 1.49 | 120 | 0.89 | 72 | 2.38 | 192 | 500 |
| Bull Bay | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | - | - | - | - | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | - | - | - | - | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.009 | 9.5 | 0.014 | 14.9 | 0.007 | 7.5 | 0.030 | 31.9 | 5,000 |
| Terminals | | | | | | | | | | |
| Koch | 1100 | 0.030 | 33 | - | - | - | - | 0.030 | 33 | 5,000 |
| DOE | 1100 | - | - | 0.030 | 33 | 0.018 | 19.8 | 0.048 | 52.8 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.100 | 50.0 | 0.192 | 95.8 | 3,000 |
| Total | | | | | | | | | | |
| Single Withdrawal | | 6.08 | 345.3 | 1.91 | 333.2 | 1.21 | 234.6 | 9.20 | 913.1 | |
| Total | | | | | | | | | | |
| 5 Withdrawals | | 30.4 | 1727 | 9.5 | 1666 | 6.1 | 1173 | 46.0 | 4,566 | |
| Project Total | | | | | | | | | | |
| 5 Cycles | | 138.0 | 5286 | 111.6 | 5123 | 235.2 | 8550 | 484.9 | 18,959 | |

TABLE 4.7-2a Expected crude oil spills during cavern fill operations - alternative site grouping #3 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Chacahoula | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 37.1 | 600 | 71.0 | 1,149.0 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.0 | 0.0095 | 10.6 | 0.0213 | 23.7 | 0.041 | 45.3 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.657 | 281 | 0.484 | 207 | 1.273 | 545 | 2.414 | 1,033 | 60,000 |
| Nordix Transfers | 27 | 3.48 | 94 | - | - | 4.40 | 119 | 7.88 | 213 | 500 |
| DOE Transfers | 27 | - | - | 3.30 | 89 | 3.01 | 81 | 6.31 | 170 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.013 | 14.6 | 0.042 | 46.5 | 0.049 | 53.4 | 0.104 | 114.5 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.047 | 51.7 | - | - | 0.059 | 65.5 | 0.106 | 117.2 | 5,000 |
| DOE | 1100 | - | - | 0.045 | 49.0 | 0.041 | 44.6 | 0.086 | 93.6 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.100 | 50.0 | 0.192 | 95.8 | 3,000 |
| Total | | | | | | | | | | |
| Single Fill | | 21.65 | 757.9 | 20.42 | 691.3 | 46.05 | 1582.2 | 88.13 | 3,031.4 | |
| Total | | | | | | | | | | |
| 5 Fills | | 108.3 | 3,789 | 102.1 | 3457 | 230.2 | 7911 | 440.6 | 15,157 | |

[a] 383 MMB total capacity distributed as follows: 200 MMB expansion capacity at Chacahoula dome
94 MMB early storage capacity at Bayou Choctaw
89 MMB early storage capacity at Weeks Island

TABLE 4.7-2b Expected crude oil spills during emergency oil withdrawal operations and total system spill expectations - alternative site grouping #3 - DOE/Nordix terminal combination.

| | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Chacahoula | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.0022 | 2.4 | 0.009 | 10.4 | 60,000 |
| Mississippi River | | | | | | | | | | |
| Vessel Casualty | 428 | 0.418 | 179 | 0.324 | 139 | 0.259 | 111 | 1.001 | 429 | 60,000 |
| Nordix Transfers | 80.6 | 1.49 | 120 | - | - | 0.89 | 72 | 2.38 | 192 | 500 |
| DOE Transfers | 80.6 | - | - | 1.49 | 120 | - | - | 1.49 | 120 | 500 |
| Bull Bay | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | - | - | - | - | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | - | - | - | - | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | |
| Pumping | 1100 | 0.009 | 10.4 | 0.014 | 15.6 | 0.010 | 10.6 | 0.033 | 36.6 | 5,000 |
| Terminals | | | | | | | | | | |
| Nordix | 1100 | 0.030 | 33 | - | - | 0.018 | 19.8 | 0.048 | 52.8 | 5,000 |
| DOE | 1100 | - | - | 0.030 | 33 | - | - | 0.030 | 33 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.100 | 50.0 | 0.192 | 95.8 | 3,000 |
| Total | | | | | | | | | | |
| Single Withdrawal | | 6.17 | 386.2 | 1.91 | 333.9 | 1.28 | 265.8 | 9.36 | 985.9 | |
| Total | | | | | | | | | | |
| 5 Withdrawals | | 30.9 | 1931 | 9.5 | 1670 | 6.4 | 1329 | 46.8 | 4,930 | |
| Project Total | | | | | | | | | | |
| 5 Cycles | | 139.2 | 5720 | 111.6 | 5127 | 236.6 | 9240 | 487.4 | 20,087 | |

TABLE 4.7-3 Expected brine spill during leaching and fill operations - Alternative Group 3 [a,b]

| | Leaching | Cavern Fill | Program Total 5 cycles + leach | Average Spill Siz (BBL) |
|---|---|---|---|---|
| Chacahoula | | | | |
| No. Spills | .072 | .047 | .307 | |
| Barrels | 360.5 | 236.9 | 1545 | 5000 |
| Bayou Choctaw | | | | |
| No. Spills | - | .003 | .015 | |
| Barrels | - | 7.7 | 38.5 | 3000 |
| TOTAL | | | | |
| No. Spills | .072 | .050 | .322 | |
| Barrels | 360.5 | 244.6 | 1583.5 | - |

[a] maximum credible spill 30,000 BBL

[b] Weeks Island early storage is non-contributing

TABLE 4.7-4 Summary of environmental impacts caused by development of Chacahoula SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Chacahoula dome and immediate vicinity | Site Preparation: 71,000 cy of excavation and 354,000 cy of fill for the central plant area, brine surge pond, containment dikes, access roads, and other surface facilities. Direct impacts on 191 acres<br><br>Cavern Leaching: Up to 42 x $10^6$ cy of salt removed from the dome by leaching. | |
| | | | Brine Disposal: Pressurization of brine disposal aquifers. |
| | Terminal Facilities Pipeline Corridors between Chacahoula and: | Site Preparation and Pipeline Connection (see Table C.3-2) | |
| | St. James Terminal | Crude Oil Distribution: Temporary excavation of 255,000 cy of earth and clearing of vegetation from 213 acres in the pipeline ROW. | |
| | Bayou LaFourche | Raw Water Supply: 76,000 cy of temporary excavation from 17 acres in pipeline ROW. | |
| | Mississippi River | | Raw Water Supply: 255,000 cy of excavation and clearing of vegetation from 54 acres in the pipeline right-of-way. |
| | Gulf of Mexico | Brine Disposal: 1,009,700 cy of excavation (mostly temporary) and clearing of 392 acres of vegetation in pipeline ROW | Raw Water Supply: 667,600 cy of excavation (mostly temporary) and clearing of vegetation from 99 additional acres (assuming raw water pipeline to Gulf is constructed in brine disposal pipeline ROW).<br><br>Brine Disposal: 989,100 cy of excavation (mostly temporary) and clearing of 392 acres of vegetation in pipeline ROW |
| | Ground Water | | Raw Water Supply: 103,000 cy of excavation (mostly temporary), 145,000 cy of fill and clearing of vegetation from 87 acres in pipeline ROW.<br><br>Possible surface subsidence over well field. |

TABLE 4.7-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Water Resources | Bubbling Bayou, Chacahoula Bayou and wetlands adjacent to the storage site | Site Preparation<br>Significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff.<br><br>Oil and Brine Spills<br>Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | |
| | Water bodies and wetlands crossed by pipeline ROW | Site Preparation and Pipeline Construction<br>Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | |
| | Bayou Lafourche | Raw Water Supply<br>2,810,000 BPD pumped from Mississippi River would increase turbidity and bank erosion from Donaldsonville to intake 5 miles north of Plaquemine and occasionally downstream; minimal effect on water quality/quantity expected. | |
| | Mississippi River | Raw Water Supply<br>Diversion of 2,810,000 BPD of water to Bayou Lafourche would not significantly affect river quality or flow rate.<br><br>Terminal Construction<br>(see Table C.3-2) | Raw Water Supply<br>Same as proposed. |
| | Gulf of Mexico | Brine Disposal<br>Disposal of brine in Gulf could cause local salinity excesses of 12 percent or less over several hundred acres and could alter surface water quality. Pipeline construction would create locally significant levels of turbidity and possibly reduce dissolved oxygen. Resuspension of pollutants from sediment. | Raw Water Supply<br>Withdrawal from Gulf - no significant effect on water quality; construction of supply pipeline would have significant local affects for most of its 42.4 mile length.<br><br>Brine Disposal<br>Same as proposed. |
| | Subsurface aquifers | | Brine Disposal<br>Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells.<br><br>Raw Water Supply<br>Withdrawal from subsurface aquifers could affect water table and induce surface subsidence, though considered unlikely; construction effect locally significant. |
| Air Quality | All Construction Sites | Site Preparation<br>Minor quantities of particulates, $SO_2$, CO, HC and $NO_x$ released from construction equipment; minimal effect. | |

TABLE 4.7-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Chacahoula dome | Site Preparation and Painting<br>Short term HC concentrations of up to 104 $\mu g/m^3$ at 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Chacahoula. | |
| | | Brine Disposal<br>Construction of a brine disposal pipeline to the Gulf eliminates locally continuous emissions at Chacahoula and adds dispersed pipeline emissions. | Raw Water Supply<br>Development of a well field for raw water supply may decrease emission at Chacahoula (except HC from painting) by 50 percent.<br><br>Brine Disposal<br>Same as proposed. |
| | Terminal Facilities | Site Preparation and Painting<br>(see Table C.3-2) | |
| Noise Level | Storage Site | Site Preparation and Cavern Well Drilling<br>Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 10 structures may be affected. | |
| | Pipeline Routes | Pipeline Construction<br>Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | |
| | | | Raw Water Supply<br>Ground water supply well field would raise noise levels for 25 or more residences.<br><br>Brine Disposal<br>Brine disposal pipeline and raw water supply pipeline would affect noise levels for over 25 residences. |
| | Terminal Facilities | Site Preparation<br>(see Table C.3-2) | |
| Species and Ecosystem | Terrestrial<br>Agricultural Land | Site Preparation<br>Temporary loss of 100 acres due to facility construction. Minimal impact importance. | |
| | | | Raw Water Supply<br>Loss of 53 acres agricultural land due to raw water well field. Loss of 22 acres agricultural land due to pipeline to Mississippi River. Loss of 2 acres to agricultural use due to pipeline to the Gulf. |
| | Bottomland and Swamp Forest | Site Preparation<br>Loss of 422 acres due to facility construction. Revegetation of 151 acres likely. Minimal impact importance. | |
| | | Brine Spills<br>Large brine spill could destroy several acres near Chacahoula dome. | Raw Water Supply - Temporary<br>Loss of 22 acres habitat due to construction of pipeline to Gulf of Mexico (in addition to acreage for brine disposal pipeline.) |

TABLE 4.7-4 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | Brine Disposal<br>Loss of 92 acres (swamp forest) due to construction of brine disposal supply lines to Gulf. | |
| | | | Raw Water Supply<br>Loss of 34 acres of swamp forest due to use of raw water well field. Loss of 32 acres of swamp forest due to use of raw water pipeline to Mississippi River.<br><br>Brine Disposal<br>Same as proposed. |
| | Aquatic<br>Bayou Lafourche | Raw Water Supply<br>Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. | |
| | Bubbling Bayou and local water bodies near construction sites | Site Preparation<br>Minimal local impacts due to erosion and runoff.<br><br>Brine Spills<br>Major brine spills remotely possible near Bubbling Bayou; significant loss of biota would follow. | |
| | Mississippi River | Raw Water Supply<br>Minor additional displacement of plankton to Bayou Lafourche through lift pumps. | Raw Water Supply<br>Same as proposed. |
| | Gulf of Mexico | Brine Disposal<br>Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce productivity. | Brine Disposal<br>Same as proposed. |
| Natural and Scenic Resources | All Pipeline Construction | ROW Clearing<br>Locally significant impact due to clearing along pipeline right-of-way. | |
| Socioeconomic Conditions | Cultural Resources | All Sites<br>Possibly loss or disruption of significant cultural resources. | |
| | Land Use | Alteration of land use on total of 1653 acres in Terrebonne and St. James Parishes. | |
| | Economy | Total construction wages, $13.4 million, much of which would be spent outside the local area. | |
| | Government | Possibly significant loss of property and severance tax revenues. | |
| | Transportation | Potential for locally significant traffic increase at shift changes; overall; congestion should not be significant. | |

TABLE 4.7-5 Summary of environmental impacts caused by operation of Chacahoula SPR facilities.

| SUBJECT AREA | AFFECTED ENVIRONMENT | PROPOSED PHYSICAL FACILITY | ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| Geology and Land Features | Land Surface | Cavern Collapse<br>Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | |
| Water Resources | Bubbling Bayou and small water bodies near Chacahoula dome | Oil and Brine Spills<br>Impacts from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months. | |
| | Bayou Lafourche | Raw Water Supply<br>Pumping of up to 2,500,000 BPD through Bayou Lafourche would increase stage, erosion, and turbidity.<br><br>Oil Spills<br>Small potential for oil spills. | |
| | Mississippi River | Raw Water Supply<br>Withdrawal of up to 1,340,000 BPD for oil displacement over 150 day period expected to have no measureable effect on water quality or quantity.<br><br>Oil Spills<br>Could have significant local impacts.<br><br>Terminal Facilities<br>(see Table C.3-3) | Raw Water Supply<br>Same as proposed. |
| | Gulf of Mexico | Brine Disposal<br>Local alteration of salinity and water quality near brine diffuser; increased brine spill exposure | Raw Water Supply<br>No effect on Gulf of Mexico water quality and quantity due to withdrawal.<br><br>Brine Disposal<br>Same as proposed. |
| | Ground Water | Oil and Brine Spills<br>Very slight chance of local ground water pollution due to surface or brine oil spill; collapse of cavity roof could seriously degrade ground water supplies for Napoleonville area but such an occurence is highly unlikely. | Raw Water Supply<br>Surface subsidence potential expected to be small due to ground water withdrawal of up to 2,500,000 BPD<br><br>Brine Disposal<br>Brine injection should have no adverse impact. |
| Air Quality | Oil Handling and Storage | Total Emissions<br>Emissions from 383 MMB oil storage facility for 5 fill and withdrawal cycles equal 77,200 to 78,900 tons, 53 percent due to expansion, 535 tons at Chacahoula. | |

TABLE 4.7-5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | | Storage in Surge Tanks (see Table C.3-3) | |
| | | Dock Transfers (see Table C.3-3) | |
| | | Terminal Facilities (see Table C.3-3) | |
| Noise Level | | Storage Site Operation: No significant increase in ambient sound levels on or adjacent to the site with either proposed or alternative facilities. | |
| Species and Ecosystems | Terrestrial | | |
| | Agricultural Land | Oil and Brine Spills: Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | |
| | | Purchase of Commerical Power: Would require maintenance of a 5-mile transmission line ROW. | |
| | | | Raw Water Supply: Withdrawal of water from wells would add 46 acres of pipeline ROW maintenance but eliminate possibility of adverse effects on Bayou Lafourche. |
| | | Terminal Facilities (see Table C.3-3) | |
| | Bottomland and Swamp Forest | Oil and Brine Spills: Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Raw Water Supply: Use of Gulf of Mexico for water supply would increase maintenance acreage required along pipeline. |
| | | Storage Site and Pipeline Corridor Maintenance Clearing: Continued maintenance of 271 acres would reduce available habitat in region. | |
| | Marsh | Brine Spill: Brine spill from pipeline could have significant local impacts. | |
| | | Pipeline Corridor Maintenance Clearing: Continued maintenance of 186 acres would reduce available habitat in region. | |
| | Aquatic | | |
| | Bubbling Bayou and local water bodies near Chacahoula dome | Oil and Brine Spills: Possibility of major spill of brine or oil from pipeline considered remote would cause locally significant impacts on aquatic life. | |
| | Bayou Lafourche | Raw Water Supply: Average flow rate increased by about 40 percent from Donaldsonville to Labadieville during oil withdrawal (150 day period, expected five times in project life); increased turbidity; impact on aquatic biota not expected to be of regional significance. | |

TABLE 4.7- 5 continued.

| SUBJECT AREA | AFFECTED ENVIRONMENT | EXPECTED IMPACT: PROPOSED PHYSICAL FACILITY | EXPECTED IMPACT: ALTERNATIVE PHYSICAL FACILITY |
|---|---|---|---|
| | Mississippi River | Oil Spills (see Table C.3-3) | |
| | | | Raw Water Supply No measureable impact on aquatic life due to water withdrawal. |
| | Gulf of Mexico | Oil Spills (see Table C.3-3) | |
| | | Brine Disposal Brine could destroy benthic habitats and reduce productivity. Small impact on nekton and plankton. Possible alteration of migration routes. | Brine Disposal Same as proposed. |
| Natural and Scenic Resources | | Oil Spills Adverse impacts associated with possible large oil spill which could foul swamp forest and contaminate water with oil. | |
| | | Operation and Maintenance Pipeline ROW maintenance would have adverse aesthetic impacts. | |
| | | | Raw Water Supply Pipeline to Gulf Coast would have additional adverse resource impact. |
| Socioeconomic Environment | Economy | Storage Site Employment Total wages expected to be approximately $114,000 during each month of oil fill and withdrawal; $17,000 during standby. | |

## 4.8 CONSIDERATIONS OFFSETTING ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTIVITY

The United States possesses abundant natural resources and yet is dependent upon the importation of large quantities of fuels. It has become increasingly dependent upon petroleum imports, which now constitute approximately 35 to 45 percent of the nation's oil consumption and account for 20 percent of the total domestic energy usage. In 1974 the annual cost of these imports was over $25 billion.

In the past twenty-five years, the United States has experienced four sudden denials of oil imports for various reasons by oil-exporting countries. Not, however, until the oil embargo of 1973-74 did the nation find itself without the capacity and resources to offset the interruption of oil imports. This embargo reduced the quantities of petroleum exported to the United States by approximately 2 million barrels per day for 19 weeks and caused world prices for crude oil to escalate.

Although the economic impacts of these events on the United States economy are still under study and debate, most of the macroeconomic study estimates of the repercussions of supply denial and simultaneous price increases tend to indicate a Gross National product (GNP) loss of approximately $35-45 billion. (Holcombe, 1974 and Bennet, 1974). Although not all of this GNP loss can be ascribed to the embargo, the interruption contributed significantly to increases in the consumer and wholesale price indices. In addition, the GNP loss was reflected in higher unemployment and stagnation in several sectors, including automobile sales and housing starts, which exacerbated the economic downturn believed to have started in late 1973. During this period, the embargo prevented real growth that probably would have stabilized unemployment and provided a stronger base for eventual economic recovery.

The United States is now more vulnerable to a petroleum supply interruption than it was in the fall of 1973. In responding to that interruption, many relatively easy steps to conserve energy were taken, and significant improvements in energy efficiency have been achieved. Higher energy prices, natural gas shortfalls, and continued uncertainty about the availability and prices of alternative forms of energy have induced many energy users to restrict their energy consumption and emphasize more effective energy management practices. However, additional improvements will require substantial investment, longer lead times, and even more intensive energy management. Moreover, the program to convert oil- and gas-fired utilities and industrial plants to coal will have converted many plants to coal, which will largely preclude further conversion to coal during a future supply interruption. Some estimates have shown that a future supply interruption of the magnitude of the one in 1973-74 could cause a reduction in GNP that, in terms of employment impact, would be equivalent to the loss of jobs for 2 million workers. Economic effects would not be limited to some geographical areas or industries but would affect the entire nation.

Standby supplies of petroleum have been proposed repeatedly as a way to buffer the impact of future supply interruptions. The National Petroleum Council (NPC), (NPC, 1975) Ford Foundation, (Ford Foundation, 1974) and the Energy Laboratory at the Massachusetts Institute of Technology (MIT) (Energy Laboratory Study Group 1974) have all recommended this action. In addition, the International Energy Program (IEP) agreement, which the United States has entered into with 17 other energy-importing countries, provides for the establishment of this type of reserve. Although the western European countries and Japan have developed stockpiles, the only appreciable stocks in the United States are working inventories.

The concern voiced by these organizations as well as the public, in addition to the nation's formal commitments to the IEP, provided strong impetus for passage of the Energy Policy and Conservation Act of 1975 (P.L. 94-163), which provides for the creation of the Strategic Petroleum Reserve. The Capline Group would provide 300 million barrels of the SPR requirement.

## 4.9 SUMMARY OF RELATIVE ENVIRONMENTAL IMPACTS

### 4.9.1 Introduction

Sections 4.2, 4.3, 4.4, 4.5, 4.6, and 4.7 contain a description of expected and potential environmental impacts which may be caused by the proposed and alternative project systems at the four candidate oil storage site groups. In this section a summary is provided of the most significant impacts associated with the proposed systems at each site. A summary of the most significant terminal impacts is also provided. Information used in this comparison is drawn from Sections 2, 3, and 4 and from Appendices A, B, and C.

The summary of site impacts is presented in Table 4.9-1. Eight categories of impact potential (Geology/Land Features, Water Resources, etc.) are subdivided into specific types of impacts (e.g., excavation/dredging and fill/spoil disposal under Geology/Land Features).

### 4.9.2 Summary Comparison of Impacts on Geology/Land Features

Impacts on geology and land resources would be the result of construction of work pads for either cavern or brine injection wells, roads, dikes and levees, and pipelines for the raw water, brine disposal or oil distribution pipelines. These impacts would be most severe for the Chacahoula site due to the 64 mile brine disposal pipeline to the Gulf and the 21.9 mile oil pipeline to St. James. Construction impacts for the other three groups of sites would be considerably less than for Chacahoula, with the least disruption occurring by expanding the early storage phase sites.

### 4.9.3 Summary Comparison of Impacts on Water Resources

Withdrawal of raw water and disposal of brine could result in impacts on water resources. The only withdrawal that would be a significant adverse impact, however, would be the raw water supply from Bayou Teche, for Iberia dome. During some seasons of some years, withdrawal of 640,000 B/D would result in a lowered water level in the Bayou which would modify flow patterns in connected water bodies.

Deep well injection of brine to properly designed and constructed wells would not result in significant environmental impacts. Disposal of large volumes of brine to the Gulf of Mexico could cause significant impacts

TABLE 4.9-1a Comparison of specific developmental impacts at proposed and alternative SPR site groups.

| | Proposed Site | Alternative Sites | | | |
|---|---|---|---|---|---|
| Category of Impact Potential | Napoleonville | Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
| **Geology and Land Features** | | | | | |
| Storage Site Preparation | 144,000 cy of excavation, 261,000 cy of fill for pipelines, access roads, and other onsite surface facilities. Direct impacts on 63 acres. | 35,000 cy of excavation and 137,000 cy of fill for on-site pipelines, access roads, and other surface facilities. Direct impacts on 32 acres | 19,000 cy of excavation and 52,400 cy of fill for cavern wellhead drill pads, containment dikes, access roads, and other surface facilities. Direct impacts on 27 acres. | 16,000 cy of excavation 79,500 cy of fill for onsite pipelines, access roads, and other surface facilities. Direct impacts on 49 acres. | 71,000 cy of excavation and 354,000 cy of fill for the central plant area, brine surge pond, containment dikes, access roads, and other surface facilities. Direct impacts on 191 acres. |
| Brine Disposal | Pressurization of brine disposal aquifers by deep well injection | Pipeline to Gulf of Mexico- 587,300 cy of excavation (mostly temporary) and clearing of 59 acres of vegetation in pipeline ROW onshore; disturbance to 778 acres offshore. | Pressurization of brine disposal aquifers by deep well injection. | Pressurization of brine disposal aquifers by deep well injection | Pipeline to Gulf of Mexico - 1,009,700 cy of excavation (mostly temporary) and clearing of 392 acres of vegetation and 572 acres offshore for ROW. |
| Crude Oil Distribution Pipeline Corridors | Temporary excavation of 300,000 cy of earth and clearing of vegetation from 61 acres in the pipeline ROW. | | | Temporary excavation of 324,000 cy of earth and clearing of vegetation from 169 acres in pipeline ROW. | Temporary excavation of 255,000 cy of earth and clearing of vegetation from 213 acres in the pipeline ROW. |
| Raw Water Supply Pipeline Corridors | 74,000 cy of excavation (mostly temporary) from 12 acres in pipeline ROW. | 5000 cy of excavation (mostly temporary) and clearing of vegetation from 9 acres in pipeline ROW. | 29,000 cy of excavation (temporary) and clearing of vegetation from 54 acres in pipeline ROW. | 8,000 cy of temporary excavation from 16 acres in pipeline ROW. | 76,000 cy of temporary excavation from 17 acres in pipeline ROW. |
| Terminal Site Preparation | Koch Terminal - 15,000 cy of excavation and 745,000 cy of dredging for pipelines, tanker dock and other surface facilities. Direct impacts on 57 acres on land.<br><br>Nordix Terminal - 82,000 cy of fill for oil surge tanks, 53,000 cy of excavation and 745,000 cy of dredging for pipelines, tanker dock and other surface facilities. Direct impact on 139 acres.<br><br>DOE Terminal - 112,000 cy of fill for oil surge tanks, access road, and other surface facilities. Direct impacts on 36 acres. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| **Water Resources** | | | | | |
| Storage Site Preparation | Significant volumes of sediment and construction pollutants carried into water bodies (Grand Bayou, Lake Verret, and wetlands adjacent to the storage site) by rainfall runoff. | Potentially large volumes of sediment and construction pollutants carried into water bodies (Plantation Lake, Warehouse Bayou, ICW, and wetlands adjacent to the storage site) by rainfall runoff. | Significant volumes of sediment and construction pollutants carried into water bodies (Bull Bay, ICW, and wetlands near the storage site) by rainfall runoff. | Significant volumes of sediment and construction pollutants carried into water bodies (Tete Bayou and wetlands adjacent to the storage site) by rainfall runoff. | Significant volumes of sediment and construction pollutants carried into water bodies (Bubbling Bayou, Chacahoula Bayou and wetlands adjacent to the storage site) by rainfall runoff. |
| Oil and Brine Spills | Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. | Very small possibility of some release reaching water bodies; maximum credible brine spill could have significant impact. |

TABLE 4.9-1a continued.

| | Proposed Site | Alternative Sites | | | |
|---|---|---|---|---|---|
| Category of Impact Potential | Napoleonville | Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
| Water Resources (cont'd) | | | | | |
| Water bodies and wetlands crossed by pipeline ROW | Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. | Locally significant volumes of sediment and construction pollutants carried into water bodies by rainfall runoff. |
| Raw Water Supply | 885,000 BPD pumped from Mississippi River to Bayou Lafourche would increase turbidity and bank erosion from Donaldsonville to Klotzville (12 miles) and occasionally downstream; minimal effect on water quality/quantity expected.<br><br>Diversion of 885,000 BPD from Mississippi River to Bayou Lafourche would not significantly affect river quality or flow rate. | Withdrawal of 650,000 BPD from ICW for cavern leaching would not significantly affect water quality or quantity. | Withdrawal of up to 1,000,000 BPD from Mississippi River would not significantly affect river quality or flow rate. | 641,000 BPD pumped from Bayou Teche during cavern leaching; minimal effect on water quality/quantity expected. | 2,810,000 BPD pumped from Mississippi River to Bayou Lafourche would increase turbidity and bank erosion from Donaldsonville to intake 5 miles north of Plaquemine and occasionally downstream; minimal effect on water quality/quantity expected.<br><br>Diversion of 2,810,000 BPD of water to Bayou Lafourche from the Mississippi River would not significantly affect river quality or flow rate. |
| Brine Disposal | Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. | Disposal of 650,000 BPD of brine in Gulf could raise salinity by 5 ppt in immediate vicinity of diffuser, and by 1 ppt over as much as 2200 acres and could alter surface water quality.<br><br>Pipeline construction would create locally significant levels of turbidity and possibly reduced oxygen levels. Resuspension of pollutants from sediments. | Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. | Pressurization of deep disposal aquifers could possibly displace saline water to potable aquifer directly or by migration up old wells. | Disposal of brine in Gulf of Mexico could cause local salinity excesses of 12 percent or less over several hundred acres and could alter surface water quality. Pipeline construction impacts would create locally significant levels of turbidity and possibly reduce dissolved oxygen. Resuspension of pollutants from sediment. |
| Terminal Construction | Koch Terminal -<br>Dredging of Mississippi River for dock and pipeline crossing near St. James would have locally significant, short-term impact. Pipeline and terminal construction would induce minor local increases in sediment in local tributaries.<br><br>Nordix Terminal -<br>Dredging of Mississippi River for dock and pipeline crossing near Sunshine would have locally significant, short-term impact. Pipeline and terminal construction would induce minor local increases in sediment in local tributaries.<br><br>DOE Terminal -<br>Pipeline and terminal construction near St. James would induce minor local increases in sediment in local tributaries. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |

TABLE 4.9-1a continued.

| Category of Impact Potential | Proposed Site: Napoleonville | Alternative Sites: Weeks Island | Alternative Sites: Bayou Choctaw / | Alternative Sites: Iberia | Alternative Sites: Chacahoula |
|---|---|---|---|---|---|
| <u>Species and Ecosystems</u> | | | | | |
| Terrestrial: | | | | | |
| Agricultural Land | | | | | |
| Site Preparation and Pipelines | Temporary loss of 66 acres due to facility construction. Temporary loss of 11 acres due to offsite construction of raw water supply pipeline and pump station. Minimal impact importance | Temporary loss of 63 acres due to facility construction. Minimal impact importance. | Temporary loss of 64 acres due to facility construction. Minimal impact importance. | Temporary loss of 202 acres due to facility construction. Temporary loss of 16 acres due to offsite construction of raw water supply pipeline and pump station. Loss of 48 acres due to construction of injection well field for brine disposal wells. Minimal impact importance. | Temporary loss of 100 acres due to facility construction. Minimal impact importance. |
| Terminal Construction | DOE Terminal - Loss of 36 acres for terminal site construction.<br>Koch Terminal - Loss of 57 acres for terminal site construction.<br>Nordix Terminal - Loss of 68 acres for terminal site construction. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| Bottomland and Swamp Forest | | | | | |
| Site Preparation and Pipelines | Loss of 147 acres due to facility construction. Revegetation of 53 acres likely. Minimal impact importance. | Loss of 22 acres due to facility construction. Revegetation of 8 acres likely. Minimal impact importance. | Loss of 50 acres due to facility construction. Revegetation of 14 acres likely. Minimal impact importance. | Loss of 48 acres due to facility construction. Revegetation of 17 acres likely. Minimal impact importance. | Loss of 422 acres due to facility construction. Revegetation of 151 acres likely. Minimal impact importance. |
| Brine Disposal | | | | Loss of 7 acres due to construction of injection well field (mostly temporary). | Loss of 92 acres (swamp forest) due to construction of brine disposal supply lines to Gulf. |
| Brine Spills | Large brine spill could destroy several acres near Napoleonville dome. | Large brine spill could destroy several acres near Weeks Island dome. | Large brine spill could destroy several acres near Bayou Choctaw dome. | Large brine spill could destroy several acres along pipeline route. | Large brine spill could destroy several acres near Chacahoula dome. |
| Terminal Construction | Loss of 55 acres for Nordix site & pipelines | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |

TABLE 4.9-1a continued.

| Category of Impact Potential | Proposed Site: Napoleonville | Alternative Sites: Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
|---|---|---|---|---|---|
| **Aquatic:** | | | | | |
| Storage Site Preparation | Minimal local impacts on Grand Bayou and local water bodies near construciton site due to erosion and runoff. | Minimal local impacts on Plantation Lake, ICW, and local water bodies near construction site due to erosion and runoff. | Minimal local impacts on local water bodies near construction site due to erosion and runoff. | Minimal local impacts Tete Bayou and local water bodies near construction site due to erosion and runoff. | Minimal local impacts on Bubbling Bayou and local water bodies near construction site due to erosion and runoff. |
| Brine Spills | Major brine spill remotely possible near Grand Bayou; significant loss of biota would follow. | Major brine spill remotely possible; significant loss of biota would follow. | Major brine spill remotely possible; significant loss of biota would follow. | Major brine spill remotely possible near Tete Bayou; significant loss of biota would follow. | Major brine spill remotely possible near Bubbling Bayou; significant loss of biota would follow. |
| Raw Water Supply | Destruction of phytoplankton and zooplankton in Bayou Lafourche during the three year leaching period. Impact on regional biotic resources considered insignificant. Minor additional displacement of plankton to Bayou Lafourche from the Mississippi River through lift pumps. | Destruction of phytoplankton and zooplankton in the ICW during the 3-year leaching period. Impact on regional biotic resources considered insignificant. | Minor additional displacement of plankton from the Mississippi River through lift pumps. | Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. | Destruction of phytoplankton and zooplankton during the three year leaching period. Impact on regional biotic resources considered insignificant. Minor additional displacement of plankton from Mississippi River to Bayou Lafourche through lift pumps. |
| **Air Quality** | | | | | |
| Storage Site Preparation and Painting | Minor quantities of particulates, $SO_2$, CO, HC and $NO_2$, released from construction equipment; minimal effect. Short term HC concentrations of up to 104 μg/m$^3$ within 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels during 3 day period at Napoleonville. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) Also, construction of a brine disposal pipeline to the Gulf eliminates locally continuous emissions at Chacahoula and adds dispersed pipeline emissions. |
| Terminal Site Preparation and Painting | Minor quantities of particulates- $SO_2$, CO, HC, and $NO_2$ released from construction equipment. Minimal effect. Short-term HC concentrations of up to 104 μg/m$^3$ within 1 km downwind during painting of tanks; possible exceedance of ambient air quality standards due to high background levels for 1 to 3 months. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |

TABLE 4.9-1a continued.

| Category of Impact Potential | Proposed Site<br>Napoleonville | Alternative Sites<br>Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
|---|---|---|---|---|---|
| Species and Ecosystems (cont'd) | | | | | |
| Noise Level | | | | | |
| Storage Site Preparation and Cavern Well Drilling | Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 75 residences may be affected. | Maximum radius of noise impact (3 dB increase over ambient), 4500 feet; no residences affected. | Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 20 residences may be affected. | Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 25 structures may be affected. | Maximum radius of noise impact (3 dB increase over ambient), 5000 feet; as many as 10 structures may be affected. |
| Pipeline Construction | Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | Maximum zone of noise impact, 1800 feet; 19 structures may be affected. | Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. | Maximum zone of noise impact, 1800 feet; 50 to 75 structures may be affected. |
| Terminal Construction | DOE Terminal - Maximum zone of noise impact, 1600 feet; 10 to 15 residences may be affected.<br>Koch Terminal - Maximum zone of noise impact, 2500 feet; up to 25 residences may be affected.<br>Nordix Terminal - Maximum zone of noise impact, 2500 feet; up to 30 residences may be affected. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| Aquatic: | | | | | |
| Brine Disposal | | Brine effluent could affect benthos community structures over several hundred acres in the Gulf of Mexico. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce production. | | | Brine effluent could affect benthos community structures over several hundred acres. Should not be significant to plankton and nekton except possibly adjacent to brine diffuser. Dredging could destroy benthic habitats and reduce productivity. |
| Terminal Construction | DOE, Koch and Nordix terminals - Minimal local impacts due to erosion and runoff. Significant short term impact due to dredging. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |

TABLE 4.9-1a continued.

| | Proposed Site | Alternative Sites | | | |
|---|---|---|---|---|---|
| Category of Impact Potential | Napoleonville | Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
| Natural and Scenic Resources | | | | | |
| All Pipeline Construction | Locally significant impact due to clearing along pipeline ROW. | Locally significant impact due to clearing of forest land on Weeks Island and along pipeline ROW, especially through coastal marsh. | Locally significant impact due to clearing along pipeline ROW. | Locally significant impact due to clearing along pipeline ROW. | Locally significant impact due to clearing along pipeline ROW. |
| Terminal Construction | Locally significant impact due to construction of terminals. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville | (Same as Napoleonville) |
| Socioeconomic Conditions | | | | | |
| Cultural Resources | Possibly loss or disruption of significant cultural resources. | Possibly loss or disruption of significant cultural resources. | Possibly loss or disruption of significant cultural resources. | Possibly loss or disruption of significant cultural resources | Possibly loss or disruption of significant cultural resources. |
| Land Use | Alteration of land use on total of 589 acres (excluding terminals) in Assumption and St. James Parishes. | Alteration of land use on total of 168 acres (excluding terminals) in Iberia, St. Mary and St. James Parishes. | Alteration of land use on total of 117 acres (excluding terminals). | Alteration of land use on total of 401 acres (excluding terminals) in Iberia, St. Mary, and St. James Parishes. | Alteration of land use on total of 1081 acres (excluding terminals) in Terrebonne and St. James Parishes. |
| Terminal Construction | DOE Terminal - alteration of land use on total of 36 acres in St. James Parish. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| | Koch Terminal - alteration of land use on total of 57 acres in St. James Parish. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| | Nordix Terminal - alteration of land use on total of 123 acres in Iberville Parish. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| Economy | Total construction wages, \$14.2 million, much of which would be spent outside the local area; loss of Dow Company jobs at Napoleonville brining operations. | Total construction wages \$8.2 million, much of which would be spent outside the local area. | Total construction wages, \$6.5 million, much of which would be spent outside the local area. | Total construction wages, \$5.8 million, much of which would be spent outside the local area. | Total construction wages, \$13.4 million, much of which would be spent outside the local area. |

TABLE 4.9-1a continued.

| | Proposed Site | | | | |
|---|---|---|---|---|---|
| Category of Impact Potential | *Napoleonville* | *Weeks Island* | *Bayou Choctaw* | *Iberia* | *Chacahoula* |
| Terminal Construction | DOE Terminal - construction wages approximately $0.6 million, much of which would be spent outside local same. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| | Koch Terminal - construction wages approximately $1.3 million, much of which would be spent outside local area. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| | Nordix Terminal - construction wages approximately $0.8 million, much of which would be spent outside the local area. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |
| Government | Possibly significant loss of property and severance tax revenues. | Minor loss of property tax revenues. Possible significant loss of property and severance tax revenues for terminal construction. | Possibly significant loss of property and severance tax revenues. | Possibly significant loss of property and severance tax revenues. | Possibly significant loss of property and severance tax revenues. |
| *Transportation* | Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. | Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. | Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. | Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. | Potential for locally significant traffic increase at shift changes; overall, congestion should not be significant. |

TABLE 4.9-1b Comparison of specific operational impacts at proposed and alternative SPR site groups.

| Category of Impact Potential | Proposed Site<br>Napoleonville | Alternative Sites --<br>Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
|---|---|---|---|---|---|
| <u>Geology and Land Features</u> | Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. | Remote possibility of roof collapse causing surface subsidence and formation of a lake onsite. |
| <u>Water Resources</u> | | | | | |
| Raw Water Supply | Pumping of up to 1,000,000 BPD through Bayou Lafourche would increase stage, erosion, and turbidity; 26 percent increase over average flow rate.<br>Withdrawal of up to 1,000,000 BPD from Mississippi River for oil displacement over 183 day period expected to have no measurable effect on water quality or quantity. | Withdrawal of up to 1,000,000 BPD from the ICW for oil displacement expected to have no measurable effect on water quality or quantity. | Withdrawal of up to 627,000 BPD from the Mississippi River for oil displacement over 150 day period expected to have no measurable effect on water quality or quantity. | Withdrawal of up to 333,000 BPD from Bayou Teche for oil displacement over 150 day period may have significant adverse effect on water quality and quantity. | Pumping of up to 2,500,000 BPD through Bayou Lafourche would increase stage, erosion, and turbidity.<br>Withdrawal of up to 1,340,000 BPD from the Mississippi River for oil displacement over 150 day period expected to have no measurable effect on water quality or quantity. |
| Brine Disposal | Brine injection should have no adverse impact. | Local alteration in salinity and water quality near diffuser. Brine injection should have no adverse impact on ground water. | Brine injection should have no adverse impact. | Brine injection should have no adverse impact. | Local alteration of salinity and water quality near diffuser; increased brine spill exposure. |
| Oil and Brine Spills: | | | | | |
| Storage Site and Pipelines | Impacts on Grand Bayou and small water bodies near Napoleonville dome from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months.<br>Small potential for oil spills into Bayou Lafourche.<br>Very slight chance of local ground water pollution due to surface brine or oil spill; collapse of cavity roof could seriously degrade ground water supplies for site area but such an occurrence is highly unlikely. | Impacts on Plantation Lake, Warehouse Bayou and small water bodies near Weeks Island dome from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months.<br>Very slight chance of local ground water pollution due to surface brine or oil spill; collapse of cavity roof could seriously degrade ground water supplies for site area but such an occurrence is highly unlikely. | Impacts on Bull Bay, ICW, and small water bodies near Bayou Choctaw dome from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months.<br>Very slight chance of local ground water pollution due to surface brine or oil spill; collapse of cavity roof could seriously degrade ground water supplies for site area but such an occurrence is highly unlikely. | Impacts on Tete Bayou and small water bodies near Iberia dome and along oil pipeline to Weeks Island form expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months.<br>Oil spills into Bayou Teche could have significant local impacts.<br>Very slight chance of local ground water pollution due to surface brine or oil spill; collapse of cavity roof could seriously degrade ground water supplies for site area but such an occurrence is highly unlikely. | Impacts on Bubbling Bayou and small water bodies near Chacahoula dome from expected oil and brine spills negligible. Possible very large spill could seriously degrade water quality for several weeks or months.<br>Small potential for oil spills into Bayou Lafourche.<br>Very slight chance of local ground water pollution due to surface brine or oil spill; collapse of cavity roof could seriously degrade ground water supplies for site area but such an occurrence is highly unlikely. |
| Terminals, Pipelines | Oil spills into Mississippi River could have significant local impacts.<br>Very slight chances of local ground water pollution due to surface oil spill. | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) | (Same as Napoleonville) |

TABLE 4.9-1b continued.

| Category of Impact Potential | Proposed Site: Napoleonville | Alternative Sites: Weeks Island | Alternative Sites: Bayou Choctaw | Alternative Sites: Iberia | Alternative Sites: Chacahoula |
|---|---|---|---|---|---|
| **Air Quality** | | | | | |
| **Total Emissions** | Emissions from 330 MMB oil storage facility for 5 fill/withdrawal cycles range from 67,700 to 69,100 tons, 46 percent due to the Napoleonville expansion. Distribution of emissions as follows: 37 percent in Gulf of Mexico; 21 percent in transit and at docks; 41 percent from terminals; 1 percent from Napoleonville storage site. | Emissions from 274 MMB oil storage facility for five fill/withdrawal cycles equal 55,000 tons, 33 percent due to the Weeks Island expansion. Distribution of emissions as follows: 38 percent in Gulf of Mexico; 20 percent in transit and at docks; 41 percent from terminals; 1 percent from Weeks Island storage site. | Emissions from 289 MMB oil storage facility for five fill/withdrawal cycles equal 59,000-60,100 tons, 38 percent due to the Bayou Choctaw expansion and Iberia. Distribution of emissions as follows: 37 percent in Gulf of Mexico; 21 percent in transit and at docks; 41 percent from terminals; 1 percent from Bayou Choctaw and Iberia storage sites. | (See Bayou Choctaw for summary) | Emissions from 200 MMB oil storage facility for five fill/withdrawal cycles equal 77,000-79,400 tons, 53 percent due to Chacahoula. Distribution of emissions as follows: 37 percent in Gulf of Mexico; 22 percent in transit and at docks; 40 percent from terminals; 1 percent from Chacahoula storage site. |
| **Noise** | | | | | |
| Storage Site and Terminal Operation | No significant increase in ambient sound levels on or adjacent to the sites with proposed facilities. | No significant increase in ambient sound levels on or adjacent to the sites with proposed facilities. | No significant increase in ambient sound levels on or adjacent to the sites with proposed facilities. | No significant increase in ambient sound levels on or adjacent to the sites with proposed facilities. | No significant increase in ambient sound levels on or adjacent to the sites with proposed facilities. |
| **Species and Ecosystems** | | | | | |
| Terrestrial | | | | | |
| Agricultural Land | | | | | |
| Oil and Brine Spills | Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | Possible oil or brine spills would have local, short-term adverse effect on agricultural productivity. | Possible oil or brine spills would have local, short-term adverse effects on agricultural productivity. | Possible oil or brine spills would have local, short-term adverse effects on agricultural productivity. | Possible oil or brine spills would have local, short-term adverse effects on agricultural productivity. |
| Purchase of Commercial Power | Would require maintenance of a 4-mile transmission line ROW. | ----- | ----- | ----- | Would require maintenance of a 5-mile transmission line ROW. |
| Bottomland and Swamp Forest | | | | | |
| Oil and Brine Spills | Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Possible oil or brine spill from pipelines could have locally significant adverse impacts. | Possible oil or brine spill from pipelines could have locally significant adverse impacts. |
| Storage Site and Pipeline ROW Maintenance Clearing | Continued maintenance of 94 acres would reduce available habitat in region by an insignificant amount. | Continued maintenance of 14 acres would reduce available habitat in region by an insignificant amount. | Continued maintenance of 36 acres would reduce available habitat in region by an insignificant amount. | Continued maintenance of 31 acres would reduce available habitat in region by an insignificant amount. | Continued maintenance of 271 acres would reduce available habitat in region. |
| Marsh | | | | | |
| Brine Spill | ----- | ----- | ----- | ----- | Brine spill form pipeline could have significant local impacts. |
| Pipeline Corridor Maintenance Clearing | ----- | Continued maintenance of 10 acres would reduce available habitats in region by an insignificant amount | ----- | Continued maintenance of 25 acres would reduce available habitats in region by an insignificant amount. | Continued maintenance of 166 acres would reduce available habitat in region. |

TABLE 4.9-1b continued.

| | Proposed Site | Alternative Sites | | | |
|---|---|---|---|---|---|
| **Category of Impact Potential** | **Napoleonville** | **Weeks Island** | **Bayou Choctaw** | **Iberia** | **Chacahoula** |
| <u>Species and Ecosystems</u> (cont'd) | | | | | |
| **Aquatic** | | | | | |
| **Raw Water Supply** | Average flow rate in Bayou Lafourche increased by about 30 percent form Donaldsonville to Klotzville during oil withdrawal (180 day period, expected five times in project life); increased turbidity; impact on aquatic biota not expected to be of regional significance.<br><br>No measurable impact on aquatic life in Mississippi River due to water withdrawal. | No measurable impact on aquatic life in ICW due to water withdrawal. | No measurable impact on aquatic life in Mississippi River due to water withdrawal. | Possible significant impact on aquatic life in Bayou Teche due to water withdrawal. | Average flow rate of Bayou Lafourche increased by about 40 percent from Donaldsonville to Labadieville during oil withdrawal; increased turbidity; impact on aquatic biota not expected to be of regional significance.<br><br>No measurable impact on aquatic life in Mississippi River due to water withdrawal. |
| **Brine Disposal** | ----- | Brine could destroy benthic habitats and reduce productivity. Small impact on nekton and plankton. Possible alteration of migration routes. | ----- | ----- | Brine could destroy benthic habitats and reduce productivity. Small impact on nekton and plankton. Possible alteration of migration routes. |
| **Oil and Brine Spills** | Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life.<br><br>Potential oil spill impacts in Mississippi River could be locally significant, especially at dock site and in lower delta.<br><br>Expected oil spill volumes in Gulf of Mexico could significantly affect marine biota. Estimated total 5,230 barrels of oil from all SPR operations in the Gulf during project lifetime.<br><br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. | Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life.<br><br>Potential oil spill impacts in Mississippi River could be locally significant, especially at dock site and in lower delta.<br><br>Expected oil spill volumes in Gulf of Mexico could significantly affect marine biota. Estimated total 4,306 barrels of oil from all SPR operations in the Gulf during project lifetime.<br><br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. | Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life.<br><br>Potential oil spill impacts in Mississippi River could be locally significant, especially at dock site and in lower delta.<br><br>Expected oil spill volumes in Gulf of Mexico could significantly affect marine biota. Estimated total 4,541 barrels of oil from all SPR operations in the Gulf during project lifetime.<br><br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. | Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life.<br><br>(See Bayou Choctaw for Group total) | Possibility of major spill of brine or oil from pipeline considered remote. Would cause locally significant impacts on aquatic life.<br><br>Expected oil spill volume in Gulf of Mexico could significantly affect marine biota. Extimated total 6,020 barrels of oil from all SPR operations in the Gulf during project lifetime.<br><br>Possible very large or maximum credible oil spill could have significant impacts to several thousand acres of shallow water or marsh if spill reaches shore before cleanup. |

TABLE 4.9-1b continued.

| | Proposed Site | Alternative Sites | | | |
|---|---|---|---|---|---|
| Category of Impact Potential | Napoleonville | Weeks Island | Bayou Choctaw | Iberia | Chacahoula |
| **Natural and Scenic Resources** | | | | | |
| | Pipeline ROW maintenance would have adverse aesthetic impacts.<br>4-mile transmission corridor alignment would have adverse impact. | Pipeline ROW maintenance would have adverse aesthetic impacts.<br>Transmission corridor alignment would have adverse impact. | Pipeline ROW maintenance would have adverse aesthetic impacts.<br>Transmission corridor alignment would have adverse impact. | Pipeline ROW maintenance would have adverse aesthetic impacts.<br>Transmission corridor alignment would have adverse impact. | Pipeline ROW maintenance would have adverse aesthetic impacts.<br>Transmission corridor alignment would have adverse impact. |
| **Socioeconomic Environment** | | | | | |
| Employment | Total wages expected to be approximately $113,000 during each month of oil fill and withdrawal; $18,000 during standby. | Total wages expected to be approximately $113,000 during each month of oil fill and withdrawal; $44,000 during standby. | Total wages expected to be approximately $68,000 during each month of oil fill and withdrawal; $44,000 during standby. | Total wages expected to be approximately $56,000 during each month of oil fill and withdrawal; $26,000 during standby. | Total wages expected to be approximately $114,000 during each month of oil fill and withdrawal; $17,000 during standby. |

to a relatively small area during the discharge period. Disposal of 1.25 million barrels of brine each day for the 4 to 5 year construction period from Chacahoula would result in the most significant change in water quality. Disposal by diffusion to the Gulf is also the proposed system for the Weeks Island expansion; however, the disposal rate is only one half as large as for Chacahoula.

Potential erosional impacts on water resources are expected to be temporary and are generally proportional to pipeline and site construction in wetland environments. Chacahoula, Napoleonville and Bayou Choctaw would each result in significant construction impacts. Pipeline construction for Chacahoula would result in much more construction in wetlands than any of the other sites.

Oil and brine spills are a function of the throughput, lengths of pipeline, and type of handling facility. Those site groups with the greatest storage capacity also have a greater expectation of oil spill. Similarly, those sites with longer pipelines have a greater expectation of oil or brine spills. The pipeline to Weeks Island is the longest oil pipeline for the Capline Group. It will be built as a part of the early storage phase of the SPR Program, however, so additional capacity could be developed at Weeks Island with no significant increase in oil spill expectation along the pipeline route. The crude oil pipeline from Chacahoula is the longest new pipeline and therefore has the greatest potential spill risk.

### 4.9.4 Summary Comparison of Impacts on Air Quality

One of the most significant potential impacts resulting from expansion of the SPR Program would be the impacts on air quality. Hydrocarbons would be emitted to the environment primarily from storage tanks and from tankers during crude oil transfer operations. Storage tank losses are a function of storage tank size and the number of tanks used. Thus, the DOE Terminal would result in more hydrocarbon loss than either of the other terminal systems. The least hydrocarbon losses from storage tanks would result from use of the Nordix and Koch Terminal facilities. Since hydrocarbon losses from tanker operations are a function of throughput, those site groups with the most storage capacity would cause the most hydrocarbon emissions. Since the storage capacity will be filled and left static until an oil supply interruption occurs, these emissions would be intermittent and infrequent even though a "worst case" analysis has been provided.

### 4.9.5 Summary Comparison of Impacts of Noise

Most noise impacts result from construction activities and are relatively short term. Since most construction activities would take place in areas remote from urban and other noise-sensitive areas, no significant noise impacts are expected.

### 4.9.6 Summary Comparison of Impacts on Species and Ecosystems

Impacts on species and ecosystems would result from disruption of habitat, direct and indirect physical impairment, and reduction in habitat quality. Expansion of Weeks Island would cause the least impact on terrestrial ecosystems. The only construction activity that would significantly affect sensitive terrestrial habitat would be the on-shore portion of the brine disposal pipeline to the off-shore brine diffuser. Site and pipeline construction for Napoleonville and Bayou Choctaw/Iberia would affect about three times as much sensitive habitat as Weeks Island would and about one sixth as much development as Chacahoula. Development of the Chacahoula site would result in disruption of 720 acres of sensitive environments (bottomland forest, deciduous swamp and marsh) compared to 37 acres for Weeks Island.

Impacts on aquatic species and ecosystems would be primarily the result of: 1) water quality changes and direct physical impairment from runoff from construction areas; 2) oil or brine spills; 3) raw water withdrawal; or 4) brine discharge to the Gulf of Mexico. The magnitude of impacts due to construction activities would be those impacts on sensitive terrestrial habitats described above plus the offshore portion of the brine disposal pipelines (and diffusers) for Weeks Island and Chacahoula. Oil and brine spills have a very low expectation for most areas. Small spills are likely to be contained within a small area and have a limited impact. Large spills, although very unlikely to occur, could result in major impacts on the aquatic environment. The impacts of oil spills would depend on the location (can cleanup be accomplished quickly) and the sensitivity of the area (marshes). The larger the capacity of the development, the greater the potential for a major oil spill impact.

Raw water withdrawal would not result in significant aquatic impacts except for a withdrawal from Bayou Teche which might occur at the same time as low flow in the Bayou.

Brine disposal to the Gulf might result in significant impacts on the biota in the immediate area (25 acres) of the diffusers and lesser impacts within the far field (2000 acres). The intermittent and infrequent nature of brine discharge during static (storage) periods would probably allow most of this area to return to normal in a few weeks (or months).

### 4.9.7 Summary Comparison of Impacts on Natural and Scenic Resources

Clearing and maintenance of pipeline rights-of-way would be the primary impact on natural and scenic resources through bottomland forest and deciduous swamps. The Chacahoula site development would have the largest impact. Since most of the construction for all site development would be in remote areas, these impacts would be minimal.

### 4.9.8 Summary Comparison of Impacts on Socioeconomic Environment

Most socioeconomic impacts are beneficial in that employment/income result. The magnitude of the beneficial impact is a function of the construction that would be required to develop the group; therefore, development of the Chacahoula Group would provide the greatest economic benefit and the Weeks Island Group the least.

### 4.9.9 Summary of Impacts - General

Many of the impacts are a function of the storage capacity; therefore, the development of the Chacahoula Group with its 383 MMB of storage capacity causes the greatest impact in several categories. Other factors that influence the impacts for a site group are: 1) length of pipelines, 2) sensitivity of the environment impacted, and 3) type of system proposed. Table 4.9-1 provides a summary of the most significant impacts for each of the Capline Groups.

## 4.10 MULTIPLE SITE DEVELOPMENT ALTERNATIVE

### 4.10.1 Introduction

The Strategic Petroleum Reserve program oil storage capacity has been expanded as discussed in Section 2.7, thus requiring the allocation of as much as 500 MMB of storage capacity to the Capline Group of sites. This capacity may be achieved by using combinations of sites, different from those presently under consideration. While there are several such different combinations of candidate SPR sites which would fulfill this goal, the surface and onsite facilities associated with the sites and the oil distribution, raw water, and brine disposal pipelines described for each of the sites would remain the same under this multiple site development alternative. The principal differences between this alternative and those previously discussed are: the crude oil fill and withdrawal schedules, the extended use of proposed facilities, and the multiple site combination required to provide the increased storage capacity.

The schedule for crude oil withdrawal would be extended for a 500 MMB Capline Group capacity to approximately ten months. The rate of withdrawal would therefore be somewhat less than for a 300 MMB capacity (2 MMB per day). Since there would be no increase in the rate at which crude oil would be removed from storage, no expansion of terminal or pipeline systems would be required. Similarly, the fill schedule would be extended to allow use of the same facilities as are proposed for the 300 MMB capacity. Other systems and facilities such as the raw water system, brine disposal system, crude oil pipelines, and on-site facilities might be used for a longer period of time but would not require expansion.

Should the increased storage capacity be required in the Capline Group, most impacts would be additive. Impacts that are directly additive are discussed in the previous sections. An example of an additive impact would be the independence of the raw water system for Weeks Island expansion and the raw water system for Napoleonville. If both sites were developed, the aquatic ecology impacts on the ICW (Weeks Island) and those on Bayou Lafourche (Napoleonville) could be added together to determine the raw water system impact on the regional aquatic environment. Most impacts are site related and geographically separated so that the impacts can be considered additive.

Certain impacts resulting from expansion of the Capline Group are synergistic. An example of synergistic effects would be the raw water system impacts if Napoleonville and Chacahoula were developed. Both raw water systems would be directly additive but the effects of increasing the flow of Bayou Lafourche to meet this larger requirement may cause erosion, local flooding of private docks, backup of storm drains, or other related impacts. In some cases, economies of scale may be achieved which result in less impact than the apparent impact of adding impacts from two sites. The most significant effects of multiple site development are described in the following sections.

### 4.10.2 Construction Impacts

The principal impacts of constructing the increased capacity alternative would be raw water withdrawal, brine disposal, and socioeconomic effects of developing several sites. The degree of impact within these areas is, for the most part, dependent upon which of the sites are included in the new combination. Impacts may result from the raw water withdrawal or from socioconomic effects.

The effects of raw water withdrawal would not constitute a significant impact unless the Napoleonville and Chacahoula candidate sites became elements of the combinations. The combination of these two sites would necessitate an increase in the flow of Bayou Lafourche, as the proposed source of raw water, during the construction phase. This increased flow is available from the Mississippi River but could create significant problems in areas upstream of the withdrawal stations as indicated in the earlier example.

The socioeconomic impacts of the increased capacity alternative development could include both beneficial and adverse effects. A beneficial effect of developing multiple sites would be seen in the construction related employment and payrolls, as construction crews would be needed at each of the sites and at the terminals. This increase would be between $15 and $20 million dollars, which would be distributed over the construction period. Adverse effects could be realized if the sites included in the combination were close to one another. These impacts would occur to the towns near the sites and would include increased traffic and demands on services.

The most significant economy of scale achieved by increasing the storage capacity to 500 MMB is that proportional impacts of terminal construction would not occur since no new docks or tanks would be required.

### 4.10.3 Operation and Maintenance

The potential impacts of operating and maintaining the increased capacity alternative are principally the increased hydrocarbon emissions resulting from increased throughput, socioeconomic impacts and, for specific sites, the raw water system.

Additional hydrocarbon emissions would result from handling of the increased crude oil throughput. However, storage tank losses would increase only slightly since the number of tanks would not be increased. The slight increase is due to the longer withdrawal period at elevated crude oil temperatures. Estimated hydrocarbon losses over an assumed 22-year period of operation (1979-2000) for five fill/withdrawal cycles, including continuous storage tank emissions during standby storage, are presented in Table 4.10-1 based on average crude oil properties (Reid vapor pressure of 4 psia and molecular weight of 70 for fugitive losses).

The hydrocarbon emissions for 500 MMB of storage would be approximately 102,500 tons during the life of the project (317 MMB expansion emissions plus early storage emissions in Table 4.10-1). This is approximately 80 percent greater than the alternative group which projected the lowest total emissions (see Table 4.3-1b), but only about 30 percent greater than the alternative group which projected the highest total emissions (see Table 4.3-1d). Total emissions refer to expansion plus early storage emissions. When examined on the basis of an average daily emission rate during operations, hydrocarbon emissions would be approximately the same since the withdrawal and fill rates would be about the same, but extended over a longer period of time. However, annual hydrocarbon emissions when 500 MMB is completely

TABLE 4.10-1 Estimated hydrocarbon emissions[a] (tons) at terminal facilities accompanying the transport of oil for development of 500 MMB storage capacity, over the life of the project assuming five fill/withdrawal cycles[b].

| Location | Tankers/Barges Fills (5) | Tankers/Barges Withdrawals (5) | Storage Tanks[c] | 317 MMB Expansion Total | Early Storage Total |
|---|---|---|---|---|---|
| A. DOE AND KOCH TERMINALS | | | | | |
| Gulf of Mexico | 23,965 | 0 | 0 | 23,965 | (13,834) |
| Mississippi River[d] | 7,025 | 7,323 | 0 | 14,348 | (7,596) |
| Terminals | 13,980 | 9,719 | 1,030 | 24,729 | (15,544) |
| Total | 44,970 | 17,042 | 1,030 | 63,042 | (36,974) |
| B. DOE AND NORDIX TERMINALS | | | | | |
| Gulf of Mexico | 23,965 | 0 | 0 | 23,965 | (13,834) |
| Mississippi River[d] | 8,103 | 8,321 | 0 | 16,424 | (7,596) |
| Terminals | 13,980 | 9,719 | 1,494 | 25,193 | (15,544) |
| Total | 46,048 | 18,040 | 1,494 | 65,582 | (36,974) |

[a] Average conditions assuming a Reid vapor pressure of 4 psia. During withdrawal operations, the crude oil at the terminal is assumed to be at 120°F (except that crude stored at Weeks Island is 100°F).

[b] The emissions in this table are for 317 MMB expansion at the Capline Group of sites; the total emissions for early storage at Bayou Choctaw and at Weeks Island (183 MMB) are given in brackets.

[c] Storage tank losses estimated to occur continuously for a 22-year period.

[d] Transit emissions, most of which occur along the Mississippi River.

withdrawn during a calendar year would be about 3070 tons/year, an increase of 31 percent over the alternative grouping which projected the highest annual emissions.

A major consideration in assessing the air quality impacts of any size Capline Group system is the fact that the majority of emissions will be temporary and intermittant, occurring only as a certainty during the period of initial fill, and then potentially during any subsequent periods of fill and withdrawal. The only continuous hydrocarbon emission source attributable to the SPR Program would be the storage tanks constructed for use only in conjunction with the Program.

The expectation of oil and brine spills would increase in appropriate proportion to the size of the program expansion; spills are generally additive for additional sites. Table 4.10-2 and 4.10-3 detail the crude oil spill expectation for an expansion of Capline Group capacity by the addition of a 200 MMB site (assumed to be Chacahoula for analysis) to the proposed 333 MMB development. Oil spill expectation over the project lifetime would total 25,285 barrels and 26,997 barrels for DOE/Koch and DOE/Nordix terminal combinations, respectively, of which 8,550 barrels and 9,253 barrels, respectively, would be attributable to expansion. This compares to the spill expectation for the proposed development of 150 MMB at Napoleonville, 6,217 barrels and 6,767 barrels, respectively.

Brine spill expectation is summarized in Table 4.10-4. The proposed development, including 150 MMB of storage capacity at Napoleonville, would have expected brine spills totalling 226 barrels during the project lifetime. Expansion of group capacity by 200 MMB would increase expected spills to 1,770 barrels, due to the longer brine pipeline connection to an expansion site.

The socioeconomic impacts of additional operational employment and payrolls would be less than a proportional addition on the basis of storage capacity. The effect on regional income would be small.

Synergistic effects of expanded raw water requirements would result if Napoleonville and Chacahoula were to be developed. These impacts would be smaller than impacts during construction since the total raw

TABLE 4.10-2a Oil spill expectation - multiple site development alternative - cavern fill operations using DOE/Koch terminal combination.

| Oil Handling Mode/Location | Average Spill Size | Bayou Choctaw[a] (Early Storage) | | Weeks Island[a] (Early Storage) | | Napoleonville[a] | | Additional 200 MMB Site[b] | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 27.8 | 450 | 37.1 | 600 | 98.8 | 1599 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.016 | 17.8 | 0.0213 | 23.7 | 0.0568 | 63.2 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.510 | 218 | 0.484 | 207 | 0.815 | 349 | 1.087 | 465 | 2.896 | 1239 | 60,000 |
| Koch Transfers | 27 | ---- | ---- | ---- | ---- | 4.57 | 123 | 1.78 | 48 | 6.35 | 171 | 500 |
| DOE Transfers | 27 | 3.48 | 94 | 3.30 | 89 | 0.99 | 27 | 5.63 | 152 | 13.40 | 362 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.029 | 31.6 | 0.042 | 46.5 | 0.024 | 25.8 | 0.024 | 26.7 | 0.119 | 130.6 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Koch | 1100 | ---- | ---- | ---- | ---- | 0.0615 | 67.7 | 0.024 | 26.4 | 0.0855 | 94.1 | 5,000 |
| DOE | 1100 | 0.047 | 51.7 | 0.0445 | 49.0 | 0.0135 | 14.9 | 0.076 | 83.6 | 0.181 | 199.2 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.075 | 37.5 | 0.100 | 50.0 | 0.2665 | 133.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Fill | | 21.52 | 711.9 | 20.43 | 691.4 | 34.37 | 1112.7 | 45.84 | 1475.4 | 122.1 | 3991.4 | |
| Total | | | | | | | | | | | | |
| 5 Fills | | 107.6 | 3560 | 102.1 | 3457 | 171.9 | 5564 | 299.2 | 7377 | 611 | 19957 | |

[a]Capline Group 333 MMB Storage Capacity assumed at: Bayou Choctaw - 94 MMB
Weeks Island - 89 MMB
Napoleonville - 150 MMB
333 MMB

[b]Capline Group 533 MMB Storage Capacity - for analysis purposes, additional 200 MMB site assumed to be Chacahoula.

TABLE 4.10-2b Oil spill expectation - multiple site development alternative - cavern withdrawal operations and project totals using DOE/Koch terminal combination.

| Oil Handling Mode/Location[a] | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Additional 200 MMB Site | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.001 | 1.2 | 0.0022 | 2.4 | 0.0104 | 11.6 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.324 | 139 | 0.324 | 139 | 0.097 | 41.4 | 0.194 | 82.9 | 0.939 | 402.3 | 60,000 |
| Koch Transfers | 80.6 | - | - | 1.49 | 120 | - | - | - | - | 1.49 | 120 | 500 |
| DOE Transfers | 80.6 | 1.49 | 120 | - | - | 0.44 | 36 | 0.89 | 72 | 2.82 | 228 | 500 |
| Bull Bay | | | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | - | - | - | - | - | - | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | - | - | - | - | - | - | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.014 | 15.4 | 0.024 | 26.4 | 0.007 | 7.7 | 0.008 | 8.8 | 0.053 | 58.3 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Koch | 1100 | - | - | 0.030 | 33 | - | - | - | - | 0.030 | 33 | 5,000 |
| DOE | 1100 | 0.030 | 33 | - | - | 0.009 | 9.9 | 0.018 | 19.8 | 0.057 | 62.7 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.3 | 0.075 | 37.5 | 0.100 | 50.0 | 0.267 | 133.3 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Withdrawal | | 6.08 | 351.2 | 1.91 | 344.7 | 0.63 | 133.7 | 1.21 | 235.9 | 9.83 | 1065.5 | |
| Total | | | | | | | | | | | | |
| 5 Withdrawals | | 30.4 | 1723 | 9.5 | 1670 | 3.2 | 653 | 6.1 | 1173 | 49 | 5328 | |
| Project Total | | | | | | | | | | | | |
| 5 Cycles | | 138.0 | 5283 | 111.6 | 5127 | 175.1 | 6217 | 235.2 | 8550 | 660 | 25285 | |

[a]During withdrawal, it is assumed that 40 percent of the oil is shipped by tanker to the Gulf and about 60 percent is delivered to the Capline Pipeline.

TABLE 4.10-3a Oil spill expectation - multiple site development alternative - cavern fill operations using DOE/Nordix terminal combination.

| Oil Handling Mode/Location | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Additional 200 MMB Site | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| **Gulf of Mexico** | | | | | | | | | | | | |
| Transfers | 16.2 | 17.4 | 282 | 16.5 | 267 | 27.8 | 450 | 37.1 | 600 | 98.8 | 1599 | 1,000 |
| Vessel Casualty | 1111 | 0.010 | 11.1 | 0.0095 | 10.6 | 0.016 | 17.8 | 0.0213 | 23.7 | 0.0568 | 63.2 | 60,000 |
| **Mississippi River** | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.657 | 281 | 0.484 | 207 | 0.995 | 426 | 1.273 | 545 | 3.409 | 1459 | 60,000 |
| Nordix Transfers | 27 | 3.48 | 94 | ---- | ---- | 3.38 | 91 | 4.40 | 119 | 11.26 | 304 | 500 |
| DOE Transfers | 27 | ---- | ---- | 3.30 | 89 | 2.18 | 59 | 3.01 | 81 | 8.49 | 229 | 500 |
| **Pipelines** | | | | | | | | | | | | |
| Pumping | 1100 | 0.013 | 14.6 | 0.042 | 46.5 | 0.053 | 58.1 | 0.049 | 53.4 | 0.157 | 172.6 | 5,000 |
| **Terminals** | | | | | | | | | | | | |
| Nordix | 1100 | 0.047 | 51.7 | ---- | ---- | 0.0455 | 50.1 | 0.059 | 65.5 | 0.1515 | 167.3 | 5,000 |
| DOE | 1100 | ---- | ---- | 0.0455 | 49.0 | 0.0295 | 32.5 | 0.041 | 44.6 | 0.116 | 126.1 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.0445 | 22.3 | 0.075 | 37.5 | 0.100 | 50.0 | 0.2675 | 133.3 | 3,000 |
| **Total** | | | | | | | | | | | | |
| Single Fill | | 21.65 | 757.9 | 20.43 | 691.4 | 34.57 | 1222 | 46.05 | 1582.2 | 122.7 | 4253.5 | |
| **Total** | | | | | | | | | | | | |
| 5 Fills | | 108.3 | 3790 | 102.1 | 3457 | 172.9 | 6110 | 230.2 | 7911 | 614 | 21268 | |

TABLE 4.10-3b Oil spill expectation - multiple site development alternative - cavern withdrawal operations and project totals using DOE/Nordix terminal combination.

| Oil Handling Mode/Location | Average Spill Size | Bayou Choctaw (Early Storage) | | Weeks Island (Early Storage) | | Napoleonville | | Additional 200 MMB Site | | Total Program Spill Risk | | Maximum Credible Spill Size |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | No. Spills | Barrels | Barrels |
| Gulf of Mexico | | | | | | | | | | | | |
| Vessel Casualty | 1111 | 0.0036 | 4.0 | 0.0036 | 4.0 | 0.001 | 1.2 | 0.0022 | 2.4 | 0.0104 | 11.6 | 60,000 |
| Mississippi River | | | | | | | | | | | | |
| Vessel Casualty | 428 | 0.418 | 179 | 0.324 | 139 | 0.097 | 41.4 | 0.259 | 111 | 1.098 | 470.4 | 60,000 |
| Nordix Transfers | 80.6 | 1.49 | 120 | - | - | - | - | 0.89 | 72 | 2.38 | 192 | 500 |
| DOE Transfers | 80.6 | - | - | 1.49 | 120 | 0.44 | 36 | - | - | 1.93 | 156 | 500 |
| Bull Bay | | | | | | | | | | | | |
| Barge Casualty | 428 | 0.003 | 1.3 | - | - | - | - | - | - | 0.003 | 1.3 | 20,000 |
| Transfers | 3.6 | 4.17 | 15 | - | - | - | - | - | - | 4.17 | 15 | 500 |
| Pipelines | | | | | | | | | | | | |
| Pumping | 1100 | 0.012 | 13.2 | 0.028 | 30.8 | 0.012 | 13.2 | 0.012 | 13.2 | 0.064 | 70.4 | 5,000 |
| Terminals | | | | | | | | | | | | |
| Nordix | 1100 | 0.030 | 33.0 | - | - | - | - | 0.018 | 19.8 | 0.048 | 52.8 | 5,000 |
| DOE | 1100 | - | - | 0.030 | 33 | 0.009 | 9.9 | - | - | 0.039 | 42.9 | 5,000 |
| Storage Site | 500 | 0.047 | 23.5 | 0.045 | 22.5 | 0.075 | 37.5 | 0.100 | 50.0 | 0.267 | 133.5 | 3,000 |
| Total | | | | | | | | | | | | |
| Single Withdrawal | | 6.17 | 389.0 | 1.92 | 349.3 | 0.63 | 139.2 | 1.28 | 268.4 | 10.0 | 1145.9 | |
| Total | | | | | | | | | | | | |
| 5 Withdrawlas | | 30.8 | 1945 | 9.6 | 1746 | 3.2 | 696 | 6.4 | 1342 | 50 | 5729 | |
| Project Total | | | | | | | | | | | | |
| 5 Cycles | | 139.2 | 5721 | 111.6 | 5123 | 176.1 | 6767 | 236.6 | 9253 | 664 | 26997 | |

TABLE 4.10-4 Expected brine spills during project lifetime -- Multiple site development alternative[a,b]

| | Leaching | Cavern Fill | Program Total 5 cycles + leach | Average Spill Size (BBL) |
|---|---|---|---|---|
| Napoleonville | | | | |
| - No. Spills | 0.016 | 0.009 | 0.061 | |
| - Barrels | 48.8 | 27.6 | 186.8 | 3000 |
| Bayou Choctaw | | | | |
| - No. Spills | - | 0.003 | 0.015 | |
| - Barrels | - | 7.7 | 38.5 | 3000 |
| Chacahoula | | | | |
| - No. Spills | 0.072 | 0.047 | 0.307 | |
| - Barrels | 360.5 | 236.9 | 1545 | 5000 |
| TOTAL | | | | |
| - No. Spills | 0.088 | 0.049 | 0.383 | |
| - Barrels | 409.3 | 272.2 | 1770 | |

[a] Maximum credible spill 30,000 BBL

[b] Weeks Island early storage is non-contributing

water requirements during oil withdrawal would be two-thirds of the construction (leaching) requirements.

### 4.10.4 Conclusions

As indicated in the preceding sections, there would be some synergistic impacts on expanding the storage capacity of the Capline Group from 300 MMB to 500 MMB. Economies of scale may also be achieved which would result in impacts less than the addition of site related impacts. Most of the impacts of increased capacity are nearly equal to the sum of the impact for each of the alternative groups described in Section 4.4 through 4.7. Therefore, the impacts of different combinations of sites to form new groups can be closely approximated by combining the site related impacts with the terminal system impacts described in Section 4.3.

CHAPTER 5.0

# MITIGATIVE MEASURES AND UNAVOIDABLE ADVERSE IMPACTS

## 5.1 INTRODUCTION AND SUMMARY

In Section 5.2, several mitigative measures are described that could moderate adverse impacts on both the natural and man-made environments. These potential mitigative measures apply to all sites. Adverse impacts that cannot be avoided despite these measures are summarized for the proposed and alternative site groupings in Section 5.3. Specific impacts have previously been discussed in Section 4.0.

## 5.2 MITIGATIVE MEASURES AND CONTROLS AVAILABLE TO LIMIT ADVERSE EFFECTS DURING CONSTRUCTION AND OPERATION

The following measures are available to minimize the extent and significance of potential adverse project impacts. Measures that are intended to be an integral part of the project design or are required by law are included in Section 4.0, rather than as mitigative measures.

### 5.2.1 Site Preparation, Construction and Design

#### 5.2.1.1 Erosion Control

Soil erosion during grading and excavation may be controlled by diverting surface runoff away from construction and spoils areas. After grading, measures taken to control soil erosion may include temporary vegetative cover, mulching, gravel cover, and riprapping. During all construction activities, movement of vehicles can be controlled to protect natural vegetation, seeded areas, and erosion control structures. Vehicles should cross drainageways only where culverts are provided. In order to check the effectiveness of the erosion control measures, water quality may be monitored at appropriate locations as part of the construction program.

#### 5.2.1.2 Air Quality

Burning of waste timber, brush, and other waste materials can be carried out in compliance with all applicable regulations. Whenever practicable, other methods of disposal (shredding or mulching) can be used rather than burning of vegetation. Internal combustion engines can be maintained in good mechanical condition to reduce gaseous emissions. Areas used by heavy equipment may be gravel surfaced and sprinkled when necessary to control dust. Main roadways should be paved and maintained. Hydrocarbon emissions from spray painting operations can be reduced by using high density primers and paints which reduce the required number of coats and therefore reduce the hydrocarbon emissions by potentially 50 percent.

5.2.1.3 Water Quality

A temporary cofferdam can be installed at the raw water intake structure to control siltation. Dredging can be performed during periods of low aquatic productivity in the winter. At this time, spawning activity and presence of juvenile aquatic organisms is usually at its lowest level. Construction of multiple pipelines in a right-of-way can be scheduled to be installed concurrently, eliminating multiple disturbances of the area.

5.2.1.4 Habitat Quality

In clearing the transportation and pipeline rights-of-way, only small trees and shrubs should be removed. No growth retardants, chemicals or herbicides should be used during construction. Buffer strips of natural vegetation can be preserved along the forests and canal banks wherever possible to provide wildlife habitat and minimize erosion. Original topsoil removed can be separated and later replaced and reseeded with native grasses when appropriate. After completion of construction, all areas disturbed by construction and not required for permanent facilities can be landscaped and seeded to be compatible with the original terrain and to provide wildlife habitat. Dredge spoil removed from creation of new docks can be disposed of in previously industrialized areas.

5.2.1.5 Socioeconomic Conditions

Transportation can be provided from nearby communities to minimize the local traffic generated during peak construction periods. Construction work shifts can be scheduled to avoid or minimize adverse effects on local highway traffic. Consideration can be given to providing temporary housing at the site during the peak construction period if local housing is unsuitable or not available. If temporary shutdown of existing brining or other operations is required, contractors may be encouraged to hire displaced workers. All project facilities should be landscaped to the maximum extent possible to minimize the negative impacts on nearby scenic or populated areas. Use of van-pooling or car-pooling of workers from their area of residence should be encouraged.

Materials trucks or barge deliveries should be scheduled at non-peak hours. Efforts should be made to be as nearly self-sufficient in case of fire or other emergencies as possible.

### 5.2.2 Operation

#### 5.2.2.1 Water Quality

During operation and storage of the oil, observation wells should be monitored regularly to detect changes in water table elevation or contamination of the aquifer.

#### 5.2.2.2 Habitat Quality

Permanent fencing can be limited to that amount necessary to maintain security of plant structures.

#### 5.2.2.3 Air Quality

Hydrocarbon emissions from the storage and transportation system have been identified as having the largest potential effect on air quality. Various controls that could significantly reduce these emissions are described in the following sections.

### 5.2.3 Control of Hydrocarbon Emissions

The release of hydrocarbon vapors to the atmosphere impacts the project in two ways. First, the hydrocarbon vapor represents an irretrievable loss of petroleum resources from the SPR system. Second, uncontrolled vapor releases would contribute a significant amount of hydrocarbons to the atmosphere in southern Louisiana, an area where hydrocarbon levels are already high.

It is technologically possible to significantly reduce hydrocarbon emissions from the storage and transportation systems.

For example, the surge tanks could be filled with water during periods when there is no oil movement. The calculated emission summaries are based on the assumption that the proposed surge tanks at each location would be maintained partially filled during static storage (no oil movement). Filling the surge tanks with water during periods when there is no oil movement could significantly reduce surge tank emissions.

Another possible system of emission control is to install vapor control and recovery systems on surge tanks. Also, vapor recovery systems could be required for tankers to prevent or minimize hydrocarbon emissions during oil transfer operations. Vapor control is accomplished using a vapor condensation unit. This unit compresses the gases to 3 or 4 atmospheres, sufficient to liquefy most of the petroleum vapors which are then recovered. The compressed air used in the unit must eventually be returned to the atmosphere, and some petroleum is flashed off. The system's efficiency may range from 60 to 85 percent petroleum recovery. This system could be most easily implemented at the tanker docks. A vapor condensation unit requires a considerable capital investment, the specific amount depending on the size of the unit required. At present, most crude-oil facilities do not handle sufficient quantities of oil to justify extensive vapor control systems. Also, existing state air quality regulations in Louisiana do not require such systems to be employed. Adaptation of existing technology would be feasible for the SPR oil storage system and may be economically advantageous.

A third possibility is permanent ballasting of tankers. This would reduce hydrocarbon emissions associated with transfer activities at the tanker docks and would also eliminate ballast discharge at the lightering site in the Gulf. It has previously been assumed that tankers would be permanently ballasted during withdrawal operations.

## 5.3 UNAVOIDABLE ADVERSE IMPACTS

### 5.3.1 Capline Group Oil Distribution Terminal Systems

Two possible combinations of oil distribution terminal systems are being considered, both of which would utilize DOE terminal facilities at St. James. The environmental setting, structural interrelationships, and potential environmental impacts of the DOE/Koch terminal system combination and the DOE/Nordix terminal system combination are discussed in previous sections.

#### 5.3.1.1 Land Impacts

Unavoidable adverse impacts on land resources at the Koch terminal would result from construction of a new tanker dock, three 150,000 bbl oil storage tanks, and a 3.2-mile connecting pipeline, and, at St. James, from construction of four 200,000 bbl tanks. These facilities would require the use of 103 acres during the construction phase of the project and involve 760,000 cy of excavation and 112,000 cy of fill. During the operation phase, however, 83 acres would be required for the maintenance of permanent terminal facilities. These lands would be preempted from other uses for the 20 to 25 year life of the project.

Construction at the Nordix terminal of a new tanker dock, ten 200,000 bbl oil tanks, and a 7.0-mile pipeline, and construction of four 200,000 bbl oil tanks at the DOE terminal at St. James would result in unavoidable adverse impacts to land resources. These facilities would require the use of 175 acres of predominantly cleared lands and involve the excavation of 798,000 cy and 194,000 cy of fill. During the operation phase of the project, use of the DOE/Nordix terminal system combination would require the use of 114 acres. The use of these lands would be preempted from other uses for the 20 to 25 year life of the project.

#### 5.3.1.2 Water Impacts

Unavoidable adverse impacts on water resources would occur in the vicinity of the DOE/Koch terminal system combination, the result of on-land grading for oil tanks and from dredging activities associated with the construction of the tanker dock and pipeline. The Mississippi River would be the principal water body affected by such construction activity.

Impacts on water quality resulting from the 760,000 cy of excavation would be locally significant but of short-term duration, and would include increases in turbidity and the release of toxic substances from bottom sediments.

Unavoidable adverse effects of operation of the DOE/Koch terminal system combination center on the potential for oil spills to occur. The quantities of oil expected to be spilled at this terminal system combination vary according to the storage site being considered. These quantities are discussed in Section 4.3.3.2. The most significant impacts on water quality resulting from an oil spill would be the potential for buildup of toxic fractions in the water column and for depletion of oxygen levels.

Construction of the DOE/Nordix terminal system combination would require 53,000 cy of land excavation and 745,000 cy of dredging in the Mississippi River. Onsite grading and excavation at the Nordix terminal system would result in some siltation of Bayou Paul as sediments are transported by runoff. The pipeline from the Nordix terminal to the Bayou Choctaw-St. James early storage pipeline crosses Bayou Butte and several very small drainage canals on the west bank of the Mississippi River. Unavoidable adverse effects of pipeline construction would consist of temporary turbidity increases a short distance downstream of the crossings. Unavoidable adverse impacts of construction activities in the Mississippi River would be similar to those described above for the DOE/Koch terminal system combination.

Unavoidable adverse effects of operation of the DOE/Nordix terminal system combination also center on the potential for oil spills during oil transfer operations. The quantities of spills expected to occur vary according to the storage site being considered and are discussed in Section 4.3.3.2. These quantities are expected to be greater than those of the DOE/Koch terminal system combination as the Nordix terminal system is located 45 miles upstream. Potential impacts on water quality would be similar to those described above.

### 5.3.1.3 Air and Noise Impacts

During site preparation and construction of the DOE/Koch terminal system combination, emission sources would generally be short-term and over a small area. The principal air pollutant of concern would be hydrocarbons, which would be emitted in small amounts from construction equipment and tank painting. During operation, unavoidable adverse effects on air resources would also center on hydrocarbon emissions. The quantity of hydrocarbons that would be released under "worst case" conditions vary according to the development alternative being considered and are discussed in subsequent sections of this chapter.

Increased noise levels can be expected to occur from development of the DOE/Koch terminal system combination. The $L_{eq}$ contribution from these activities is expected to be 67 dB at 500 feet. Up to 25 residences would be affected by these noise level increases. Noise contributions during operation of the terminal system combination are expected to be minimal.

Unavoidable adverse effects on air resources resulting from construction and operation of the DOE/Nordix terminal system combination are expected to be similar to those of the DOE/Koch combination. The quantities of hydrocarbons emitted, under a worst case scenario, are described in subsequent sections of this chapter.

Increased noise levels can be expected to occur from development of the DOE/Nordix terminal system combination. The $L_{eq}$ contribution from these activities is expected to by 67 dB at 500 feet. Up to 30 residences would be affected by these increases. Noise level contributions from tanker operations are expected to be minimal.

### 5.3.1.4 Biotic Impacts

Development of the DOE/Koch terminal system combination would involve several unavoidable impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects due to forced migration, increased noise, and human disturbance. The regrading of approximately 57 acres on land would severely impact any small invertebrates in the surface vegetation or soil. As these areas are presently in an industrial use, it is expected that wildlife is presently discouraged from the area. Effects of pipeline construction in cleared land habitat is expected to be short-term and minor. Dredging in the Mississippi River would have locally severe impacts on bethos and organisms in the water column.

Normal operation of the DOE/Koch terminal system combination would have little additional impact on the ecological aspects of the sites.

Impacts from development and operation of the DOE/Nordix terminal system combination are expected to be similar to those for the DOE/Koch combination, with the exception that the pipeline from the Nordix site to the Bayou Choctaw-St. James early storage pipeline would affect more waterways.

### 5.3.2 Proposed Development - Early Storage Sites Plus Napoleonville Dome

#### 5.3.2.1 Land Impacts

The land occupied by the plant area overlying the dome would be withdrawn from use for brine production or industrial product storage for the life of the SPR. Although industrial products could be stored in the caverns at the completion of the SPR, salt extraction would likely not be resumed. During oil storage, access to the site would be controlled by the DOE for reasons of safety and security of the stored oil. About 437 acres overlying the dome would be fenced for the life of the project, as would one to two acres at the raw water intake structure and also at the crude oil pipeline connection with the Weeks Island-St. James pipeline. An additional area would be restricted at the terminal sites.

On-site activities during the construction phase of the project would include the grading and excavation of 63 acres. This acreage would be occupied by the plant area, roadways, wellheads, distribution pipelines, and the brine pond. This construction would require 261,000 cubic yards of fill and 144,000 cy excavation. Pipeline construction and grading offsite would temporarily disturb 150 acres on land, and 2 acres in open water, and require 480,000 cubic yards of earth excavation and 200 cy of fill. For the life of the project, however, 41 acres onsite and 94 acres offsite for maintenance of permanent facilities and pipeline rights-of-way would be unavoidably adversely impacted.

Leaching of 10 new storage cavities and expanding existing caverns in the Napoleonville salt dome would involve removal of up to 45.5 x $10^6$ tons of salt.

### 5.3.2.2 Water Impacts

During the construction phase, some siltation of local water systems is expected to occur as a result of the grading and excavation of 215 acres despite the utilization of erosion control measures. Some of the sediments resulting from the approximately 624,000 cubic yards of earth movement would be transported into Grand Bayou and into Lake Verret. The construction of the proposed raw water supply system would include a 4.6-mile pipeline between the plant site and Bayou Lafourche. This pipeline could affect water quality of the streams it crosses and could include changes in water-flow patterns, BOD, dissolved oxygen, pH, nutrients, heavy metal concentrations, salinity, and turbidity. Approximately 74,000 cubic yards of material would be excavated for the pipeline. Construction of the proposed brine disposal injection well system would require the installation of 6.7 miles of pipeline, well pads, and roadways. The excavation and grading for these facilities, as they would not cross any major water bodies, would cause only minimal impacts on water quality. Construction of a 19.1-mile pipeline from the Napoleonville site to St. James would cross Bayou Lafourche and several smaller streams, including Bayou Verret. All but the westernmost one mile of the pipeline would utilize existing rights-of-way. The impacts of construction would be much the same as those discussed above.

Consumptive use of water at the Napoleonville candidate site will be small in relation to available surface water supply from the Mississippi River. Water, withdrawn at an average rate of 58 cfs, would be taken from Bayou Lafourche, which would be supplied by additional pumpage from the Mississippi River. A small water quality impact, in the form of increased turbidity, would occur in Bayou Lafourche between Donaldsonville and the intake structure. The additional pumpage would increase the flow of Bayou Lafourche by 23 percent. The proposed brine disposal method should have minimal impacts on water supply as the depth of the receiving formations is well below the aquifers containing fresh or slightly saline water.

### 5.3.2.3 Air and Noise Impacts

During the site preparation and construction phase of development of the Napoleonville candidate SPR site, emission sources would generally be short-term and over a small area. The principal pollutant of concern would be hydrocarbon emissions, as there is an indication that hydrocarbon (and oxidant) concentrations in southern Louisiana frequently exceed the National Ambient Air Quality Standards (NAAQS) (Section 3.3.3.3). The quality of air would be slightly affected during site construction. Paint solvent emissions are the major contributor of hydrocarbons and the three-hour hydrocarbon concentration, at one kilometer downwind, due to paint solvent emissions is calculated to be 104 $\mu g/m^3$.

Small amounts of fugitive dust would be created during site preparation and construction activities. Small amounts of emissions would be produced from open burning, engine exhaust, and the new salt dome facilities. The applicant is committed to minimize such effects and to comply with local and state regulations and standards.

During facility operations, atmospheric emissions would occur as a result of the storage, transportation, and transfer of oil. It is expected that significant quantities of hydrocarbon vapors would be released during these operations. Total hydrocarbon emissions associated with operation of the Napoleonville expansion of the Capline Group would range from about 33,800 to 36,600 tons during the 22-year operational life of the project. Worst case hydrocarbon concentrations from storage tank losses at the terminals would range from 114 to 232 $\mu g/m^3$ at 2 kilometers downwind. During peak withdrawal operations at the terminals, and under unfavorable dispersion conditions, undesirable hydrocarbon concentrations can be expected to occur as far as 27 kilometers downwind of the terminal facilities.

Increased noise levels can be expected to occur from construction of site facilities, and development of storage caverns, pipelines, and terminal facilities. The drilling of new cavity entrances and brine disposal wells is expected to contribute an equivalent sound level, $L_{eq}$, of 67 dB at 500 feet. Drilling operations may be expected to last from

300 to 450 days. Construction machinery used for site preparation activities may be expected to contribute an equivalent sound level of 68 dB at 500 feet. The equivalent sound level contributions from pipeline construction has been estimated to be 69 dB at 500 feet. The $L_{eq}$ contribution from construction of new terminal facilities is expected to be 67 dB at 500 feet.

Principal sound sources during the operation of the Napoleonville candidate SPR facility would be material handling equipment such as pumps for filling and emptying the facility. The equivalent sound level contribution for the proposed facility to the ambient sound level is estimated to be 30-35 dB at 500 feet. This contribution is considered to be negligible. Noise contributions from tanker operations at the terminals are also considered to be negligible.

5.3.2.4 Biotic Impacts

Development of the 437 acre (fenced area) Napoleonville candidate SPR site and 152 acres offsite would involve several impacts on the biota of the area. These impacts include the loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance.

Approximately 589 acres of wildlife habitat would be lost to site development. Habitat types include cleared land (66 acres), deciduous swamp and bottomland forest (147 acres), and open water (2 acres) and 374 acres within the fenced area that would remain undeveloped but nevertheless restricted. Since the sites would be fenced, it may be assumed that, except for avifauna, these habitats would no longer be available to wildlife. Earth moving activities for well pad construction, roads, and pipelines would increase turbidity in swamps and other surface water systems. Increases in turbidity would decrease light penetration, thereby reducing productivity. The permanent reduction in habitat would result in the loss of space, food, cover, and nesting, breeding, and visiting areas for most of the resident species. Animal losses from site preparation would occur mostly among non-mobile species. For the life of the project, however, only 41 acres of cleared land, 14 acres of bottomland forest, and 80 acres of swamp would be unavoidably adversely impacted for maintenance of permanent surface facilities and pipeline rights-of-way.

### 5.3.3 Alternative Grouping No. 1 - Early Storage Sites Plus Expansion of Weeks Island

#### 5.3.3.1 Land Impacts

The land occupied by the plant area overlying the dome would be withdrawn from use for salt production for the life of the SPR program. Although industrial products could be stored in the caverns at the completion of the SPR, salt extraction would likely not be resumed. During oil storage, access to the site would be controlled by the DOE for reasons of safety and security of the stored oil. About 100 acres overlying the dome would be fenced for the life of the project, as would one to two acres at the raw water intake structure. An additional area would be restricted at the terminal sites.

On-site activities during the construction phase of the project would include the grading and excavation of 32 acres. This acreage would be occupied by the plant area, roadways, wellheads, and the brine pond. This construction would require 137,000 cubic yards of fill and 35,000 cy excavation, about two-thirds of which would take place in areas already cleared. Pipeline construction and grading offsite would disturb 846 acres, about 68 acres of which will be on-shore; the remainder would be off-shore for construction of the brine disposal pipeline. An estimated 592,300 cubic yards of temporary excavation and 18,300 cy of fill would be required. For the life of the project, however, only 25 acres onsite and 43 acres offsite for maintenance of permanent facilities and pipeline rights-of-way would be unavoidably adversely impacted.

Leaching of 10 storage cavities in the Weeks Island salt dome would involve removal of about 91 MMB of salt by leaching for disposal in the Gulf of Mexico. This is equivalent to $34.5 \times 10^6$ tons of salt.

5.3.3.2 Water Impacts

During the on-site construction, some siltation of local water systems is expected to occur as a result of the grading and excavation of 878 acres, despite the utilization of erosion control measures. Some of the sediments, resulting from the approximately 627,300 cubic yards of excavation would be transported initially into the swamps and marshes in the vicinity of the dome. A small amount of sediments could move into Plantation Lake. Sediments could also be transported west into the Intracoastal Waterway and eventually to the coastal bays and the Gulf of Mexico.

The pipeline constructed for raw water supply would pass through forested land on the south flank of the elevated island and would cross no water bodies. Erosion caused by runoff from spoil piled along the pipeline trench would enter the marsh south of the dome. No changes in water quality or quantity within the Intracoastal Waterway are expected to occur.

Analysis of the disposal of brine into the Gulf of Mexico, as discussed in Section 4.1 and Appendices C and G, indicates that the current sequence has only a moderate effect on the maximum predicted concentration in the far field of the plume but has a substantial influence on the shape of the calculated concentration distribution. During periods of stagnation, the plumes remain close to the diffuser. Concentrations near the diffuser would be generally higher during slack current periods than for the strong net current cases due to concentration buildup. Associated with increased salinity would be an alteration of normal ion ratios and increased concentrations of precipitates. The pipeline constructed to dispose of the brine would cross Bayou Cypremont and the Intracoastal Waterway, would traverse about 1.5 miles of coastal marsh containing numerous small tidal creeks and ponds, and would terminate in the Gulf of Mexico. Impacts of pipeline construction in these areas include decreased pH and dissolved oxygen, and increased nutrient concentrations. Potential water quality impacts related to construction of the off-shore portion of the pipeline would be primarily a result of bottom disruption during pipeline burial. Effects that could occur are increases in BOD and lowering of dissolved oxygen, lowering of pH, increase in nutrients, and possible increases in concentrations of heavy metals released from the sediments. Development of the backup brine disposal wells would release sediments to the adjacent marsh and swamp forest wetlands, with effects similar to those discussed above.

The estimated quantity of brine spilled during leaching of Weeks Island is 45 barrels on land and in water bodies. Maximum credible spills of up to 30,000 barrels are considered possible, though unlikely.

5.3.3.3 Air and Noise Impacts

The air quality at the Weeks Island candidate site would be slightly affected during site preparation and construction. The impacts on air quality from these activities would be similar to those described for the Napoleonville candidate site in Section 5.3.2.3. All downwind concentrations of pollutants due to construction activities would be well below state and national air quality standards. However, as background hydrocarbon levels in southern Louisiana often exceed the three-hour standard, infrequent additional excesses may be expected. These construction impacts would be short-term and confined to a relatively small area. The development of the proposed terminal facilities for this alternative grouping would be identical to those for Napoleonville. The impact of terminal construction activities on air quality would be minor.

Generally, the air quality impacts resulting from operations of the facilities in this alternative grouping of sites would be very similar to those described for the proposed site development at Napoleonville in Section 5.3.2.3. The impacts at the terminals would also remain approximately the same as those described in that section. The major differences between the two alternatives are reduced emissions for this alternative. The total hydrocarbon emissions associated with the Weeks Island SPR primary oil distribution system would range from approximately 20,800 to 22,000 tons during the 22-year operational life of the project, approximately 40 percent less than for Napoleonville. The smaller storage capacity at Weeks Island than Napoleonville is the principal reason for the decrease in emissions. These decreases would occur in the Gulf of Mexico, along the Mississippi River, at the terminals, and at the Weeks Island candidate site. Worst case hydrocarbon emissions during tanker/barge transfer operations at terminals, from storage tanks at terminals and from the brine ponds at Weeks Island would remain unchanged from those discussed in Section 5.3.1.3, where it was concluded that during peak withdrawal operations and unfavorable dispersion conditions, undesirable hydrocarbon concentrations could be expected up to 27 km (17 miles) away.

Site preparation and construction activities for the Weeks Island expansion are not expected to adversely impact the ambient noise in the vicinity of the site, as there are no residents nearby and because of its industrial nature. The development of the brine disposal injection well system will, however, adversely affect approximately 94 structures within the noise impact zone created by well drilling operations. The duration of these impacts could be as long as 90 days (three brine disposal wells, each being completed in approximately 30 days). Construction of three pipelines (raw water line to the Intracoastal Waterway, line to the brine disposal well field, and the oil distribution line to St. James) would have an adverse impact on the areas that they traverse. The types of land and the number of residences affected is discussed in Section 4.4.2.1.4. It was concluded that areas along the pipeline route would be affected for only a short duration, as the construction would progress at a rate of 1/2 mile per day. There would be minimal noise impacts at the terminals as the areas already experience industrial noise.

5.3.3.4 Biotic Impacts

Construction phase impacts associated with the expansion of the Weeks Island candidate site include the disruption of 37 acres of bottomland forest, deciduous swamp and marsh, 63 acres of cleared land, and 778 acres of open water during site preparation activities such as grading and clearing. Since the area to be enclosed by fencing would be about 100 acres (including the above habitats), it may be assumed that, except in the case of avifauna, the resources provided by these habitats totaling 946 acres will be permanently lost to other wildlife groups. Small rodents and other non-mobile species would be likely to be most affected by on-site activities. Indirect effects of site preparation include effects on wildlife of forced migration, increased noise, loss of cover, space, food, and human disturbance. The expansion of the site should not have any significant effects on the aquatic environment. For the life of the project, however, only 19 acres of swamp and marsh, 5 acres of bottomland forest, and 44 acres of cleared land would be unavoidably adversely impacted for maintenance of permanent surface facilities and pipeline rights-of-way.

The development of a brine disposal system, raw water supply system, and oil distribution system would also have adverse impacts on the biotic resources of the area. The brine disposal system to the Gulf of Mexico would require 975 acres of terrestrial and aquatic habitats. Impacts from this system include the loss of the habitat, increases in turbidity in the streams crossed, brine discharge effects, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance. The proposed raw water supply system from the Intracoastal Waterway to the site would be located almost entirely on developed land. There would, therefore, be very little terrestrial impact related to the construction of this system. Aquatic impacts center on the entrainment and impingement of aquatic organisms on the intake structures (4.3.3.1.5). The actual loss of aquatic organisms is expected to be relatively small as the volume of water removed from the Intracoastal Waterway is only a small percent of the total volume of water available. The effects of the construction of the oil distribution system have been addressed in the supplement to FES 76/77-8. Gulf brine disposal would destroy benthic habitats, reduce primary productivity, result in avoidance of nektonic organisms, and may alter larval migration patterns.

### 5.3.4 Alternative Grouping No. 2 - Early Storage Sites Plus Expansion of Bayou Choctaw Plus Iberia

#### 5.3.4.1 Land Impacts

The land occupied by the plant area expansion overlying the Bayou Choctaw dome would be withdrawn from its present use for the life of the

SPR program. During oil storage, access to the site would be controlled by the DOE for reasons of safety and security of the stored oil. About 27 acres overlying the dome would be fenced for the life of the project, as would one to two acres at the raw water intake structure on the Mississippi River. Additional land would be restricted at the terminal sites.

On-site activities during the construction phase of the project would include the grading and excavation of 27 acres, of which only a small portion would occur in areas already disturbed. The plant area, cavern wellheads and containment dikes, and roadways would require 19,000 cy excavation, 62,400 cubic yards of fill. Pipeline construciton and grading offsite would temporarily disturb 90 acres of land and require 99,000 cubic yards of excavation and 116,000 cy of fill. For the life of the project, however, only 18 acres onsite and 58 acres offsite for maintenance of permanent surface facilities and pipeline rights-of-way would be unavoidably adversely impacted.

Onsite grading and excavation at the Iberia site would be confined to about 49 acres, of which a large portion would occur in areas used for agricultural purposes. The plant area, cavern wellheads and containment dike, and roadways would require 79,500 cubic yards of fill and 16,000 cy excavation. Pipeline construction and grading offsite would temporarily disturb 241 acres of land and require 355,000 cubic yards of excavation and 68,000 cy of fill. For the life of the project, however, only 35 acres onsite and 153 acres offsite for maintenance of permanent surface facilities and pipeline rights-of-way would be unavoidably adversely impacted.

Leaching of six additional storage cavities in the Bayou Choctaw dome would involve removal of 50 MMB of salt, or about $21.2 \times 10^6$ tons. Leaching of six storage cavities in the Iberia dome would remove $19.0 \times 10^6$ tons.

5.3.4.2 Water Impacts

Site preparation and construction of the Bayou Choctaw site may directly affect several water bodies, including Bayou Bourbeaux, Bull Bay, Port Allen Canal/Intracoastal Waterway, Bayou Choctaw, the onsite lake, and the Mississippi River.

During this period, some siltation of local water bodies is expected to occur as a result of grading and excavation of 296,400 cubic yards of earth on 117 acres of land, despite the utilization of erosion control measures. Some sediments would be transported into Bayou Bourbeaux, the on-site lake, and, as most construction would take place on the southern portion of the dome, into Port Allen Canal via some of the natural bayous.

Site preparation and construction at the Iberia site would also involve large amounts of earth movement, about 371,000 cubic yards of excavation and 147,500 cubic yards of fill, on 290 acres of land. Some of the sediments associated with these activities would be transported in Bayou Teche or into Lake Fausse Pointe.

Construction of the proposed raw water supply pipeline from the Bayou Choctaw site to the Mississippi River would include the installation of 5.4 miles of pipeline and an intake structure. No major waterways would be crossed, though the headwaters of Bayou Bourbeaux and other intermittent streams would cross the right-of-way. Depending on water depths and mixing conditions, a 60-acre area of swamp forest and shallow water could be affected by low pH, low dissolved oxygen, and high nutrient conditions.

Construction of the proposed raw water supply system for Iberia would include the installation of 1.5 miles of pipeline between the plant area and the intake structure on Bayou Teche. No waterways would be crossed. Impacts on water quality would be similar to those discussed above.

Construction of the proposed brine disposal injection well system for Bayou Choctaw would require the installation of 3.9 miles of pipeline. Permanent roadways would be constructed to each wellhead. Releases of interstitial water resulting from construction could be 2.2 acre-feet. Only minor water bodies would be crossed. Impacts from these activities would be similar to those discussed above. The estimated quantity of brine spilled during leaching of the Bayou Choctaw expansion is estimated to be about 20 barrels of brine. Maximum credible spills of up to 30,000 barrels are considered possible, though highly unlikely.

Construction of the proposed brine disposal injection well system for the Iberia site would require the installation of 1.5 miles of pipeline between the site and the wellheads south of the dome. As no major water bodies or other sediment transporting waterways would be crossed by the system, only minimal impact on water quality due to sediment release and drainage from spoil would be anticipated. The estimated quantity of brine spilled during leaching of the Iberia cavities is 23 barrels. Maximum credible spills of 30,000 barrels are considered possible, though highly unlikely.

The oil distribution pipeline that would be constructed from the Iberia dome to the Weeks Island early storage site would cross Bayou Patout, Warehouse Bayou, and their feeder channels. Impacts on water quality from construction of this pipeline would be much the same as those previously described.

#### 5.3.4.3 Air and Noise Impact

The air quality in the vicinity of both the Bayou Choctaw and Iberia domes would be slightly affected during site preparation and construction. The impacts on air quality from these activities would be similar to those described for the Napoleonville candidate site in Section 5.3.2.3. All downwind concentrations of pollutants due to construction activities would be well below state and national standards. However, as background hydrocarbon levels in southern Louisiana often exceed the three-hour standard, additional excesses may be expected. These construction impacts will be short-term in nature and confined to a relatively small area around each of the sites. The development of the terminal facilities would have identical impacts to those for Napoleonville, which would be minor.

Generally, the air quality impacts resulting from operation of the Bayou Choctaw and Iberia sites would be very similar to those described for the proposed development, in Section 5.3.2.3. Impacts at the terminals would also be substantially the same. The major differences are reduced emissions for this alternative.

The total hydrocarbon emissions associated with the Bayou Choctaw and Iberia primary oil distribution systems would range from approximately

24,800 to 27,200 tons during the 22-year operational life of the project, about 26 percent less than for Napoleonville. Worst case hydrocarbon concentrations during tanker transfer operations at the terminals would remain unchanged from those discussed in Section 5.3.2.3, where it was concluded that during peak withdrawal operations and unfavorable dispersion conditions, undesirable hydrocarbon concentrations could be expected up to 27 km (17 miles) away.

Major construction activities would occur at the Bayou Choctaw site along the pipeline route and the brine disposal well field. The equivalent sound level, $L_{eq}$, contribution from cavern well drilling operations and from brine disposal well drilling operations is estimated to be 67 dB at 500 feet. The duration of these sound level contributions would be from 360 to 540 days. There would be a total of 46 structures that would serve as receptors for this noise. The estimated contribution from pipeline construction would be 69 dB ($L_{eq}$) at 500 feet. Since pipelaying progresses along the pipeline route at approximately one-half mile per day, areas would be affected for only a short period of time.

The noise impacts resulting from site preparation and construction activities at the Iberia site would be very similar to those described above. There are 25 structures that would be affected by cavern well drilling operational noise. There are 90 structures that would be affected by pipeline construction for brine disposal, raw water supply, and oil distribution.

5.3.4.4 Biotic Impacts

Development of the Bayou Choctaw site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance.

Approximately 53 acres of deciduous swamp and open water bodies would be disturbed and 64 acres of land presently cleared would be used. Grading of 117 acres to a depth of one foot would also severely impact any small invertebrates in the surface vegetation and topsoil. Loss of primary and secondary terrestrial productivity would be localized but permanent. Loss of the swamp habitat by filling would eliminate most benthic organisms (an integral part of the aquatic food web), and most fish would be displaced to new habitats. For the life of the project, however, only 36 acres of swamp and 40 acres of cleared land would be unavoidably adversely impacted for maintenance of permanent surface facilities and pipeline rights-of-way.

The elimination of the 29 acres within the brine disposal pipeline right-of-way is expected to have a significant, though short-term, adverse impact in areas of high precipitation and soil moisture.

Direct effects of the construction (other than death resulting directly from construction activities) include permanent habitat loss (loss of food, cover, nesting, and breeding areas), forced migration of resident wildlife, and animal loss resulting from increased activity, road traffic, and covering fill.

Development of the Iberia site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance.

Approximately 8 acres of bottomland forest, 40 acres of deciduous swamp, 39 acres of marshland, 1 acre of open water, and 202 acres of cleared land would be disturbed. Grading of 290 acres to a depth of one foot would also severely impact any small invertebrates in the surface vegetation and topsoil. Secondary productivity by these organisms, while unknown for this site, is probably moderate.

Approximately 290 acres of wildlife habitat would be lost due to grading associated with site development, including 49 acres within the fenced 160-acre storage site. Habitat types to be affected include cleared land, existing oil field development, and bottomland forest. Since 160 acres at the site would be enclosed by fencing, it can be assumed that, except in the case of avifauna, the available resources provided in the habitat would be lost to many other wildlife groups. For the life of the project, however, only 25 acres of marsh, 25 acres of swamp, 6 acres of bottomland forest, and 132 acres of cleared land would be unavoidably adversely impacted for maintenance of permanent surface facilities and pipeline rights-of-way.

Earth moving activities for leach pad construction, roads, and other construction operations would increase turbidity and add nutrients to Bayou Tete. Increases in turbidity from construction would affect most of the surface water on-site by decreasing light penetration and hence possibly reducing plankton production.

Permanent loss of habitat from pipeline construction is expected in the wooded bottomlands and swamps. Brush and trees would be completely removed within the right-of-way in these areas. This removal would result in a loss of habitat, feeding areas, protective cover, and nesting areas for woodland species. Arboreal species of wildlife and woodland perching and nesting avifauna would be adversely affected. Some species within these groupings include the squirrels, raccoon, opossum, broadheaded skink, eastern gray treefrog, red-tailed and red-shouldered hawks, other hawks (Buteo spp.), owls, and most passerines. The loss of feeding areas would be permanent for some species (i.e., squirrels); however, once recovery of grasses, shrubs, and emergent macrophytes takes place, the area may provide a food source for some wildlife species. Loss of protective cover and nesting areas in the pipeline right-of-way in bottomland woods and swamps would be permanent for most species of wildlife unless dense stands of tall, herbaceous vegetation are permitted to remain.

### 5.3.5 Alternative Grouping No. 3 - Early Storage Sites Plus Chacahoula Dome

#### 5.3.5.1 Land Impacts

The land occupied by the plant area overlying the dome would be withdrawn from use as marshland for the life of the SPR program. During oil storage, access to the site would be controlled by the DOE for reasons of safety and security of the stored oil. About 450 acres overlying the dome would be fenced for the life of the project, as would one to two acres at the raw water intake structure on Bayou Lafourche. An additional area of about 66 acres would be restricted at the terminal sites.

On-site activities during the construction phase of the project would include the grading and excavation of 191 acres, of which only a small portion would occur in areas already disturbed. The plant area, cavern wellheads, and containment dikes, roadways, and other onsite construction would require 354,000 cubic yards of fill and 71,000 cy excavation. Pipeline construction and grading offsite would temporarily disturb 1,203 acres of land and require about 1,370,700 cubic yards of earth excavation, and 60,000 cy of fill. For the life of the project, however, only 127 acres onsite and 394 acres offsite for maintenance of permanent surface facilities and pipeline rights-of-way would be unavoidably adversely impacted.

Leaching of 24 storage cavities in the Chacahoula salt dome would involve removal of about 200 MMB of salt for disposal, or about $75.8 \times 10^6$ tons of salt.

5.3.5.2 Water Impacts

During on-site construction, some siltation of local water systems is expected to occur as a result of the grading and excavation of 1,394 acres despite the utilization of erosion control measures. Some of the sediments, resulting from the approximately 1,855,700 cubic yards of earth movement, would move into Bubbling Bayou and Donner Canal, which are located within 0.5 mile of the site.

Construction of the proposed raw water supply system would include the installation of 6.5 miles of buried pipeline between the plant area and the intake structure on Bayou Lafourche. A branch of Bubbling Bayou, the Phillips Canal, and 3.5 miles of swamps and marshes would be crossed. Water quality impacts would include changes in water flow patterns, BOD, dissolved oxygen, pH, nutrients, heavy metals concentrations, salinity, and turbidity. During construction of the pipeline, about 2.3 acre-feet of interstitial water could drain to surrounding land. Depending on water depths and mixing concentrations, a 60-acre area of swamp forest and shallow water could be affected by low pH, low dissolved oxygen, and high nutrient concentrations.

The proposed brine disposal location for the Chacahoula site is located in the coastal waters of the Gulf of Mexico, approximately 26 miles south of Point Au Fer. During the construction phase, a maximum of approximately 570 to 600 MBPD of brine with a salinity of 200 parts per thousand greater than the ambient would be disposed. The effects of this disposal of brine is discussed in Section 4.1, Appendix C and in detail in Appendix G. The proposed brine disposal pipeline route crosses Chacahoula Bayou, Tiger Bayou, Bayou Black, Lake Cocodric, an unnamed east-west canal, and Bayou Penchant. Impacts of pipeline construction in these areas include decreased pH and DO, and increased nutrient concentrations. Potential water quality impacts related to construction of an offshore portion of the pipeline would include increases in BOD, nutrients and trace metals released from the sediments and decreases in pH and DO. Pipeline construction will require approximately $3.0 \times 10^6$ cubic yards of excavation, potentially releasing 86 acre-feet of interstitial water to the surrounding environment. The estimated quantity of brine spilled during leaching of the caverns is 360 barrels. Maximum credible spills of up to 30,000 barrels are considered possible, although unlikely to occur.

The proposed oil distribution pipeline between the Chacahoula site and the St. James terminal would cross Bayou Lafourche, Bayou Petit Chackboy, Bayou Verret, Bayou Citamon, Coulee Michel, and the St. James canal.

5.3.5.3 <u>Air and Noise Impacts</u>

The air quality at the Chacahoula candidate site would be slightly affected during site preparation and construction. The impacts on air quality from these activities would be similar to those described for the Napoleonville candidate site in Section 5.3.2.3. All downwind concentrations of pollutants due to construction activities would be well below state and national air quality standards. However, as background hydrocarbon levels in southern Louisiana often exceed the three-hour standard, additional exceedances may be expected. These construction impacts will be short-term in nature and confined to a relatively small area. The development of the proposed terminal facilities would have identical impacts to those for Napoleonville, which would be minor.

Generally, the air quality impacts resulting from operation of the Chacahoula site would be very similar to those described for the proposed development in Section 5.3.2.3. The impacts at the terminal sites would also remain appoximately the same as those described in Section 5.3.2.3. The major differences between Chacahoula and Napoleonville are increased emissions for this alternative. The total hydrocarbon emissions associated with the Chacahoula site primary oil distribution system would range from approximately 43,800 to 46,900 tons during the 22-year operational life of the project, about 29 percent greater than for Napoleonville. Worst case hydrocarbon concentrations during tanker transfer operations at the terminals would remain unchanged from those discussed in Section 5.3.2.3, where it was concluded that during peak withdrawal operations and unfavorable dispersion conditions, undesirable hydrocarbon concentrations could be expected up to 27 km (17 miles) downwind.

Site preparation and construction at the Chacahoula site would increase noise levels at approximately 67 structures during the development of the backup brine disposal wells. On-site activities would have little noise impact as there are few receptors near the site. Noise impacts due to pipeline construction would be most significant where the raw water supply and oil distribution pipelines cross the Bayou Lafourche levee. In excess of 50 residences would be exposed to sound level increases of 3 dB or more for periods of up to one week.

### 5.3.5.4 Biotic Impacts

Development of the Chacahoula site would involve several impacts on the biota of the area. These impacts include loss of terrestrial and aquatic habitats, increases in turbidity, and indirect effects on fish and wildlife due to forced migration, noise, and human disturbance.

Approximately 1,394 acres of wildlife habitat would be lost due to grading associated with site development, including 191 acres within the fenced 450-acre storage site. Habitat types to be affected include cleared land, existing oil field development and urban areas, deciduous swamp and bottomland forest, and freshwater wetlands (creeks, bayous, and marshes). Since 450 acres at the site would be enclosed by fencing, and 1,203 acres would be required offsite, it can be assumed that, except in the case of avifauna, the available resources provided by the habitat would be lost to many other wildlife groups. For the life of the project, however, 271 acres of swamp, 186 acres of marsh and 64 acres of cleared land would be unavoidably adversely impacted for maintenance of permanent surface facilities and pipeline rights-of-way.

Permanent loss of habitat is expected in the marshes. Brush and trees would be completely removed within the right-of-way. This removal would result in a loss of habitat, feeding areas, protective cover, and nesting areas for woodland species. Arboreal species of wildlife and woodland perching and nesting avifauna would be adversely affected.

Direct effects of the construction (other than death resulting directly from construction activities) include permanent habitat loss (loss of food, cover, nesting and breeding areas), forced migration of resident wildlife, and animal loss resulting from increased activity, road traffic, and covering fill. Indirect effects of construction include impacts on wildlife of forced migration, increased noise, and human disturbance. Earth moving activities for leach pad construction, roads, and other construction operations would increase turbidity and add nutrients to swamps and other surface water systems in the area. Brine disposal in the Gulf during construction and operation would result in the destruction of benthic habitats, mortalities to plankton entrained in the plume, avoidance by nekton, and a general decrease in productivity.

CHAPTER 6.0

RELATIONSHIP BETWEEN LOCAL SHORT-TERM USE OF THE ENVIRONMENT AND MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

## 6.1 INTRODUCTION

This section describes the relatively short-term uses of the local environment that are implicit in the construction and operation of the proposed oil storage facilities in the Capline Group of sites and the expected effects on maintenance and enhancement of long-term producitivity. Based on the analysis in the previous sections of this statement, it is concluded that, while there are striking differences in the effects of implementing the SPR program among the sites, the proposed uses of the sites and their environs would not significantly affect the long-term productivity of the environment.

The principal short-term use of the Capline Group of sites will be the underground storage of petroleum for use during a period of national emergency. This oil storage will contribute to the short-term availability of petroleum resources should the nation's foreign supplies be reduced, thus providing an element of stability and security to our economy and to our national well-being. The use of the Capline Group of sites for underground oil storage will add a potential reserve of 300 million barrels of oil for immediate use in the future. The potential storage for each site considered is discussed in Section 2.1. The capacity of the Capline Group will account for approximately 60 percent of the storage requirements as detailed in the Energy Policy and Conservation Act of 1975.

There is no current experience in the United States to indicate any stress to the environment that would occur due to underground oil storage. Long-term studies and experiences in European countries indicate that no harmful effects can be expected using current technology. The increased storage potential may enhance both the short and long-term economic productivity of the nation by reducing the threat of an oil supply interruption, promoting international stability of oil supply and freeing national resources for the development of alternative energy supplies. With adequate safety and monitoring measures for fire prevention and to prevent the leakage of oil into the groundwater systems or to the surface, no long-term harmful effects are expected.

On the other hand, it is recognized that chronic or high-level pollution from possible accidental spills could have adverse impacts in certain areas. It is difficult to quantify these impacts or to estimate the short or long-term effects of a major oil spill, since these effects would depend on the location and rate of the spill. Data provided on expected average spill rates and a maximum credible spill impact indicate that significant environmental damage should be localized and not affect regional resource values (see Section 4.2).

Within the Capline Group, the surface acreages and the amount of salt resources committed to the project vary according to site. A discussion of the relationship of the project sites and the committment of these resources is presented in Section 7.0. The removal of the salt from the domes, however, will result in a reduction in the long-term mineral resources available to the industry. Available salt resources, both in the region and the United States, are sufficient to allow continued mining in the foreseeable future.

## 6.2 EFFECT ON NATIONAL AND REGIONAL ECONOMIC PRODUCTIVITY

The Capline Group of SPR storage facilities will provide a potential reserve supply of 300 million barrels of petroleum during the 20-25 year operating life of the facilities. This oil will provide some measure of certainty in meeting the projected national energy needs of governmental, industrial, commercial, residential and other users.

Construction and operation of the storage site(s) will thus increase available standby energy; the beneficial effect on economic productivity will be large compared to the loss of mineral salt resources, agricultural, forestry, recreational or other potential uses of the sites. Increased payrolls and, possibly, increased job security in the petroleum and petrochemical industries will have a beneficial economic impact on southeastern Louisiana.

There should be no short-term economic losses associated with implementing the project.

## 6.3 ADVERSE IMPACTS ON PRODUCITIVITY

### 6.3.1 Impacts on Land Use

The construction and operation associated with the development of petroleum storage capacity in the Capline Group of sites will disrupt surface acreage and commit a loss of salt resources. The extent of disruption and mineral resource committment varies, however, according to the site considered. Discussion of the nature and extent of these impacts are presented in Section 7.0.

### 6.3.2 Impacts on Water Use

Construction and operation of the project is not expected to be detrimental to commercial or recreational uses of any of the water resources in the project area of southeastern Louisiana.

### 6.3.3 Impacts on Air Resources Uses

Operation of the project with uncontrolled release of hydrocarbon vapors from barges and tankers during oil transfer and transportation would produce a significant increase in atmospheric hydrocarbon loading, at least in the vicinity of the primary transfer terminals. This increase could affect the selection of future industrial sites in areas which experience noticeably increased hydrocarbon or ozone concentrations as a result of the project. This impact should be of greatest significance within 5 to 10 miles of the transfer terminals.

### 6.3.4 Impacts on Biological Productivity

Construction associated with the development of the project is expected to result in the short-term loss of several habitat types. The habitat types affected are cleared lands, bottomland forest, deciduous swamp, saline marsh, intermediate and brackish marsh, fresh water marshland, fresh inland waters, and saline coastal waters. The quantities of these habitats that would be affected are dependent on the development alternative selected, and are outlined for each of the alternatives in Chapter 4.0. The effect of habitat alteration resulting from any of the development alternatives on the long-term productivity of the ecosystem of southern Louisiana is expected to be minimal. It should be noted, however, that variables such as specific pipeline route location, the development alternative selected, time of year for construction, the success of revegetation efforts, and maintenance procedures determine the degree to which these short-term impacts affect the long-term productivity of the regional ecosystem. Those impacts on biological productivity that are considered unavoidable are discussed in Chapter 5 for each of the development options.

# CHAPTER 7.0

# IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

## 7.1 INTRODUCTION

Resources that are irreversibly committed by the proposed action cannot be altered at some later time to restore their original value. Such irretrievable commitments consume resources that are not recoverable for subsequent use.

The types of resources affected by the underground storage of crude oil can be described as: 1) material resources; for example, renewable and nonrenewable resource materials consumed in construction and operation; and 2) natural resources, including any recognized beneficial uses of the environment. Resources that may be irreversibly committed are: 1) plants and animals destroyed on and around the site; 2) construction materials and energy that cannot be recovered or recycled; 3) materials consumed or reduced to waste products; and 4) land areas removed from present uses.

The following sections detail the resource commitments required for the proposed development of the Capline Group, which includes Napoleonville Dome, early storage at Bayou Choctaw and Weeks Island Domes and terminals. Table 7.2-1 in Section 7.2.9 summarizes the resource commitments for the proposed development and the three alternative development groupings.

## 7.2 SUMMARY OF IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

### 7.2.1 Land

Proposed development at the Napoleonville site would require 589 acres restricted from present use, 215 of which would be graded and excavated for onsite facilities both within the 437 acre fenced area, and for offsite brine disposal, raw water and crude oil pipeline systems. During operation, the fenced area and pipeline rights-of-way would require 531 acres and for the life of the project only 135 acres would be unavoidably impacted due to permanent surface facility structures and pipeline rights-of-way, although the pipeline rights-of-way could possibly be converted to other uses, leaving only 37 acres of destroyed land.

Development of alternative sites in the Capline Group would involve land commitments as follows, compared to the proposed expansion at Napoleonville:

| | Napoleonville | Weeks Island | Bayou Chochaw | Iberia | Chacahoula |
|---|---|---|---|---|---|
| Land restricted from present use, acres | 589 | 946 | 117 | 401 | 1653 |
| Area graded and excavated for site facilities, acres | 215 | 878 | 117 | 290 | 1394 |
| (Site fenced area, acres) | (437) | (100) | (27) | (160) | (450) |
| Area required for operation, acres | | | | | |
| -Total fenced area or restricted R.O.W. | 531 | 143 | 85 | 313 | 844 |
| -Site facilities or restricted R.O.W. | 135 | 68 | 76 | 188 | 521 |
| Land irretrievably committed, acres | 37 | 21 | 18 | 27 | 47 |

### 7.2.2 Air

The expected short-term effects of construction (fugitive dust and diesel exhaust) on air resources are described in Section 4.3.3.1. Uncontrolled venting during operational oil transfer and transport to the storage caverns would result in releases of hydrocarbon vapors as discussed in Section 4.3.3.2. Other atmospheric releases are of relatively minor significance. No irreversible commitments of air resources in the region will occur for the proposed development, or its alternatives.

### 7.2.3 Water

Construction of the Napoleonville Dome site as the proposed site would require the leaching of 92 MMB of capacity in new caverns and 28 MMB of expansion in existing cavern space to achieve the design total of 150 MMB. Leaching the new cavern space would require 840 MMB ($3.5 \times 10^{10}$ gallons) of raw water. Assuming that five fill and withdrawal cycles would be experienced during the life of the project, an additional 750 MMB ($3.15 \times 10^{10}$ gallons) would be used, for a total of 1590 MMB ($6.7 \times 10^{10}$ gallons). This water would be irretrievable in its original low-salinity form, as brine would be formed in the caverns by salt dissolution.

Water for Napoleonville would be ultimately obtained from the Mississippi River, which has a mean daily flow of 562,400 cubic feet per second. Over the project lifetime of 20 years, the Napoleonville site would use 0.0025 percent of the river flow ($2.6 \times 10^{15}$ gallons). The loss of this volume of water over the life of the project is insignificant.

Construction of any of the alternative site groupings would require leaching of 91 to 200 MMB of new capacity. Leaching the new cavern space and displacing the stored oil during five withdrawal cycles would require from 1092 to 2400 MMB of raw water. This water would be irretrievable in its original low-salinity form.

### 7.2.4 Species and Ecosystems

Construction of the proposed crude oil storage facility and the associated docks and pipelines will result in habitat alterations. During construction, there would be a temporary displacement and/or loss of plants and animals from both on-shore and off-shore pipeline rights-of-way. Effects during standby operations would be minimal.

At Napoleonville, 30 acres of swamp, 6 acres of bottomland forest and 1 acre of cleared land would be continuously cleared of obstructive vegetation for the duration of the project due to permanent surface facilities and must be considered irretrievable. The cumulative effects of facility construction and operation on the biotic community at Napoleonville would be insignificant when the total population and productivity of the area is evaluated (see Sections 4.3.3.1 and 4.3.3.2). No endangered, threatened, or unique wildlife or vegetation have been identified to be affected by the proposed action or its alternatives.

At alternative sites, the land considered irretrievable for other uses for the duration of the project would amount to the following totals: 15 acres of cleared land, 4 acres of bottomland forest, and 2 acres of marsh for Weeks Island; 18 acres of swamp for Bayou Choctaw; 24 acres of cleared land and 3 acres of bottomland forest for Iberia; and 2 acres of cleared land and 45 acres of swamp for Chacahoula.

### 7.2.5 Material

#### 7.2.5.1 Construction Materials

Most of the concrete, steel and other materials used in the construction of the proposed site and the related expansion of terminal facilities may be physically, though often not economically, retrievable. These materials must, however, be considered as an irretrievable commitment of resources since valid estimates of their salvage cannot immediately be made.

Estimates of construction material irretrievably committed total about 20,000 tons of steel and 50,000 tons of concrete.

#### 7.2.5.2 Salt

Disposal of brine from solution mining of the salt dome irreversibly commits the solid salt resource. Approximately 45.5 million tons of salt (equivalent to 120 MMB of new leached storage capacity) would by construction of the Napoleonville site be lost to future recovery. This is 0.4 percent of the estimated $1.15 \times 10^{10}$ tons of salt contained in the dome down to a level of -3000 feet MSL.

#### 7.2.5.3 Oil

For the five fill-withdrawal cycles planned for the proposed system, the total potential storage capacity at Napoleonville is 750 MMB of crude oil. Oil losses through incomplete recovery, evaporation and spills could total about 0.037 percent of the potential storage capacity. A total of 275,000 barrels of crude oil might be irretrievable (see also Section 7.2.6).

### 7.2.6 Energy

The energy consumed during construction and operation includes the energy required to supply materials, prepare and operate the site, transport the crude oil, and losses of crude oil during transport (see Section 7.2.5). Tabulated gross energy values include:

| | Millions of BTU |
|---|---|
| Construction | |
| Labor | 100,000 |
| Equipment | 500,000 |
| Steel (20,000 tons) | 800,000 |
| Concrete (50,000 tons) | 300,000 |
| | 1,700,000 |
| Oil Handling | |
| Tanker Transport ($2.96 \times 10^{10}$ Ton Miles @ 450 BTU/Ton-Mile) | 13,330,000 |
| Loading & Unloading | 4,865,000 |
| | 18,195,000 |

The tabulations indicate that above 1,700,000 MMBTU (million BTU) would be consumed in constructing the proposed system and $1.82 \times 10^7$ MMBTU would be expended in handling the oil through five storage cycles. In terms of crude oil equivalence content (5.5 MMBTU/barrel), the potential oil resources use is:

| | |
|---|---|
| Construction - 0.041% of Potential Cavern Storage Capacity | (310,000 bbl) |
| Handling (5 Cycles) - 0.44% | (3,310,000 bbl) |
| Oil Not Recovered From Caverns - 0.0046% | (34,500 bbl) |
| Oil Released in Evaporation During Transportation - 0.030% | (226,100 bbl) |
| Spill Expectation During Project Lifetime - 0.0011% | (6,500 bbl) |
| Oil Displaced in Brine - 0.0010% | (7,500 bbl) |
| Total - 0.52% of Potential Storage Capacity, Where Total Potential Storage Capacity is 750 MMB (150 MMB @ Napoleonville x 5 Cycles) | (3,894,600 bbl) |

1. Requires 40 MMBTU per ton for manufacture
2. Requires 6 MMBTU per ton for manufacture
3. All percentages are of potential cavern storage capacity

The energy used is irretrievable. It represents an investment of approximately 0.5 percent of the storage capacity to help prevent future drastic reductions in energy availability as a result of arbitrary decisions by foreign suppliers.

The energy expended for construction and operation at any of the alternative sites is summarized in Table 7.2-1. The differences in energy requirements depend on the distances over which the oil, water and brine are handled and the volumes handled.

7.2.7 Labor

Following completion and initial fill of the Bayou Choctaw and Weeks Island early storage phase facilities and the new construction and initial fill of the Napoleonville proposed site, the proposed development grouping would be operated as a single system for the anticipated 20 year project life. This would include approximately 675 man-years of effort for construction and initial fill of the Napoleonville site and expanded terminal facilities, plus 832 man-years of operational effort for standby and the anticipated additional fill-withdrawal cycles. This utilization of manpower would not be available for other uses and would be irretrievable.

Manpower requirements for alternative site developments are shown in Table 7.2-1.

### 7.2.8 Capital

The cost of constructing and operating the facility over the project lifespan would represent money for equipment and manpower which is essentially irretrievable. These costs are weighted against the possible severe economic loss which the country would incur if no provisions are made against oil embargos.

### 7.2.9 Summary

Table 7.2-1 is a comparative summary of the commitment of resources required to develop any of the site groupings within the Capline Group.

TABLE 7.2-1 Resource commitments for Capline Group candidate sites.

| RESOURCE | UNITS | PROPOSED DEVELOPMENT | ALTERNATIVE GROUPING NO. 1 | ALTERNATIVE GROUPING NO. 2 | | | ALTERNATIVE GROUPING NO.3 |
|---|---|---|---|---|---|---|---|
| | | Napoleonville | Weeks Island Expansion | Bayou Choctaw Expansion | Iberia Dome | Combination | Chacahoula |
| **LAND** | | | | | | | |
| Land removed from present use | acres | 589 | 946 | 117 | 401 | 518 | 1,653 |
| Land irretrievably committed | acres | 37 | 21 | 18 | 27 | 45 | 47 |
| **WATER** | | | | | | | |
| Water use during project lifetime | MMB(%)[1] | 1,590 (0.0025) | 1,092 | 672 (0.0011) | 600(1.09) | 1,272(---) | 2,400 (0.0038) |
| **ECOSYSTEM AND SPECIES** | | | | | | | |
| Area permanently cleared of vegetation | acres | 37 | 21 | 18 | 27 | 45 | 47 |
| **MATERIAL** | | | | | | | |
| Construction materials - steel | tons | 20,000 | 30,000 | 10,000 | 15,000 | 25,000 | 60,000 |
| Construction materials - concrete | tons | 50,000 | 15,000 | 20,000 | 30,000 | 50,000 | 75,000 |
| Salt | MM tons | 45.5(0.4) | 34.5 | 21.2 | 19.0 | 40.2 | 75.8 |
| **ENERGY** | | | | | | | |
| Labor and equipment for construction | MM BTU | 600,000 | 450,000 | 250,000 | 300,000 | 550,000 | 1,000,000 |
| Oil handling by tanker | MM BTU | 13,330,000 | 8,050,000 | 4,975,000 | 4,442,500 | 9,417,500 | 17,766,000 |
| Oil transfers, raw water supply and brine disposal | MM BTU | 4,865,000 | 7,855,000 | 2,755,000 | 2,965,000 | 5,720,000 | 14,504,000 |
| **ENERGY EQUIVALENCE** | | | | | | | |
| Construction | bbl(%)[2] | 310,000 (0.041) | 316,000 (0.069) | 140,000 (0.050) | 196,000(0.078) | 336,000(0.063) | 700,000 (0.070) |
| Oil handling | bbl(%) | 3,310,000 (0.44) | 2,892,000 (0.64) | 1,405,000 (0.50) | 1,347,000(0.54) | 2,752,000(0.52) | 5,867,000 (0.59) |
| Oil not recovered from caverns | bbl(%) | 34,500 (0.0046) | 21,000 (0.0046) | 13,000 (0.0046) | 11,500(0.0046) | 24,500(0.0046) | 46,000 (0.0046) |
| Oil released by evaporation | bbl(%) | 226,100 (0.030) | 139,700 (0.031) | 85,500 (0.030) | 76,800(0.031) | 162,300(0.031) | 287,400 (0.029) |
| Spill expectation | bbl(%) | 6,500 (0.0009) | 4,750 (0.0010) | 2,850 (0.0010) | 1,950(0.0008) | 4,800(0.0009) | 8,900 (0.0009) |
| Oil retained in brine | bbl(%) | 7,500 (0.0010) | 4,500 (0.0010) | 2,800 | 2,500(0.0010) | 5,300(0.0010) | 10,000 (0.0010) |
| Total Energy Equivalence | bbl | 3,894,600 | 3,377,950 | 1,649,150 | 1,635,750 | 3,284,900 | 6,919,300 |
| Potential Storage Capacity | MM bbl | 750 | 455. | 280 | 250 | 530 | 1,000 |
| Percent of Potential Storage Capacity | (%) | (0.52) | (0.74) | (0.59) | (0.65) | (0.62) | (0.069) |
| **LABOR** | | | | | | | |
| Manpower required for construction | man-years[3] | 675 | 423 | 338 | 276 | 614 | 666 |
| Manpower required for operation | man-years | 832 | 592 | 254 | 347 | 601 | 993 |
| Total Manpower | man-years | 1,507 | 1,015 | 592 | 623 | 1,215 | 1,659 |

[1]Percent of average stream flow in source stream.

[2]Percent of Potential Storage Capacity

[3]All sites except Iberia include estimated 100 man-years for terminal expansion.

# CHAPTER 8.0

## SUMMARY OF PROPOSED AND ALTERNATIVE ACTIVITIES

### 8.1 INTRODUCTION

The purpose of this section is to provide a summarization of the proposed and alternative activities considered for the Capline Group of the Strategic Petroleum Reserve program. The range of alternatives available to, and considered by, the Department of Energy occur within two categories: first, within the grouping of the sites being considered and, second, within the consideration of viable systems for oil distribution, raw water supply, and brine disposal for the sites being examined. The proposed development alternative of utilizing the Napoleonville dome candidate site in conjunction with the early storage sites at Bayou Choctaw and Weeks Island, has been examined in relation to both alternative sites (i.e. expansion of Weeks Island early storage site plus use of Bayou Choctaw early storage site) and alternatives to the proposed facility systems.

For all of the sites considered, the utilization of the early storage phase facilities have been included as integral elements. These facilities were included to maximize the storage capacity for the Capline Group, and to minimize the environmental effects inherent in developing separate system components for any of the alternative sites. Table 8.1-1 presents a comparison of the components for the proposed development and its alternatives. A summary of the early storage facilities is presented below. The environmental impacts, and a more detailed description of the early storage phase system components are presented in FES 76-5 and supplments for the Bayou Choctaw site and FES 76/77-8 and supplements for the Weeks Island site. The relationship of the early storage phase sites to SPR sites in the Capline Group is presented in Chapter 2 of this report.

#### 8.1.1 Bayou Choctaw Early Storage Site

There are about 94 million barrels of available storage capacity at the Bayou Choctaw Early Storage Site. Development of this capacity will require conversion of existing brine and product storage caverns to crude

TABLE 8.1-1 Summary of major structural requirements of each SPR alternative.

| | Proposed Development (early storage sites plus Napoleonville) | Alternative Grouping No. 1 (early storage sites plus expansion of Weeks Island) | Alternative Grouping No. 2 (early storage sites plus Bayou Choctaw expansion plus Iberia) | Alternative Grouping No. 3 (early storage sites plus Chacahoula) |
|---|---|---|---|---|
| Expansion Capacity | 150 MMB | 91 MMB | 106 MMB | 200 MMB |
| Number of New Cavity Wells | 10 | 10 | 12 | 24 |
| New Water Pipelines to site | 4.6 mi | 0.9 mi | 6.9 mi | 6.5 mi |
| New Water Pipelines on site | 9.0 mi | 6.6 mi | 5.0 mi | 13.5 mi |
| New Oil Pipelines to site | 19.1 mi | 0.0 mi | 14.6 mi | 21.9 mi |
| New Oil Pipelines on site | 9.0 mi | 6.6 mi | 5.0 mi | 13.5 mi |
| New Oil Surge Tanks | 0 | 0 | 0 | 0 |
| New Docks | 0 | 0 | 0 | 0 |
| New Brine disposal line to Gulf | 0.0 mi | 37.6 mi | 0.0 mi | 64.0 |
| New Partial Backup Brine injection wells | 0.0 mi | 2.3 mi | 0.0 mi | 1.9 mi |
| Brine pipeline to injection injection wells | 6.7 mi | 0.0 mi | 8.3 mi | 0.0 mi |
| Plant Control Facilities | new | exists | new* | new |
| Brine Pit | 160,000 BBL | 120,000 BBL | 230,000 BBL | 430,000 BBL |
| Blanket Oil Tank | 1 | 1 | 1 | 1 |
| Prime Water Tank | 1 | 1 | 1 | 1 |
| Power generator fuel tank | 0 | 0 | 0 | 0 |

*some exist at Bayou Choctaw (Early Storage Phase) oil storage and construction of associated surface facilities. The initial filling of the caverns will be via existing barge docks at Bull Bay. This will take place concurrently with the construction of an oil distribution pipeline to DOE terminal facilities at St. James, La. for further filling operations. Conversion of the sites is scheduled such that oil deliveries will begin via barges at the Bull Bay terminal in mid 1977.

The source of water for displacement of this stored oil during withdrawal operations will be the on-site lake, which is connected to Bayou Bourbeaux and the Intracoastal Waterway. The proposed method for disposing of the saturated brine displaced during oil fill operations, will be injection into subsurface saline strata off the southern flank of the dome.

### 8.1.2 Weeks Island Mine Early Storage Site

The Weeks Island Mine, a conventional underground salt mine, has about 89 million barrels of crude oil storage capacity. As this mine is operated in the dry, crude oil can be stored or withdrawn without the need for raw water supply or brine disposal facilities. Conversion of the existing mine will involve the conversion of the existing service shaft to a pump shaft, installation of oil pumps and casings, sealing of the existing production shaft, and construction of the necessary oil distribution facilities. Initial fill of the Weeks Island facility will be conducted using a pipeline connection to the DOE Terminal at St. James. The proposed route of this pipeline is about 64.4 miles in length and will extend east from Weeks Island to Franklin, then northeast to St. James, crossing within one mile of the Napoleonville dome candidate site.

## 8.2 SUMMARY OF ACTIVITIES AT THE PROPOSED DEVELOPMENT - EARLY STORAGE SITES PLUS NAPOLEONVILLE DOME

### 8.2.1 Proposed Activities

The total storage capacity of the proposed development (the use of Weeks Island early storage site, Bayou Choctaw early storage site, and development of the Napoleonville dome candidate site) would be approximately 333 million barrels of oil. This capacity would be distributed among the three sites, with Bayou Choctaw early storage sites having a capacity of up to 94 MMB; Weeks Island early storage site having a capacity of 89 MMB, and Napoleonville dome having a capacity of 150 MMB. To accommodate this capacity at the Napoleonville candidate sites, seven existing caverns would be utilized and 10 new caverns would be mined and then used. Each of these new caverns wells would require grading approximately 1 acre of land for a drill pad and road access. The land required for drill pads would total seven acres of bottomland forest and three acres of deciduous swamp. After completion of the wells, leaching of the salt to create storage space would begin. Water would be withdrawn from Bayou Lafourche, which would in turn be supplied by additional pumpage from the Mississippi River at Donaldsonville. The water would be injected into the wells, serving two purposes. It would be used to dissolve salt from the cavern walls, thus forming brine, and second, to displace brine already produced in the cavity. Brine displaced from the caverns would be disposed of by utilizing deep injection wells. The well field needed to accommodate the disposal of brine would be located to the south of the Napoleonville dome site and would be connected to the site by a 6.7 mile pipeline. The land required for this field would be 76 acres in cleared land and deciduous swamp uses. The disposal system would consist of twenty-eight wells, well pads, pipelines, and access roadways.

Completed storage caverns would be filled with oil delivered from the terminals by pipeline. This pipeline would be 19.1 miles long and would be located in both cleared lands and deciduous swamp. The Napoleonville dome - St. James pipeline would parallel the pipeline from Weeks Island mine to the DOE terminal that would be constructed as an element of the early storage phase of the SPR program.

Terminal facilities for crude oil distribution would consist of the following: an expanded DOE terminal at St. James, plus an expanded Koch terminal at St. James, or the Nordix terminal at Sunshine. At the DOE terminal at St. James, four 200,000 barrel oil tanks would be constructed, along with increased utilization of the existing tank farm and docks. The Koch terminal at St. James would be expanded by the addition of a new tanker dock on the east side of the Mississippi River and three 500,000 barrel tanks on the west side, along with part-time use of an existing tanker dock. Facilities constructed at Sunshine, La. by Nordix, consisting of a tanker dock and ten 150,000 barrel tanks, would together with part-time use of an existing tanker dock be utilized for the SPR.

During an emergency withdrawal of crude oil from the storage caverns, raw water would be withdrawn from Bayou Lafourche to displace the stored oil, as described in the leaching procedure.

8.2.2 Alternative Activities

An alternative source of raw water for development of the Napoleonville dome would be Grand Bayou, which is located immediately to the west of the site. The ability of Grand Bayou to meet the water demands of the SPR program at Napoleonville has not been established. Use of this alternative raw water source would necessitate the construction of 0.4 miles of pipeline, an intake structure, and four acres of deciduous swamp. Another alternative raw water source would be the use of ground water from wells located near the site. These wells would be located along the oil pipeline to the east of the dome. Development of this alternative would require 4.6 miles of new pipeline to be constructed, the use of 26 acres of cleared lands, and would involve two water crossings by the new pipeline. A third alternative raw water source would be the Gulf of Mexico, near Cote Blanche. Utilization of this alternative would require the construction of 44.3 miles of new pipeline from the Napoleonville site to the Gulf. This pipeline would parallel the alternative brine disposal pipeline. Development of this alternative would require the use of 17 acres of cleared lands, 5 acres of bottomland forest, 45 acres of deciduous swamp, 25 acres of marsh, and 25 water crossings. A fourth alternative raw water source would be the Mississippi

River near St. James. This alternative would involve 19.1 miles of pipeline which would follow the crude oil distribution pipeline route. Land used in construction would be 39 acres of cleared land and 22 acres of deciduous swamp.

An alternative method of brine disposal is the construction of a brine disposal pipeline to the Gulf of Mexico. This would involve the construction of a 74.4 mile pipeline and the use of 17 acres of cleared land, 5 acres of bottomland forest, 45 acres of deciduous swamp, 25 acres of marsh, and 25 water crossings. Development of this alternative in conjunction with the use of the Gulf of Mexico as an alternative raw water supply would result in a shared pipeline right-of-way. Use of the brine disposal to the Gulf of Mexico alternative would also necessitate the construction of several back-up brine disposal wells which would be located along the pipeline to the Gulf. An additional 3.7 miles of pipeline construction would be required and six acres of cleared land would be used.

## 8.3 SUMMARY OF ACTIVITIES FOR ALTERNATIVE GROUPING NO. 1 - EARLY STORAGE SITES PLUS EXPANSION OF WEEKS ISLAND

### 8.3.1 Proposed Activities

The total storage capacity for the Capline Group of SPR sites, under this development alternative, would be approximately 274 million barrels of crude oil. Alternative grouping No. 1 includes the storage of approximately 183 MMB of crude oil at the Bayou Choctaw dome and Weeks Island mine early storage sites and the expansion of the Weeks Island site to accommodate the storage of 91 MMB of crude oil. Under this grouping, the development of the Weeks Island site would be in two stages. First, the existing underground salt mine operated by the Morton Salt Company will be converted to crude oil storage during the early storage phase of the program. The second stage would be the leaching of caverns to provide 91 MMB of additional storage under the long-range provision of the program. The expanded capacity could be developed without construction of a new crude oil distribution pipeline to St. James, as only increased usage of the existing Weeks Island - St. James pipeline (constructed as a part of the early storage system previously described) would be necessary. New raw water supply and brine disposal pipelines would, however, need to be constructed as the early storage phase facilities at Weeks Island did not have a requirement for such pipelines. Oil terminal facilities would be as described in Section 8.2.1.

The additional capacity would consist of six 10 MMB capacity caverns, two 7.3 MMB capacity caverns, and two 8.2 MMB capacity caverns. The expansion of the site would also necessitate the construction of on-site pipelines and access roadways connecting the caverns to the central plant site. The existing plant site would need to be expanded to accommodate the larger through-put of the site. Cavern construction techniques, as previously described, would follow a leach, then fill scenario.

Raw water is proposed to be provided through a short pipeline to the Intracoastal Waterway. This pipeline, 0.9 miles in length, would require the use of 9 acres of cleared lands near the site. A maximum of 28,000 barrels per hour of raw water would be required. The pipeline from the water intake structure and pump station, which would be constructed on the Intracoastal Waterway, would terminate at a 112,000 barrel raw water surge pond. This pond would require 2 acres of cleared lands on the site.

Brine produced during leaching and crude fill operations would flow to a lined, 120,000 barrel settling and surge reservoir. This reservoir would require an additional two acres of cleared land on the site. The proposed means of disposing brine is via a pipeline to the Gulf of Mexico, the proposed route of which runs onshore southeast of the plant area for 5.5 miles, then extends across West Cote Blanche Bay in a south-easterly direction, then south across East Cote Blanche Bay and into the Gulf of Mexico. An underwater pipeline length of 32.1 miles would be required to extend the pipeline to the 20 foot water depth. The onland portion of the brine disposal pipeline would require the use of 28 acres of cleared land, 13 acres of deciduous swamp, and 13 acres of marsh, and would necessitate the crossing of 6 water bodies. To supplement the offshore brine disposal system, a series of three deep injection wells would be constructed off the southeast flank of the dome, along the brine disposal pipeline. This back-up brine disposal system would require the use of 5 acres of cleared land and 2 acres of deciduous swamp.

### 8.3.2 Alternative Activities

The alternative source of raw water supply for the development of the Weeks Island site would be the Gulf of Mexico. This alternative would involve the construction of a 7.5 mile pipeline. The construction of an intake and pumping structure, water storage tanks on-site, the use of 7 acres of cleared land, 3 acres of deciduous swamp, 3 acres of marsh and 6 water crossings. The total acreage required, including open water acreage, would be 62 acres.

The alternative method of brine disposal would be the utilization of deep injection wells. This would involve the development of 13 wells in a well field located to the south of the site. A new, 8.8 mile pipeline would need to be constructed, as would wellhead pads, and access roads. Land requirements for this alternative would include the use of 106 acres of cleared land, and 19 acres of deciduous swamp.

The alternate brine diffuser site would require a 53.1 mile pipeline following the proposed pipeline route on land but extending offshore an additional 15.5 miles.

## 8.4 SUMMARY OF ACTIVITIES OF ALTERNATIVE GROUPINGS NO. 2 - EARLY STORAGE SITES PLUS EXPANSION OF BAYOU CHOCTAW PLUS IBERIA DOME

### 8.4.1 Proposed Activities

The total storage capacity for the Capline Group of SPR sites, under this development alternative, would be approximately 289 MMB of crude oil. Alternative grouping No. 2 includes the storage of up to 183 MMB of crude oil at the Bayou Choctaw dome and Weeks Island mine early storage sites, the expansion of the Bayou Choctaw dome site to accommodate 150 MMB (56 MMB increase) of storage capacity, and the development of the Iberia dome site to 50 MMB of storage capacity.

#### 8.4.1.1 Bayou Choctaw Expansion

The expansion of the Bayou Choctaw dome would principally include the leaching of six new cavities and construction of access roads, pads, protective diking, and pipelines connecting the new facilities to existing systems. Modification of the early storage systems would be required to handle increased oil, water, and brine flows resulting from an approximately 60 percent increase in the volume of crude oil stored at the site. The principal addition to existing facilities would be the construction of a raw water supply pipeline to an intake on the Mississippi River.

The terminal facilities which would be used for oil distribution from the Bayou Choctaw site would be as discussed in Section 8.2.1.

The Mississippi River would provide displacement water for the expansion requirements at Bayou Choctaw, through a 5.4-mile pipeline to an intake east of the site. This pipeline would require the use of 53 acres of cleared land and would involve one water crossing.

A system of deep injection wells will be used for brine disposal during early storage operations. Ten brine disposal wells will be constructed for this system. The expansion of the Bayou Choctaw storage capacity would result in an increased volume of brine to be disposed. To dispose of the increased volume of brine, the well field constructed as an element of the early storage phase system would be expanded to a total of 23 wells. The construction of additional brine disposal pipelines would require the use of three acres of cleared land and twenty-five acres of deciduous swamp. Four stream crossings would also be required. Access roads and brine disposal wellhead pads would require the use of 7 acres of deciduous swamp and the roadways would also cross four water bodies.

#### 8.4.1.2 Iberia Dome

Development of the Iberia dome for the storage of 50 MMB of crude oil would require the construction of new oil distribution, raw water, and brine disposal systems, and the construction of cavern space and associated surface facilities. To accommodate the planned storage capacity, it is anticipated that six caverns would need to be leached.

Crude oil distribution is proposed through the DOE Terminal via a new 14.6-mile pipeline connection from Iberia dome to the Weeks Island early storage facility. This pipeline would require the use of 90 acres of cleared land, 40 acres of deciduous swamp, and 39 acres of marsh. From Weeks Island, the crude oil would be transported in the early storage phase pipeline to St. James.

Raw water for oil withdrawal and cavern preparation would be supplied by Bayou Teche. The 1.5 mile pipeline connection would be located in the same right-of-way as the oil distribution pipeline. On-site, the pipeline would be connected to a 10,000 barrel raw water reservoir. At the Bayou, an intake structure and pumping station would be constructed, requiring a total of 16 acres of cleared land for the system.

Brine disposal is proposed to be accomplished by deep well injection. Brine would be transported from the site to a well field located on the southern flank of the dome. Approximately 4.4 miles of pipeline would be constructed requiring the use of 38 acres of cleared land and five acres of bottom land forest. The well field would require the use of 10 acres of cleared land and two acres of bottomland forest.

### 8.4.2 Alternative Activities

#### 8.4.2.1 Bayou Choctaw Expansion

An alternative raw water source for the expansion of the Bayou Choctaw site would be the Intracoastal Waterway near the site. The construction of an intake structure, a pump station, and 1.0 miles of pipeline would be necessary. The construction of these facilities would require the use of 8 acres of cleared lands. Another source of raw water would be to construct a 98.3 mile pipeline to the Gulf of Mexico. Development of this alternative would likely require that brine be removed to the Gulf as well. To provide the necessary economics, the rightof-ways would extend southeast to near the Chacahoula dome, then southwest to the Gulf. The pipeline route would traverse 133 acres of cleared lands, 9 acres of bottomland forests, 232 acres of deciduous swamps, 298 acres of marshes, and would cross 49 waterways and 51 acres of open water. A third source of raw water would be to develop ground water wells in shallow, subsurface aquifers along the proposed crude oil pipeline right-of-way. These wells would tap the Plaquemine aquifer at depths between 100 and 450 feet. The aquifer is considered capable of providing the water quantities required during oil removal. A 4.7 mile pipeline would need to be constructed which would require the use of 12 acres of cleared land.

An alternative method of disposing of brine would be to construct a 119.9 mile pipeline from Bayou Choctaw site to the Gulf of Mexico. Such a pipeline would require the construction of a brine diffuser system in the Gulf and would require the use of 133 acres of cleared land, 9 acres of bottomland forest, 232 acres of deciduous swamp, 298 acres of marshes, and would cross 49 waterways and 574 acres of open water. The development of this alternative would likely require that raw water be obtained from the Gulf, as the two pipelines could share a common right-of-way. Use of the Gulf of Mexico for brine disposal would also require the development of a back-up brine disposal system of deep injection wells. This back-up system would involve the construction of a 2.2 mile pipeline, and would require six acres of cleared land for drill pads, access roads, and pipelines. Another method of brine disposal would be the development of a brine well field, which would be located along the proposed raw water supply pipeline from the Mississippi River. This alternative would require the construction of a 2.6 mile pipeline, access roads, and wellhead pads. Land use requirements would be limited to 10 acres of cleared land by sharing the proposed raw water supply pipeline right-of-way.

8.4.2.2 Iberia Dome

An oil distribution system alternative specific to the Iberia site would be the construction of a new 39 mile pipeline directly from the site to St. James. This pipeline would traverse similar terrain to the pipeline constructed from the Weeks Island early storage phase site to St. James.

Alternative sources of raw water for displacement of oil and for cavern development would be Lake Fausse Pointe, 6 miles to the east, or via a pipeline from the Gulf of Mexico. Deep wells, along the oil distribution pipeline route, for providing a ground water source could also be considered. The development of the Lake Fausse Pointe alternative would require a 7.3 mile pipeline which would traverse 68 acres of cleared land and 3 acres of bottomland forest. An intake structure and a pump station would also be required and would use one acre of cleared land. The development of the Gulf of Mexico alternative would require that a 22.1 mile pipeline be constructed, which would traverse 117 acres of cleared land, 66 acres of deciduous swamp, and 13 acres of marshland, and would cross 8 waterways, and 49 acres of open water. The use of groundwater wells would require the construction of 3.7 miles of new pipeline and the use of 9 acres of cleared land.

Disposal of brine to the Gulf of Mexico would be an alternative to the proposed deep well injection. The 52.2 mile pipeline from the site to the Gulf would parallel the route for the alternative raw water supply pipeline. The onshore land requirements would, therefore, be the same for the two pipelines.

## 8.5 SUMMARY OF ACTIVITIES AT ALTERNATIVE GROUPING NO. 3 - EARLY STORAGE SITES PLUS CHACHOULA DOME

### 8.5.1 Proposed Activities

The total storage capacity for the Capline Group of SPR sites, under this development alternative, would be 383 million barrels of crude oil. Alternative grouping No. 2 includes the storage of up to 183 MMB of crude oil at the Bayou Choctaw dome and Weeks Island mines early storage sites and the development of 200 MMB of storage capacity at the Chacahoula dome candidate site. A summary of activities at the early storage phase sites has been presented in Sections 8.1.1 and 8.1.2.

The Chacahoula dome is presently planned for the storage of 200 MMB of crude oil in 24 new salt cavities, which would be leached in the -2500 feet to -3500 feet depth interval. Oil distribution is proposed via a new pipeline connection to the DOE terminal at St. James Port facilities on the Mississippi River. This pipeline would be 21.9 miles long and would traverse 85 acres of cleared land, 128 acres of deciduous swamp, and would cross 10 waterways. The terminal facilities would be as discussed in Section 8.2.1.

Bayou Lafourche is the proposed source of raw water for the initial leaching of the storage cavities, and for the subsequent displacement of the stored oil. It is a regulated stream which is supplied by a pumping station at Donaldsonville, Louisiana, on the Mississippi River. Utilization of this new raw water source would require that a 6.5 mile pipeline be constructed from the site to Bayou Lafourche and that an intake structure and 2-acre pump station be constructed. The pipeline route would traverse 7 acres of cleared lands and 10 acres of deciduous swamp and cross 3 waterways. A maximum rate of 54,000 gallons per minute of water would be required. In addition to the above facilities, the pipeline would be connected to a 40,000 barrel raw water reservoir, which would be constructed as an element of the on-site system.

The proposed means of disposing of brine from the Chacahoula facility is via a pipeline to the Gulf of Mexico at the rate of 70,000 barrels per hour. A three-well emergency injection field would be constructed north of the site, along the oil distribution pipeline route. The proposed route for the Gulf pipeline would run parallel to an existing pipeline and would traverse 6 acres of cleared land, 88 acres of deciduous swamp and 298 acres of marsh before reaching the coast. The brine proceeds off-shore for a distance of about 23.6 miles and terminates at a diffuser in 30 foot water depths. The total length of the proposed route is about 64 miles. The back-up brine disposal wells would require about 1.9 miles of new pipeline construction and would use about five acres of deciduous swamp.

### 8.5.2 Alternative Activities

An alternative source of raw water for use at the Chacahoula facility would be the development of ground water from shallow aquifers near the site. This source would require the construction of 10.2 miles of new pipelines, using 14 acres of cleared land and 11 acres of deciduous swamp. Also, access roads and wellhead pads would be required, which would use 39 acres of cleared land and 23 acres of deciduous swamp. Another source of raw water would be the Gulf of Mexico via a 42.4 mile pipeline. This pipeline would be constructed parallel to the proposed brine disposal pipeline route and would traverse an additional 2 acres of cleared land, 22 acres of deciduous swamp and 75 acres of marshes. An intake structure and pump station would also be required. Another alternate raw water source would be the Mississippi at St. James via a 21.9 mile pipeline following the crude oil distribution pipeline right-of-way. The pipeline route would require 22 acres of cleared land and 32 acres of swamp.

Brine disposal by deep well injection is an alternative to the proposed method. This would require construction of a 18.1 mile pipeline, access roads, and wellhead pads. These facilities would require the use of 221 acres of deciduous swamp and would involve the crossing of 4 waterways.

The alternate brine diffuser site would follow the proposed pipeline right-of-way onshore but would extend only 22.3 miles offshore.

## 8.6 NO-ACTION ALTERNATIVE

A description of the no-action alternative and its impacts, as it applies to this entire program is provided in the programmatic EIS (FES-76-7). Within the SPR program, the decision not to develop the proposed development group (Weeks Island and Bayou Choctaw early storage phase sites and the Napoleonville dome) would result in the development of one of the other candidate sites to take its place. In that case, the impacts described in Section 4 of the Weeks Island Mine EIS (FES 76/77-8) and Section 3 of the Bayou Choctaw dome EIS (FES 76-5) would be maintained. However, a decision not to develop the Napoleonville dome would result in other impacts: those associated with the alternative facility. Since all of the candidate sites are also located in the Gulf Coast Region, it is likely that many of the impacts resulting from development of the replacement site would be substantially the same as those for the proposed development. However, the detailed impacts of any particular facility are very site-specific and are discussed in the section for that site.

CHAPTER 9.0

CONSULTATION, RELATED PERMITS, AND DISCUSSION OF COMMENTS

Various local and regional agencies contributed information and assistance for the preparation of the Environmental Impact Statement. A list of these agencies is given in Section 9.1. Further advice and coordination will be sought from agencies having regulatory jurisdiction over those segments of the environment which will or could potentially be affected by the proposed project. Procedures are currently underway to prepare applications for those permits and licenses which would be required to proceed with the implementation of the project. Those Federal and state agencies whose concerns interface with the proposed actions are listed in Section 9.2, and Section 9.3 lists those agencies who responded with comments, and a discussion of those comments can be found in Section 9.4.

## 9.1 AGENCIES AND GROUPS CONSULTED

In preparation for this draft Environmental Impact Report, numerous agencies, governmental units and groups were consulted for information and technical expertise pertaining to the proposed project. These groups are listed alphabetically below:

| FEDERAL | LOCATION |
|---|---|
| Department of the Army; U.S. Army Corps of Engineers | Washington, D.C. |
| Department of the Army; U.S. Army Corps of Engineers, Coastal Engineering Division | New Orleans, Louisiana |
| Department of the Army; U.S. Army Corps of Engineers, Kansas City District | Kansas City, Missouri |
| Department of the Army; U.S. Army Corps of Engineers, New Orleans District | New Orleans, Louisiana |
| Department of the Interior; Bureau of Land Management | Washington, D.C. and New Orleans, Louisiana |
| Environmental Protection Agency | Washington, D.C. |
| Environmental Protection Agency, Region VI | Dallas, Texas |
| Federal Energy Administration | Washington, D.C. |
| Federal Energy Administration, Region VI | Dallas, Texas |
| Federal Insurance Administration | Washington, D.C. |
| Housing and Urban Development Administration | New Orleans, Louisiana |
| National Climatic Center | Asheville, North Carolina |
| National Marine Fisheries Commission | Washington, D.C. |
| National Oceanic and Atmospheric Administration | New Orleans, Louisiana |
| NOAA, Environmental Data Services, Deep Water Ports | Washington, D.C. |
| Occupational Safety and Health Administration (OSHA) | New Orleans, Louisiana |

| FEDERAL (Cont'd) | LOCATION |
|---|---|
| United States Bureau of Indian Affairs | Washington, D.C. |
| United States Department of Transportation, Coast Guard Division (Deep Water Ports) | Washington, D.C. |
| United States Geological Survey | Baton Rouge, Louisiana |
| United States Geological Survey | Reston, Virginia |
| **STATE** | |
| Louisiana Agricultural, Stabilization and Conservation Services | Alexandria, Louisiana |
| Louisiana Air Control Commission | New Orleans, Louisiana |
| Louisiana Air Pollution Control Commission | Baton Rouge, Louisiana |
| Louisiana Archaeological Survey and Antiquities Commission | Baton Rouge, Louisiana |
| Louisiana Department of Agriculture, Soil Conservation Service | New Iberia, Louisiana |
| Louisiana Department of Agriculture, Soil Conservation Service | New Orleans, Louisiana |
| Louisiana Department of Conservation | Baton Rouge, Louisiana |
| Louisiana Department of Conservation | New Orleans, Louisiana |
| Louisiana Department of Health | New Orleans, Louisiana |
| Louisiana Department of Natural Resources | New Iberia, Louisiana |
| Louisiana Department of Public Works | Baton Rouge, Louisiana |
| Louisiana Department of Revenue | Baton Rouge, Louisiana |
| Louisiana Economic Development Administration | Baton Rouge, Louisiana |
| Louisiana Governor's Council on Environmental Quality | |
| Louisiana State Department of Education | Baton Rouge, Louisiana |
| Louisiana State Department of Employment Security | Baton Rouge, Louisiana |

## STATE (Cont'd)

| | |
|---|---|
| Louisiana State Planning Board | Baton Rouge, Louisiana |
| Louisiana State Tax Commission | Baton Rouge, Louisiana |
| Louisiana State University, Center for Wetlands Research | Baton Rouge, Louisiana |
| Louisiana State University, College of Forestry, Cooperative Fishing Unit | Baton Rouge, Louisiana |
| Louisiana State University, Institute of Environmental Studies | Lafayette, Louisiana |
| Louisiana State University, the Library | Baton Rouge, Louisiana |
| Louisiana Stream Control Commission | Baton Rouge, Louisiana |
| Louisiana Wildlife and Fisheries Commission | New Orleans, Louisiana |
| Louisiana Wildlife and Fisheries Commission, Oyster, Seafood & Water Bottom Commission | Baton Rouge, Louisiana |
| New Orleans, University of; College Business Administration | New Orleans, Louisiana |
| State Art, Historical & Cultural Preservation Agency | Baton Rouge, Louisiana |

## LOCAL

| | |
|---|---|
| Acadiana Planning & Development District | Lafayette, Louisiana |
| Acres America, Inc., Consulting Engineers | Buffalo, New York |
| American Petroleum Institute, Division of Transportation | Washington, D.C. |
| Association of Oil Pipelines | Washington, D.C. |
| Burk & Associates, Inc., Environmental Section | New Orleans, Louisiana |
| Domtar Chemicals, Inc. | Cote Blanche Island, Louisiana |
| Domtar Chemicals LTD, Goderich Mine | Ontario, Canada |

## LOCAL (Cont'd)

| | |
|---|---|
| Fenix & Scisson Inc. | Tulsa, Oklahoma |
| Morton Salt Co. | Weeks Island, Louisiana |
| Oil & Gas Journal | Tulsa, Oklahoma |
| Oil Mop Co. | Belle Chasse, Louisiana |
| Secretary of Police Jury, Iberville Parish | Plaquemine, Louisiana |

## OTHER

| | |
|---|---|
| Allied Chemical Corporation | Houston, Texas |
| Butler Associates, Inc. | Tulsa, Oklahoma |
| Gulf Coast Towing Association | Golden Meadows, Louisiana |
| Gulf Oil Corporation | Houston, Texas |
| LOOP, Inc. (Louisiana Offshore Oil Port) | New Orleans, Louisiana |
| Louisiana Power and Light | |
| Louisiana State University, Center for Wetland Resources | Baton Rouge, Louisiana |
| Louisiana State University, Institute for Environmental Studies | Baton Rouge, Louisiana |
| Nicholls State University | Thibodaux, Louisiana |
| Texas A&M University | College Station, Texas |
| Texas Eco | Bryan, Texas |

## 9.2 ENVIRONMENTALLY ORIENTED PERMITS AND LICENSES

Regulatory Bodies and Their Jurisdicational Concerns:

A number of Federal regulations which must be complied with during project development are listed in Table 9.2-1. Also included in the list are state regulations which are relevant to the program. DOE will consult with the state agencies in charge of implementing these regulations pursuant to the Intergovernmental Coordination Act of 1968.

Table 9.2-1 Environmentally oriented permits and licenses

| AGENCY | PERMIT TYPE | REFERENCES | REMARKS |
|---|---|---|---|
| 1. U.S. Corps of Engineers, District Engineer (New Orleans) | (a) Discharge of dredged material into navigable waters.<br>(b) Structures or activities affecting the navigability of navigable waters; includes structures under a navigable waterway.<br>(c) Any transport of dredged material into coastal waters.<br>(d) Work causing canals to become connected to navigable waters.<br>(e) Fixed structures on the outer continental shelf.<br>(f) Piers or bulkheads at the coastline. | 33 CFR 320<br>33 CFR 322<br>33 CFR 323 | |
| 2. U.S. Coast Guard, District Commander of 8th Coast Guard District (New Orleans) | Letter of Intent to operate an oil transfer facility. | 33 CFR 154.110 | Letters of Intent must be submitted and approved 60 days prior to date intended operation is to begin. |
| 3. U.S. Coast Guard, Commandant (Washington, D.C.) | Certification is required for marine sanitation devices on new vessels equipped with installed toilet facilities, where "new" vessels refer to those constructed after January 30, 1977. | 33 CFR 159 | If desired, operators of vessels constructed prior to January 30, 1977 may apply for certification of marine sanitation devices installed on these watercraft. |
| 4. U.S. Environmental Protection Agency, Region VI | NPDES (National Pollutant Discharge Elimination System) permit required for any industrial discharges into navigable waters including the "contiguous zone" (ocean waters). Such a permit would probably be necessary for discharge of effluents from the offshore and onshore terminal waste treatment facilities. In addition, certification is still requiref from the EPA administrator (or from appropriate designated State or Interstate agencies) whenever a Federal license or permit is being sought for activities which may result in discharge into the navigable waters. | 40 CFR 125;<br>Water Pollution Control Act, Section 401 | The State of Louisiana does not yet have an approved program for issuing NPDES permits. However, the State has to certify that it has seen and approved the permit application before EPA will act on it. |
| 5. U.S. Environmental Protection Agency, Region VI | Permit for Ocean Dumping required for brine disposal. | 40 CFR 220 | |
| 6. Louisiana Stream Control Commission (enforcement agency is the Louisiana Division of Water Pollution Control) (Baton Rouge) | (a) Certificate of Approval required for permission to discharge wastes into the public waters.<br>(b) State must approve applications for NPDES permits before submission to U.S. Environmental Protection Agency. | Louisiana Regulation Requiring Submission of Reports for the Discharge of Industrial Waste . . ., Section IIIA;<br>40 CFR 123 | Certificate of Approval required at least 30 days prior to beginning of discharges. |
| 7. Louisiana Air Control Commission (enforcement agency is the Louisiana Division of Air Control and Occupational Health) (Baton Rouge) | Certificate of Approval for construction of sources of air pollution emissions. Applies primarily to onshore turbines, but might apply to some petroleum handling equipment as well. | Louisiana Air Control | (a) Application for certificate must be submitted prior to preliminary site preparation.<br>(b) State of Louisiana has not previously extended permitting authority to offshore structures. |

Table 9.2-1 Cont'd.

| AGENCY | PERMIT TYPE | REFERENCES | REMARKS |
|---|---|---|---|
| 8. Louisiana Air Control Commission - Division of Air Control and Occupational Health (Baton Rouge) | Approval for open burning of land clearing debris is not specifically required at present so long as the guidelines stipulated in the air control regulations are met. However, it is advisable to notify the Division prior to such burning to determine that predicted ambient air quality and atmospheric conditions at the time of burning will be suitable and to alert the Division that burning is planned and will be properly conducted. | Louisiana Air Control Commission Regulations, Section 11.0 | |
| 9. Louisiana Air Control Commission - Division of Air Control and Occupational Health (Baton Rouge) | Regulations are not being considered for the establishment of ambient noise level standards. In final form, such regulations may require permits for the operation of specified industrial noise sources. | None | |
| 10. Not Established | Compliance with Coastal Zone Management Plan, when adopted. | None | The State of Louisiana is in the process of developing a Coastal Zone Management Plan, but a final program has not yet been adopted. None of the adjacent coastal states have management programs which are as yet federally approved. Florida and Texas have drawn up CZM Plans, the contents of which do not appear to require state approval of construction and operation activities. |
| 11. Louisiana Offshore Terminal Authority | Authorization for construction and operation of deepwater port facilities within the Authority's jurisdiction. Such authorization will include State environmental review and approval of the deepwater port under the Authority's Environmental Protection Plan. | Louisiana Revised Statutes 34: 3101-3116; Superport Environmental Protection Plan | |
| 12. Louisiana State Division of Health Bureau of Environmental Services | Permit for installation of sewage treatment facilities and for disposal of solid and oily water wastes. | Chapter X, Sanitary Codes, Sections 10.50 10.56.4 State of Louisiana | |

## 9.3 Request for Comments

Comments on the Draft EIS for Capline Group Salt Domes were requested from the following agencies, companies and organizations. Copies of the document were also made available to the Council on Environmental Quality and to the public in September 1977.

### Federal

Department of Agriculture
Department of the Army
Department of Commerce
Department of Defense
Department of Energy (10 Regional Offices)
Department of Health, Education and Welfare
Department of Housing and Urban Development
Department of the Interior
Department of Labor
Department of State
Department of Transportation
Department of Treasury
Advisory Council on Historic Preservation
Appalachian Regional Commission
Council on Environmental Quality
Energy Research and Development Administration
Environmental Protection Agency
Federal Power Commission
Interstate Commerce Commission
National Science Foundation
Nuclear Regulatory Commission
Tennessee Valley Authority
Water Resources Council
National Oceanic and Atmospheric Administration
U.S. Fish and Wildlife Service

### State

Louisiana State Clearinghouse
Louisiana Department of Justice
Louisiana Air Control Commission
Louisiana Wildlife and Fisheries Commission
Louisiana Offshore Terminal Authority
Louisiana Department of Conservation
Louisiana Stream Control Commission

### Local

Assumption Parish Police Jury
Iberia Parish Police Jury
Iberville Parish Police Jury
Lafourche Parish Police Jury
St. Martin Parish Police Jury
St. Mary Parish Police Jury
Terrebonne Parish Police Jury

Other

Acadiana Planning and Development District
American Petroleum Institute
Center for Law and Social Policy
Electric Power Research Institute
Environmental Defense Fund, Inc.
Environmental Policy Center
Friends of the Earth
Fund for Animals, Inc.
Institute of Gas Technology
Interstate Natural Gas Association
Izaak Walton League of America
Energy Conservation Committee - Keys to Education for
  Environmental Protection
National Association of Counties
National Audubon Society
National Parks and Conservation Association
National League of Cities
National Resource Defense Council, Inc.
National Wildlife Federation
New York State - Office of Energy Analysis
U.S. Conference of Mayors
American Littoral Society
Edison Electric Institute
New Orleans Audubon Society
South Central Planning and Development Commission
Kaiser Engineers
Florida Audubon Society
Louisiana Wildlife Federation
Olin Chemicals
Louisiana Environmental Professional Association
Baton Rouge Audubon Society
Council on the Environment
The States-Item
Orleans Audubon Society
Calcasieu Rod & Gun Club
Ecology Center of Louisiana
Sierra Club, Delta Chapter
Sierra Club, N.O. Group
League of Women Voters
Louisiana Power & Light
The Times-Picayune
The Courier
Canoe & Trail Shop, Inc.
RESTORE, Inc.
Sierra Club - Gulf Coast Regional Conservation Committee
Sierra Club - Southern Plains Regional Conservation Committee
LOOP, Inc.
Allied Chemical
Gulf States Marine Fisheries Commission

## 9.4 DISCUSSION OF COMMENTS RECEIVED ON THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

The list of agencies and groups included with the summary in the front of this statement indicates those who furnished comments on the draft EIS to the Department of Energy within the allotted comment period. Copies of the comment letters are included in Appendix K.

All of the review comments received by DOE have been considered in the preparation of this Final EIS. Although only timely comments are formally addressed here, all comments were considered to the extent practicable in the preparation of the document. The EIS has been expanded and modified, where appropriate, as a result of comments received. In other cases, either no substantive issues were raised or no change to the EIS was considered appropriate. The following listing presents a summary of the disposition of substantive issues raised in the comments.

### 9.4.1 Comments Received from Federal Agencies

#### 9.4.1.1 U.S. Environmental Protection Agency, November 30, 1977

Comment 1:

It appears that impacts regarding utilization and loss of wetlands could be minimized if appropriate measures are taken, and that expansion development of either the Iberia or Chacahoula alternative sites would contribute to the greatest amount of wetland destruction. In light of the President's Executive Order on Protection of Wetlands (Executive Order 11990), consideration should be given to proposals potentially less damaging to wetlands.

The applicant should provide substantive evaluation of all proposed and alternative actions with regard to their potential to adversely impact the wetlands. The proposed action should be the most practicable of all alternatives and provide possible mitigative measures. Rights-of-way should avoid wetlands if possible. Future storage and expansion should consider using offshore domes and other inland sites away from wetland areas.

Response:

The issue of wetlands preservation has been addressed in numerous sections of the draft EIS. Throughout the planning phase of the SPR Program, contact has been, and will continue to be, made with appropriate Federal and State agencies to assure that the proposed systems are constructed and operated in an environmentally sound manner. Pipeline rights-of-way have been designed to make maximum use of existing pipeline corridors. The proposed and alternative pipeline routes have been discussed with Federal and State agencies and the proposed systems judged to be the best choices. DOE is working with these agencies to incorporate appropriate construction techniques, including protective and mitigative measures, into the construction contracts as permit conditions. DOE is in the process of reaching an agreement with the U.S. Fish and Wildlife Service whereby a compensatory area of wetlands, equivalent to the area impacted, would be set aside as part of a wildlife management area.

Comment 2:

Under Draft regulations of the Underground Injection Control (UIC) program of the Safe Drinking Water Act (Public Law 93-523), the applicant should provide sufficient data to EPA from the ongoing testing and analysis program before initiating any emplacement, mining, or disposal operations. Data and analyses provided should be consistent both with requirements of EPA and with requirements for permit application of the Louisiana Department of Conservation, Oil and Gas Division. The intentions of the applicant with regard to the above recommendations should be adequately addressed in the Final EIS.

Response:

The EIS reflects preliminary designs and an appraisal of available information on the environment to be potentially affected. This material is considered to be of sufficient detail to enable an assessment of the environmental feasibility of the project. In several instances, flexible designs and close monitoring of construction and operation would be required to support an effective evaluation of the resulting environmental impacts. Data would be provided to the EPA and to the State of Louisiana, Department of Conservation, as it became available, and DOE would closely coordinate those activities with EPA and the Louisiana Department of Conservation.

Comment 3:

It is recommended that the method of brine disposal involving use of the displaced brine as a chemical feed stock be adopted wherever practicable. Discussion of this alternative should be included in the Final EIS.

Response:

The quantities of brine produced by SPR activities would far exceed the demands of local industries. Further, production of brine would not occur at a rate assuring consistent, uninterrupted supply. The quality of brine required by industries varies significantly with respect to such factors as the purity of the dissolving water, and salt concentration and soluble impurities in the brine. Therefore, it would be difficult to define and supply brine in the quantities and qualities acceptable to receiving industries. In the event that brine can be economically supplied by the SPR activities, DOE would attempt to make it available.

Comment 4:

The statement indicates that pipelines for the SPR salt domes will be coated externally with an asphalt-sand mixture or coal tar enamel for corrosion protection. The pipeline will also contain sacrificial zinc anodes to lessen internal corrosion. The Final EIS should discuss whether these anti-corrosion measures could have any adverse impacts on ground water quality in the project area.

Response:

The materials used to protect the pipeline may be leached or otherwise deposited in the soil. Zinc is toxic to aquatic life, however, and therefore is a potential ground water pollutant. Zinc readily forms insoluble oxide and hydroxide precipitates in a neutral pH environment. Unless there is a considerable amount of excavation and surface exposure of soils near the anodes after installation, it is unlikely that sufficient quantities of zinc would be leached into nearby waters to have any adverse impact on life forms.

Comment 5:

In the discussion of the interpretative ruling of December 21, 1977, regarding the Federal Clean Air Act, the term "emission trade-off" should be changed to emission offset. Furthermore, based on regional air quality data taken from ambient air monitoring studies in 1975, levels of non-methane hydrocarbons and photochemical oxidants were exceeding Federal air standards quite frequently in southern Louisiana. Therefore, the emission offset policy may be applicable to this project. Note that the exclusion of new sources that emit less than 100 tons per year, is based on potential not actual emissions.

Response:

References to emission trade-off (Section B.2.3) have been changed to emissions off-set. The emissions off-set policy does not apply to the Capline group of SPR sites due to the temporary and intermittant nature of the emissions and because double-seal, floating roof tanks are planned for this group of sites, making potential emissions at any location less than 100 tons/year. DOE is aware that the EPA policy regarding emission offsets is currently undergoing a review, and that a clarification will be issued in the near future. DOE will take any steps necessary as a result of this clarification.

Comment 6:

The Clean Air Act, amended on August 7, 1977, has changed Prevention of Significant Deterioration (PSD) regulations. The number of PSD designated source categories have been expanded from 19 to 28, one of which is petroleum storage and transfer facilities. Also, PSD regulations no longer apply only to particulate and sulphur dioxide emissions but to all criteria pollutants, (i.e. sulphur dioxide ($SO_2$), Total Suspended Particulates (TSP), Non-Methane Hydrocarbons (NMHC), nitrous oxides ($NO_x$), carbon monoxide (CO), and photochemical oxidants ($O_3$). These changes and their effect upon the project should be addressed in the final statement.

Response:

Section B.2.3 discusses the changes made to PSD regulations and their effect on the proposed project. These regulations included the inclusion of petroleum storage and transfer source categories and extension of the regulations to all criteria pollutants. However, with the exception of sulfur dioxide and particulate matter where allowable incremental increases were specified, the other criteria pollutants are to be controlled, at present, using Best Available Control Technology (BACT). Hydrocarbon emissions from the Capline Group SPR sites would be controlled using floating roof tanks with double seals, which is considered to be the BACT for hydrocarbon emissions.

Comment 7:

In eliminating hydrocarbon emission venting from the underground storage caverns, condensation units in lieu of a flare system should be used. This would not only provide potential for explosion of the stored volatile gases but would also conserve fuel by allowing the condensed emissions to be returned to storage.

Response:

Use of condensation units to recover hydrocarbon emission resulting from venting of the underground storage caverns is discussed in Section 5.2.3.

Comment 8:

No sewage discharges for any of the Capline Group sites are mentioned in the Draft EIS. If such discharges will occur, discharge points, type of treatment, and possible impacts to the receiving stream should be discussed. In addition, National Pollutant Discharge Elimination System (NPDES) permit application for such discharges should be addressed.

Response:

Sanitary wastes generated during construction at the proposed storage sites or along the rights-of-way would be handled through portable facilities consistent with Occupational Health and Safety Administration and Federal and State pollution control regulations. Wastewater handling procedures during the operational phases of SPR would be designed to assure that the waste stream would meet all appropriate and applicable Federal, State, and local disposal standards. These procedures would be finalized during the detailed project design. The NPDES permit application would include those discharges which would occur.

Comment 9:

The discussion of the Spill Prevention Control and Countermeasure (SPCC) Plan as required under Code of Federal Regulations at 40 CFR 112, will be prepared within 6 months after the facility begins operation and shall be fully implemented no later than 1 year after operation begins.

Response:

Section E.2.1.5 has been revised to include a statement defining implementation of the SPCC Plan.

Comment 10:

The levels of environmental noise tabulated on page B.2-66 of the Draft EIS have been labeled as "established guidelines," from EPA. However, this table reflects only "identified levels" which are requisites to protect public health and welfare with an adequate margin of safety for both activity interference and hearing loss. The noise levels cited in this table do not constitute a regulation, specification, or standard.

Response:

Section B.2.4, Background Ambient Sound Levels, and other sections discussing sound levels and noise impacts have been revised accordingly.

9.4.1.2 U.S. Army Corps of Engineers, November 22, 1977

Comment 1:

Specific onsite sampling, analyses, and impact evaluations should be conducted to update information on water quality and species composition in the proposed project areas and to adequately assess project impacts. Some of the most significant adverse impacts which would occur as a result of the proposed project are those which would affect the water quality and dependent aquatic organisms of the numerous streams and wetlands of the project areas. These problems should be addressed first hand.

Response:

Data from literature reviews pertaining to water quality were considered to be sufficient to provide an understanding of the conditions in the areas surrounding the proposed and alternative storage sites, such data from literature sources concerning the species composition of those areas having been augmented by field inspections. After a site has been selected, specific onsite sampling and analyses of water quality conditions will be undertaken and, together with more detailed impact evaluations, will be made an element of the appropriate permit applications. Baseline characterization of offshore areas has been initiated and is presented in Appendix G. Water quality sampling and analyses will be continued during the construction phase of the project to determine the extent of impacts related to the development of the storage facilities.

Comment 2:

The references to rare and endangered species should be changed to threatened or endangered. The American alligator is considered threatened in the project areas.

Response:

References to rare and endangered species have been changed to threatened or endangered species in Section B.2.5 and in the site-specific environmental settings. The status of the American alligator has been changed to threatened in Section B.2.5.

Comment 3:

The environmental setting and impact sections should provide discussions as to how the proposed project and alternatives would affect vector problems. Construction activities would produce habitat for vectors of public health significance, especially mosquitoes. Project completion probably would impede normal surface drainage and also would create temporary and permanent impoundments suitable for vector production.

Response:

Vector problems in the project area are frequently the result of water impoundments, including those arising from poor drainage, and improper disposal of refuse. Temporary and permanent impoundments of water resulting from on and off site construction activities are expected to create additional habitat for vectors, such as mosquitoes, but to represent a minimal increase of the existing habitat in southern Louisiana. Habitat creation for other vectors, such as rats and mice, would be minimized to a negligible level by requiring that trash and other debris be removed to a sanitary landfill on a regular basis.

Comment 4:

The source reference should be included for Table 3.2-1 on page 3.2-13.

Response:

Table 3.2-1 is a summary using information presented in Appendix B and obtained from a variety of sources.

Comment 5:

Page 3.3-6, paragraph 4. Add water hyacinth to the list of plants in this paragraph, since it is a codominant aquatic herb located in the area.

Response:

Water hyacinth has been added to the list of plants appearing in that paragraph.

Comment 6:

Page 3.4-7, paragraph 1. The referenced table (Table 3.4-1) is not included in the text.

Response:

Reference to the table (Table 3.4-1) was in error. The reference should have been to Table B.4-2, and has been corrected in the text.

Comment 7:

Page 4.1-4, paragraph 3. Change the paragraph as follows: "At least three potentially significant... may occur: 1) changes in the benthic communities, 2) disruption of migration routes, and 3) denial of valuable inshore habitat to many pelagic species incapable of utilizing waters of higher salinities."

Response:

The report section containing the referenced paragraph has been revised to reflect previously unavailable information, making the suggested change unnecessary.

Comment 8:

Page 4.1-5. The source referenced for figure 4.4-1 should be included.

Response:

Figure 4.4-1 has been deleted from the text as part of a revision to the report.

Comment 9:

Page 4.1-7, paragraph 1. There would be a greater reduction in suitable habitat for aquatic organisms if the combined effects of all brine releases associated with the entire SPR program were considered.

Response:

The development of the Capline Group of SPR storage sites is not dependent upon development of either the sites of the Texoma Group or the sites of the Seaway Group. As such, to provide the total brine releases of the SPR program would be somewhat misleading. The subject paragraph has, however, been deleted as part of report revision.

Comment 10:

Page 4.1-10, paragraph 1. The statement in this paragraph appears many times in the text. Regardless of the amount of nutrients that are added to the organic system, photosynthetic productivity would be significantly curtailed due to the reduction in light levels.

Response:

The statement has been modified to reflect the decrease in photosynthetic productivity as follows: "or affected by reduced light penetration, thus mitigating the effects of reduced light levels on plant productivity in the immediate vicinity of construction activity."

Comment 11:

Page 4.1-11, paragraph 3. The research reference should be provided to substantiate the stated recovery times.

Response:

The recovery time for old field and pasture habitats is based upon the expected time for revegetation to occur. It is likely that the grasses which constitute the principle vegetation of these habitats would require at least one growing season to re-establish in disturbed areas. The estimate of 6 months to 1 year would, therefore, represent the longest period for re-establishment of this biological community following cessation of disruptive activites.

Comment 12:

Page 4.1-12, paragraph 1. Utilization of the push-ditch method of pipeline construction, where feasible, would significantly reduce construction impacts.

Response:

The push-ditch method of pipeline construction would be used whereever feasible rather than the flotation canal method as described in Sections 2.2.2 and A.3.4. It is likely, however, that some pipeline construction would occur in areas where heavy construction equipment was unable to be supported. In such cases, a modified push-ditch method may be used, which would reduce construction disruption versus the flotation canal method. In selected areas, however, flotation canals would be required.

Comment 13:

Page 4.3-2, paragraph 1 and 2. The site specific environmental settings for the Koch and Nordix sites are not provided in the text.

Response:

A site specific environmental setting for the Koch and Nordix terminal systems is provided in Sections B.3.2 and 3.3.2.

Comment 14:

Page 4.5-4, paragraph 1. The total habitat area involved is not presented in section 3.4.2.5, as stated in this paragraph.

Response:

The total habitat area involved in the expansion of the Weeks Island site is presented in Section B.4.2.5 and Table B.4-2.

Comment 15:

Page 5.2-1, paragraph 5.2.1.3. Low-flow conditions are the worst conditions from a water quality standpoint, and dredging during these periods could aggravate an already bad situation.

Response:

This reference has been changed to reflect the fact that dredging activity would occur during periods of low biological activity.

Comment 16:

Page 5.2-3, paragraph 5.2.2.2. Add a statement that a program of monitoring dikes of brine reservoirs, the brine diffusors, and brine and oil pipelines would be undertaken.

Response:

Statements that a monitoring program would be instituted are located in Sections 2.2.3 and A.3.1.

Comment 17:

Page 5.3-2, paragraph 1. State the approximate number of cubic yards of material that would be excavated for the pipeline.

Response:

Construction of the proposed brine disposal injection well system would require the installation of 6.7 miles of pipelines, well pads, and roadways. Excavation for this system would amount to 106,000 cubic yards. This excavation requirement has been included in that paragraph.

Comment 18:

Page 6.3-1. It is necessary that paragraph 6.3.4 "Impacts on Biological Productivity" be added. It should include a discussion of the biological activity that would be affected by the cumulative impacts from construction and operation of the proposed project and those of the considered alternatives.

Response:

Section 6.3.4 "Impacts on Biological Productivity" has been added to Chapter 6, and addresses the extent to which biological activity would be impaired by construction of the proposed facilities.

Comment 19:

Page 9.2-2, table 9.2-1. The reference to 33 CFR 209 should be updated. Regulatory program regulations were revised on 19 July, 1977, and the proper reference is now Title 33, CFR, Parts 320-329.

Response:

Reference to 33 CFR 209 has been deleted in Chapter 9 and been replaced by reference to 33 CFR 320-329.

Comment 20:

Volume II, page A.3-24, paragraph A.3.4.3. The flotation canal method is the least acceptable method of pipeline construction discussed. The reasons other methods cannot be used must be well documented before the flotation method can be considered acceptable.

Response:

The flotation canal method of pipeline construction would be utilized only when no other method of construction (such as push-ditch method) could be used.

Comment 21:

Volume II, page B.2-73, paragraph 2. There are no shrub species listed in this paragraph, as indicated.

Response:

Reference to shrubs on page B.2-77 has been deleted.

9.4.1.3 Advisory Council on Historic Preservation, October 28, 1977

Comment 1:

Although cultural resource studies indicate no properties included in or known to be eligible for inclusion in the National Register of Historic Places will be affected, should additional studies identify any such cultural resources the Department of Energy should delay further processing of the undertaking and afford the Council an opportunity to comment pursuant to the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

Response:

After selection of the development alternative for oil storage in the Capline Group of salt domes, studies will be undertaken to determine whether any cultural resources eligible for inclusion in the National Register of Historic Places exist at the selected locations. Should any eligible resources be affected by activities at the sites, DOE would afford the Council an opportunity to comment pursuant to the above cited regulation.

9.4.1.4 National Oceanic and Atmospheric Administration, November 4, 1977

Comment 1:

There are no adequate site specific physical oceanographic or meteorological data for the potential brine disposal sites along the Louisiana coast.

Response:

A biological, oceanographic, and meteorological sampling program has been initiated to develop a preliminary baseline characterization of the environments of the Weeks Island and Chacahoula brine diffuser locations in the Gulf of Mexico. The results of this sampling program are provided in Chapters 3 and 4, and Appendices B, C, and G.

Comment 2:

The state-of-the-art for oil spill analysis includes models which provide lines of probabilistic impact and probabilistic time to impact in this area. This information, would improve the plan for containment and removal of spilled oil.

Response:

Oil movement, as addressed in the EIS, includes tanker transport in coastal waters from the 12-mile limit up the Mississippi River to the terminals at Sunshine and St. James, Louisiana. Spills in these waters would be principally influenced by nearshore currents and tides, river and harbor dimensions and manmade features. Models that provide contours of probabilistic impact and probabilistic time to impact are more appropriate for assessing effects of spills in open waters, with no nearshore influences, and would not provide a meaningful approximation of actual conditions.

Comment 3:

The modeling approach used to characterize the dispersion of brine into surrounding waters may suffer from assumptive mathematical simplifications. The assumptions of constant depth and vertically constant current appear to be weaknesses in the MIT model.

Response:

The approach used by the MIT investigators assumes a constant depth and a vertically constant current in order to closely approximate ambient conditions while yielding a manageable mathematical model.

For the Gulf Coast area, which exhibits a low bottom gradient, the assumption of a uniform water depth is reasonable in both the near and far field. A vertically constant current, while not accurately depicting conditions in the very near field, becomes less significant in the intermediate and far field. Additionally, for the high velocity diffusers analyzed, jet velocity is greatly in excess of current velocity (by about two orders of magnitude) and the near field plume would be little influenced by current variations with depth.

9.4.1.5 U.S. Department of Agriculture, Soil Conservation Service, November 16, 1977

Comment:

Approximately 75 percent of the land in the Napoleonville site area, 30 percent in the Weeks Island site area, and 100 percent in the Iberia and Bayou Choctaw site areas are classified as prime farmland. None of the land in the Chacahoula site area is considered prime farmland. The amount of land not in industrial use within the storage site areas that is classified as prime farmland should be determined.

Response:

The fenced-in area of the Napoleonville site is approximately 440 acres, of which approximately 386 acres are non-industrial uses. If 75 percent of the soils in the 386-acre area are potentially prime farmland, this would amount to 286 acres. At Weeks Island site, the fenced area is approximately 100 acres, of which approximately 30 acres are classified as having prime farmland potential. At the Iberia site, there would be 160 acres within the fence classified as prime farmland. At Bayou Choctaw, the fenced-in site area is all in industrial use.

### 9.4.2 Comments Received from State Agencies

No substantive comments were received.

### 9.4.3 Comments Received from Local Agencies

No substantive comments were received.

### 9.4.4 Comments Received from Companies, Groups, and the Public

#### 9.4.4.1 Dow Chemical Company, Louisiana Division, November 11, 1977

Comment 1:

On page C.4-3, Volume III, delivery of a portion of the brine to Dow Chemical Company is mentioned as a system alternative. This cannot be a system alternative because plant size severely limits the volume that can be processed by Dow. Also, the quality of brine from Bayou Laforche or Grand Bayou raw water may not be compatible with Dow's requirements.

Response:

The system alternative of delivering a portion of the brine resulting from development of the Napoleonville site has been deleted.

Comment 2:

Page C.4-46, Volume III, speaks of displacing, at least temporarily, Dow employees working in the brine fields. If Dow's brine production at Napoleonville is interrupted, a major socioeconomic impact on over 2,000 employees will occur at Dow's plant at Plaquemine, Louisiana, which depends entirely on Napoleonville brine raw material. The ability to store large quantities of product is essential for stable and economic operation of the Plaquemine plant. If this storage capacity resulting from Dow's brining operation is not available, it will also have a major socioeconomic impact on Dow's employees.

Response:

Based on DOE's experience at early storage sites, it is unlikely that any displacement of Dow employees would occur at the Napoleonville site. Should it occur, however, there would be sufficient time after DOE's announcement of intentions for Dow to relocate brining activities to another portion of the dome. As presently planned, SPR activities would affect seven of Dow's brine wells at Napoleonville.

9.4.4.2 Morton-Norwich Products, Inc., November 18, 1977

Comment 1:

The expanded use of the Weeks Island, Louisiana, salt dome for oil storage wastes a valuable and irreplaceable natural resource. MORTON, the owner of the salt reserves in the Weeks Island salt dome, has determined that the dome has certain characteristics which make it ideally suited for the underground mining of rock salt.

The draft EIS identifies other salt domes which are more suitable for oil storage by solution mining but less suitable for underground salt mining.

Response:

The proposed development option for the Capline Group of salt domes is utilization of the Napoleonville site in conjunction with the early storage reserve (ESR) sites. If Weeks Island salt dome should be utilized for expanded SPR storage, development would occur approximately one mile from the relocated mine and would not interfere with underground mining activities. Ample salt reserves, accessible to underground mining, should be available to MORTON for the forseeable future.

Comment 2:

The suggested significant expansion of Weeks Island salt dome for oil storage through rapid solution mining could affect the seal or structural integrity of the existing or proposed rock salt mining shaft collars. One dome subject to rapid mining was reportedly uplifted by 6 inches. Such a movement at Weeks Island could force an abandonment of the rock salt operations and irreparably impact the community and the salt industry.

Response:

The design of new solution-mined caverns at Weeks Island would, if the site is chosen for development, seek to minimize changes in the stress forces in the dome that might affect either the seal or structural integrity of the existing or proposed rock salt mining shaft collars. Solution mining on the dome would conform to State of Louisiana rules and regulations regarding the use of salt dome cavities for storage of liquid hydrocarbons (Statewide Order No. 29-M). The caverns created by solution mining would also be kept under pressure during the mining cycle and during the storage cycle.

Comment 3:

As recognized in the Draft Environmental Impact Statement, the expanded use of Weeks Island for oil storage could have adverse impact on the environment, which, in turn, could interfere with the operational needs of MORTON'S facilities.

Response:

Those environmental impacts resulting from site construction and operation of the Weeks Island SPR facilities would be well removed from the site of MORTON'S mining activity. The additional governmental facilities required by the Weeks Island expansion would be located approximately 1 mile from the site of MORTON'S relocated mine workings. The land area enclosed for these facilities would be 100 acres of the 1960-acre surface of the dome. During construction and operation phases of the project, every effort would be made to avoid disruption of MORTON'S activities.



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