DOE/SP--99000887

U.S. DEPARTMENT OF ENERGY

STRATEGIC PETROLEUM RESERVE
PROJECT MANAGEMENT OFFICE
NEW ORLEANS, LOUISIANA

Site Environmental Report
for
Calendar Year 1997

Department of Energy
Strategic Petroleum Reserve Project Management Office
900 Commerce Road East
New Orleans, Louisiana 70123

Distribution:

Enclosed for your information is a copy of the Site Environmental Report for Calendar Year 1997 for the U.S. Department of Energy's Strategic Petroleum Reserve. This report is prepared and published annually for distribution to local, State, and Federal Government agencies, the Congress, the public, and the news media. The report was prepared for the Department of Energy by DynMcDermott Petroleum Operations Company.

To the best of my knowledge, this report accurately summarizes and discusses the results of the 1997 Environmental Monitoring Program.

If you have any questions or desire additional information, please contact David Brine of the Project Management Office Environmental, Safety and Health Division at (504) 734-4277.

Sincerely,

William C. Gibson, Jr.
Project Manager

Enclosure

QUESTIONNAIRE/READER COMMENT FORM

The 1998 Site Environmental Report, slated for publication in 1999, will be updated with new and pertinent user comments.

Please submit your questions/comments on a photocopy of this page and forward it to the following address:

DynMcDermott Petroleum Operations Company
Environmental Department, EF-83
850 South Clearview Parkway
New Orleans, LA 70123

A copy of your comments will be sent to the originator for response.

Date: _____

Name of Submitter: _____

Street or P.O. Box: _____

City/State/Zip code: _____

Organization (if applicable): _____

Comments:

_____

_____

_____

_____

_____

_____

(Attach other sheets as needed)
(for originator's use)

Subject Matter Expert (SME): _____ Date: _____

SME's Response: _____

_____

_____

_____

This page intentionally blank

STRATEGIC PETROLEUM RESERVE

SITE ENVIRONMENTAL REPORT

FOR

CALENDAR YEAR 1997

Document No. ASE5400.54 Rev. A0

Prepared for the U. S. Department of Energy
Strategic Petroleum Reserve Project Management Office
under Contract No. DE-AC96-93PO18000

DynMcDermott Petroleum Operations Company
850 South Clearview Parkway
New Orleans, Louisiana 70123

DISCLAIMER

LIST OF EFFECTIVE PAGES

Section	Pages	Revision	Effective Date
List of Effective Pages	i	0	5/31/98
Table of Contents	ii - iv	0	5/31/98
List of Figures	v	0	5/31/98
List of Tables	vi - vii	0	5/31/98
Abbreviations and Acronyms	viii - xv	0	5/31/98
Executive Summary	xvi - xix	0	5/31/98
Section 1	1 - 21	0	5/31/98
Section 2	1 - 29	0	5/31/98
Section 3	1 - 23	0	5/31/98
Section 4	1	0	5/31/98
Section 5	1 - 46	0	5/31/98
Section 6	1 - 36	0	5/31/98
Section 7	1 - 4	0	5/31/98
Appendix A	1 - 18	0	5/31/98
Appendix B	1 - 4	0	5/31/98
References	1 - 3	0	5/31/98

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

TABLE OF CONTENTS (continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF TABLES (continued)

ABBREVIATIONS AND ACRONYMS

ac	acre
adj	adjacent
ADM	action description memorandum
AFFF	aqueous film forming foam
AO	administrative order
ARCO	Atlantic Richfield Company
As	arsenic
AST	aboveground storage tanks
ASTM	American Standard Testing Methods
avg	average
bbl	barrel(s) (1 bbl = 42 gallons)
BC	Bayou Choctaw
BDL	below detectable limit
BH	Big Hill
bldg	building
bls	below land surface
BM	Bryan Mound
BMP	best management practices
BOD_5	five day biochemical oxygen demand
BTU	British Thermal Unit
CAA	Clean Air Act

ABBREVIATIONS AND ACRONYMS (continued)

CAP	corrective action plan
°C	degrees Celsius
CEQ	Council for Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESQG	conditionally exempt small quantity generator
CFR	Code of Federal Regulations
Ci	curies
cm	centimeter
CMD	Coastal Management Division
CO	carbon monoxide
COD	chemical oxygen demand
COE	United States Army Corps of Engineers
CV	coefficient of variation
CWA	Clean Water Act
CX	categorical exclusion
CY	calendar year
DM	DynMcDermott Petroleum Operations Company, Inc.
DMR	discharge monitoring report
DO	dissolved oxygen
DOE	United States Department of Energy
DOT	United States Department of Transportation

ABBREVIATIONS AND ACRONYMS (continued)

DPRP	Discharge Prevention and Response Plan
EA	environmental assessment
EIQ	emissions inventory questionnaire
EIS	environmental impact statement
EO	executive order
EPA	United States Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERT	emergency response team
ERO	emergency response organization
ESA	Endangered Species Act
ES&H	Environmental Safety & Health
F&WS	United States Fish and Wildlife Service
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	finding of no significant impact
FRP	Facility Response Plan
ft	feet
GALCOE	U.S. Army Corps of Engineers, Galveston Division
GLO	General Land Office
ha	hectare
HAP	hazardous air pollutant

ABBREVIATIONS AND ACRONYMS (continued)

H_g	mercury
HPP	high pressure pump pad
HQ	headquarters
HW	hazardous waste
ICW	Intracoastal Waterway
ISO	International Organization of Standardization
in	inch
km	kilometers
LA	Louisiana
lab	laboratory
LAC	Louisiana Administrative Code
lbs	pounds
LDEQ	Louisiana Department of Environmental Quality
LPDES	Louisiana Pollutant Discharge Elimination System
LPE	laboratory performance evaluation
LDNR	Louisiana Department of Natural Resources
LDOTD	Louisiana Department of Transportation and Development
LDWF	Louisiana Department of Wildlife and Fisheries
LWDPS	Louisiana Water Discharge Permit System
m^3	cubic meters
m/sec	meters per second

ABBREVIATIONS AND ACRONYMS (continued)

maint	maintenance
max	maximum
MBI	methylenebis
mCi	millicuries
mg/l	milligrams per liter
mi	miles
M&O	management & operations contractor
mmb	million barrels
NAAQS	National Ambient Air Quality Standards
NE	northeast
NEPA	National Environmental Policy Act
NFRAP	No Further Remedial Action Plan
NHPA	National Historic Preservation Act
NOEC	No effects observed concentration
NORM	naturally occurring radioactive material
NO_X	nitrogen oxide
NOV	notice of violation
NPDES	National Pollutant Discharge Elimination System
NPL	National Priority List (CERCLA)
NRC	National Response Center
NSR	new source review

ABBREVIATIONS AND ACRONYMS (continued)

NV	not a valid or statistically meaningful number
NW	northwest
NWP	nationwide permit
O&G	oil and grease
OPA	Oil Pollution Act
Ops	operations
OVA	organic vapor analyzer
PCB	polychlorinated biphenyl
pH	negative logarithm of the hydrogen ion concentration (acidic to basic on a scale of 0 to 14, 7 is neutral)
PM_{10}	particulate matter (larger than 10 microns)
PMO	Project Management Office
PPA	Pollution Prevention Act of 1990
ppt	parts per thousand
PREP	Preparedness for Response Exercise Program
PSD	prevention of significant deterioration
QA	quality assurance
QC	quality control
RCRA	Resource Conservation and Recovery Act
RCT	Railroad Commission of Texas
RPX	recovery pump exercise

ABBREVIATIONS AND ACRONYMS (continued)

ROW	right-of-way
RWIS	raw water intake structure
SAL	salinity
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Se	selenium
SE	southeast
SIP	state implementation plan
SJ	St. James Terminal
SOC	security operations center
SO_2	sulfur dioxide
SOW	statement of work
SPCC	Spill Prevention Control and Countermeasures Plan
SPR	Strategic Petroleum Reserve
SQG	small quantity generator
STP	sewage treatment plant
s.u.	standard units
SW	southwest
TDH	Texas Department of Health
TDH&PT	Texas Department of Highways and Public Transportation

ABBREVIATIONS AND ACRONYMS (continued)

TDS	total dissolved solids
TNRCC	Texas Natural Resource Conservation Commission
TOC	total organic carbon
TPDES	Texas Pollution Discharge Elimination System
TPQ	threshold planning quantity
tpy	tons per year
TSCA	Toxic Substance Control Act
TSS	total suspended solids
TWC	Texas Water Commission
TX	Texas
UIC	underground injection control
UST	underground storage tank
USCG	United States Coast Guard
VOC	volatile organic compound
VWS	verification well study
WH	West Hackberry
WI	Weeks Island
yd	yard

EXECUTIVE SUMMARY

The purpose of this Site Environmental Report (SER) is to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts for the U. S. Department of Energy (DOE) Strategic Petroleum Reserve (SPR). The SER, provided annually in accordance with DOE Order 5400.1, serves the public by summarizing monitoring data collected to assess how the SPR impacts the environment. The SER provides a balanced synopsis of non-radiological monitoring and regulatory compliance data and affirms that the SPR has been operating within acceptable regulatory limits.

Included in this report is a description of each site's environment, an overview of the SPR environmental program, and a recapitulation of special environmental activities and events associated with each SPR site during 1997. Two of these highlights include decommissioning of the Weeks Island site, involving the disposition of 11.6 million m^3 (73 million barrels) of crude oil inventory, as well as the degasification of over 12.6 million m^3 (79.3 million barrels) of crude oil inventory at the Big Hill and Bryan Mound facilities. The decision to decommission the Weeks Island site is a result of diminishing mine integrity from ground water intrusion. Transfer of Weeks Island oil began in November 1995 with 11.3 million m^3 (70.8 million barrels) transferred by December 31, 1997. Degassifying the crude oil is a major pollution prevention initiative because it will reduce potentially harmful emissions that would occur during oil movements by three or more orders of magnitude. There was only one reportable oil and no reportable brine spills during 1997. Although the total volume of oil moved (received and transferred internally) was approximately 13.9 million m^3 (87.3 million barrels), the total amount of oil spilled in 1997 was only 0.32 m^3 (2 barrels). The longer term trend for oil and brine spills has declined substantially from 27 in 1990 down to one in 1997. The oil spill was reported to the appropriate agencies and immediately cleaned up with no long term impacts observed.

The SPR's continuing efforts to improve the quality, cost effectiveness, and integration of environmental operations is consistent with the Code of Environmental Management Principles (CEMP). The SPR has incorporated CEMP's five environmental principles into an Integrated Safety Management System.

The SPR sites were inspected or visited on 12 occasions by outside regulatory agencies (Environmental Protection Agency, Louisiana Department of Environmental Quality, Railroad Commission of Texas, Texas General Land Office, U. S. Coast Guard, and Texas Natural Resource Conservation Commission) during 1997. All issues and concerns raised were resolved without enforcement action. Four minor noncompliances were self reported under state and federal discharge permits for all SPR sites during 1997, and no Notice of Violations (NOV) were received. The SPR continues to address ground water contamination from the brine pond and buried piping at West Hackberry with positive results.

The SPR sites generally operate as either Conditionally Exempt Small Quantity Generators (CESQG) in Texas, or Small Quantity Generators (SQG) in Louisiana (the smallest level generator in each state). The SPR is not a hazardous waste treatment, storage, or disposal (TSD) facility. Superfund Amendments and Reauthorization Act (SARA) Title III, Tier Two, reports are prepared and submitted to agencies every year detailing the kinds and amounts of hazardous substances on SPR facilities. Emergency Planning and Community Right-to-Know Act (EPCRA) Section 313 reports were prepared for the first time in 1997 for calendar year (CY) 1996. There were no activities during 1997 that triggered EPCRA 313 reporting for CY 1997.

The St. James Terminal was leased to the Shell Pipe Line Corporation on January 31, 1997. On August 1997, the crude oil pipeline connecting the St. James Terminal and Weeks Island facility was sold to Louisiana Interstate Gas Co. for use as a gas pipeline.

The SPR facilities operate under the National Pollutant Discharge Elimination System (NPDES). Permit renewal applications were found administratively complete by the Environmental Protection Agency (EPA) in late 1993 to early 1994 allowing each site to continue to discharge. Only one renewal NPDES permit was issued, Bryan Mound in 1995. The Louisiana Department of Environmental Quality (LDEQ) was given primacy for the state NPDES program (LPDES) in 1996. One permit renewal application under the new LPDES program, West Hackberry facility, was submitted in 1997. Several air permit modification applications were submitted to the regulatory agencies in 1997 to support decommissioning activities at Weeks Island (2), support life-extension projects at Bayou Choctaw and West Hackberry, and accurately describe current facility operating conditions at Big Hill. Further, each SPR site operates in accordance with a Pollution Prevention Plan prepared in accordance with a separately issued general permit for storm water associated with industrial activity.

The SPR met its drill and exercise requirements for 1996 under the Oil Pollution Act of 1990 through the National Preparedness for Response Exercise Program (PREP).

DOE SPRPMO appraisal teams conducted formal annual visits to each site meeting with contractor management staff, reviewing environmental practices and performance indicators, and reviewing findings with management and operations (M&O) contractor staff. Internal M&O contractor environmental self-assessments at the SPR sites during 1997 identified a total of two Environmental Category II findings (Administrative) and eight Environmental Category III findings (Best Management Practice). No findings indicated that there was any environmental degradation occurring as result of these findings.

The SER also characterizes environmental management performance and programs pertinent to the SPR. The active permits and the results of the environmental monitoring program (i.e., air, surface water, ground water, and water discharges) are discussed within each section by site. The quality assurance program is presented which includes results

from laboratory and field audits and studies performed internally and by regulatory agencies.

The SPR was the first government member of the Louisiana Environmental Leadership Pollution Prevention Program and the first DOE facility in the Texas Pollution Prevention Partnership. The vapor pressure management and crude oil degasification pollution prevention integrated planning and design initiative won the 1997 Governor's Award for Outstanding Achievement in Pollution Prevention for the State of Louisiana. The crude oil tank bottom reclamation activities won the 1997 DOE Pollution Prevention award for hazardous waste recycling. Several pollution prevention initiatives are discussed within this report.

The Questionnaire/Reader Comment Form located inside the front cover of this document may be utilized to submit questions or comments to the originator for response.

1. INTRODUCTION

The purpose of this Site Environmental Report (SER) is to present a summary of environmental data gathered at or near SPR sites to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts.

The creation of the Strategic Petroleum Reserve (SPR) was mandated by Congress in Title I, Part B, of the Energy Policy and Conservation Act (P.L. 94-163), of December 22, 1975. The SPR provides the United States with sufficient petroleum reserves to mitigate the effects of an oil supply interruption.

During 1997, the SPR consisted of five Gulf Coast underground salt dome oil storage facilities (three in Louisiana and two in Texas) and an administrative facility (in Louisiana). The Weeks Island site is undergoing decommissioning and its inventory is being transferred to the Big Hill and Bayou Choctaw sites. The St. James Terminal, a marine terminal facility, is now under commercial lease as of January 31, 1997. The SPR employed approximately 1,075 government and contractor personnel at these facilities during 1997. Figure 1-1 is a regional map showing the relative location of SPR facilities.

The pipeline terminals currently used by the SPR are the ARCO Terminal (Texas City, Texas), the Phillips Docks and Jones Creek Tank Farm (Freeport, Texas), the Sunoco Pipeline Terminal (Nederland, Texas), the Capline and LOCAP Pipeline Terminal from LOOP (St. James, Louisiana), and the Lake Charles refineries (via the Texas 22 pipeline). The Bayou Choctaw pipeline was leased to Shell Pipe Line Corp. on May 1, 1997 and the Weeks Island pipeline was sold to Louisiana Intrastate Gas Company on August 22, 1997. These transactions allowed a total $22,272,500 deposit into the U.S. Treasury. The sites are also capable of distributing crude oil via tank ships.

Descriptions of the individual sites with photographs (Figures 1-2 through 1-6), follow. Section 5, Figures 5-1 through 5-5, provide the site-specific configurations.

Each site's crude oil storage capacity and 1997 year-end inventory is illustrated in Table 1-1.

Table 1-1. Site Storage Capacities/Inventories

Site	Capacity	Inventory (Dec 31, 1997)
BC	11.9 million m^3 (75 mmb)	10.7 million m^3 (67.5 mmb)
BH	25.4 million m^3 (160 mmb)	12.9 million m^3 (81.5 mmb)
BM	35.9 million m^3 (226 mmb)	34.6 million m^3 (217.8 mmb)
WH	34.8 million m^3 (219 mmb)	30.8 million m^3 (193.7 mmb)
WI	N/A Undergoing Decommissioning	492,900 m^3 (3.1 mmb)

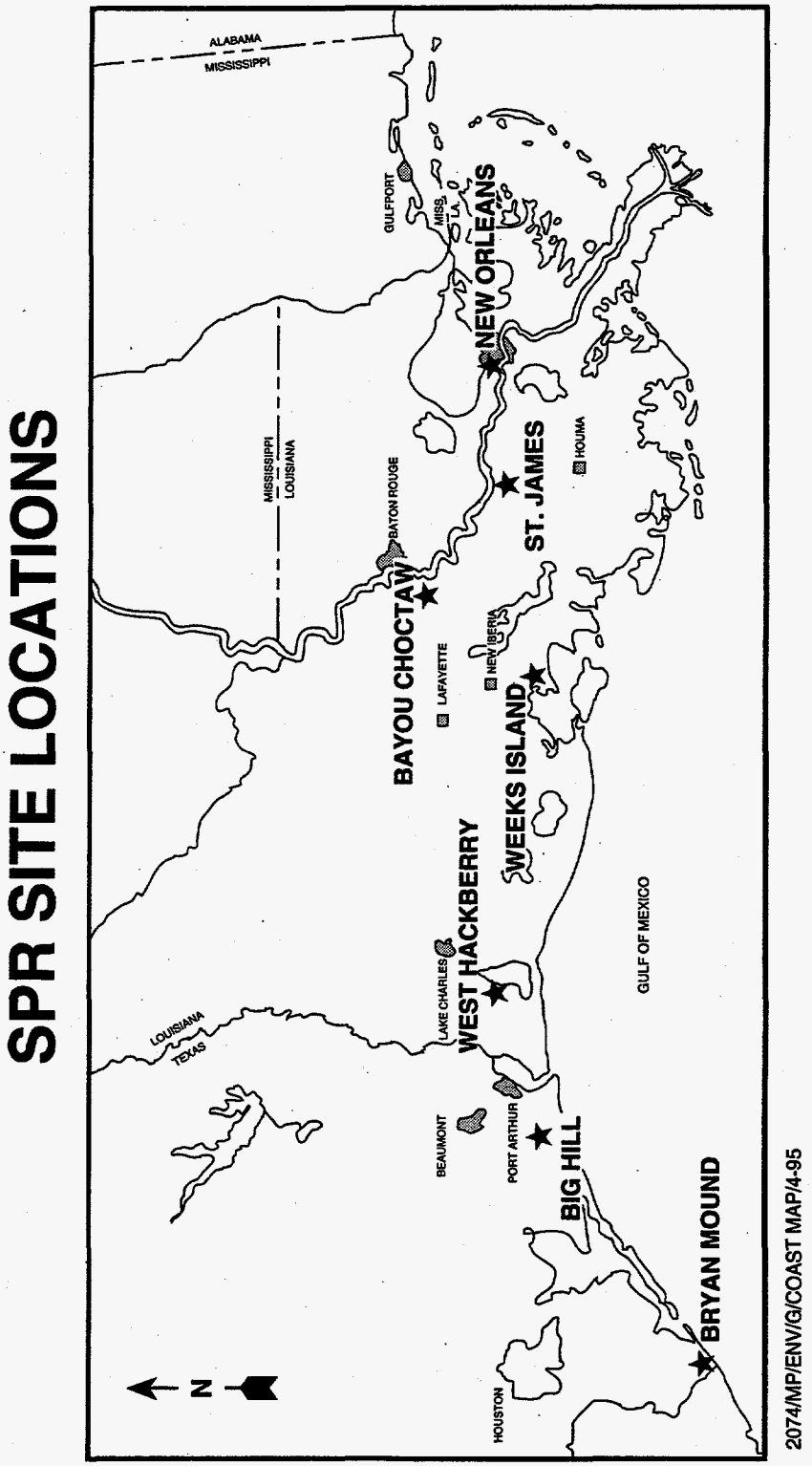


Figure 1-1. SPR Site Locations

1.1 BAYOU CHOCTAW

The Bayou Choctaw (BC) site is located on the west side of the Mississippi River, 19.3 km (12 mi.) southwest of Baton Rouge in Iberville Parish, Louisiana (Figure 1-2). The site consists of a primary operational area and a brine disposal area occupying approximately 69 and 81 hectares (ha) (168 and 200 acres (ac)) respectively. The area surrounding the site is rural with a number of people living in small settlements along the nearby highways. The nearest communities are Addis to the northeast and Plaquemine to the southeast. Baton Rouge, which is the Louisiana State Capital and the major source of housing and services for the site, is within easy commuting distance.

The habitat surrounding the site is a freshwater swamp. Elevation ranges from approximately 1.5 to 3.0 m (five to ten ft) above sea level. Although there are no clear topographic expressions in the area, major surface subsidence has occurred creating substantial areas of bottomland hardwoods and swamp with interconnecting waterways. The site proper is normally dry and protected from spring flooding by the site's flood control levees and pumps. The collapse of a solution-mined cavern in 1954 resulted in the formation of a 4.9 ha (12 ac) lake, Cavern Lake, on the north side of the site.

Bottomland hardwood forest and deciduous swamps are predominant at the Bayou Choctaw site. The vegetation at the site includes bald cypress, sweetgum, water tupelo (characteristic of lowland areas), bulltongue, and spikerushes. Water oak is also present but not abundant. The deciduous swamp is the most widespread habitat type found at the site. It provides resources for a large number of wildlife.

Figure 1-2. Bayou Choctaw SPR Site

Bird species common at Bayou Choctaw are heron, ibis, egret, woodpecker, wood duck, thrush, American anhinga, and American woodcock. Raptors are commonly observed perching in the area. Other endangered species of raptors may occasionally appear near the Bayou Choctaw site or along its pipeline right-of-ways. Inhabitants of the bottomland forest and swamp include opossum, squirrel, nutria, mink, river otter, raccoon, swamp rabbit, white-tailed deer, and snakes. The American alligator, classified as "threatened by similarity of appearance," is frequently found in and adjacent to the site.

The site is located near the intersection of several major bayous and waterways. The Intracoastal Waterway (Port Allen Canal) passes in a north-south direction one km (0.6 mi) west of the site. The Intracoastal Waterway extends to the north and then turns eastward through the Port Allen Locks to enter the Mississippi River at Baton Rouge. In the area of the site, the Intracoastal Waterway is part of Choctaw Bayou, a natural waterway. Smaller canals and bayous, such as Bayou Bourbeaux, the North-South Canal, and the East-West Canal enter the site area and continue to Bull Bay and the Intracoastal Waterway.

The Bayou Choctaw site will be used to store 11.9 million m^3 (75 mmb) of crude oil. The 1997 year-end inventory is 10.7 million m^3 (67.5 mmb). Currently, there are six solution-mined caverns at this storage site. Raw water is provided from Cavern Lake. Brine is transported via pipeline to 12 brine disposal wells located approximately 3 km (2 mi) south of the site. There is a 91 cm (36 in) 58 km (36 mi) long crude oil pipeline that connects the site to the St.

James Terminal. This line was leased to Shell Pipe Line Co. on May 1, 1997.

1.2 BIG HILL

The Big Hill (BH) site is located in Jefferson County, Texas, approximately 109 km (68 mi) east of Houston, 37 km (23 mi) southwest of Port Arthur, and 14 km (9 mi) north of the Gulf of Mexico. Only small unincorporated communities are located near the site. The rural area around the site (Figure 1-3) is used primarily for rice farming, cattle grazing, and oil and gas production. The permanent work force is supplied in small part from the local area, with the remainder moving into the area or commuting from Beaumont or Port Arthur. The site is situated on approximately 111 ha (275 ac) of land on the Big Hill salt dome. Surface elevations reach 10 m (35 ft) above sea level, the highest elevations in the region. The agricultural and pasture land uses around Big Hill are typical of the region.

Approximately one km (0.6 mi) south of the dome is the northern boundary of fresh to intermediate marsh which grades into brackish and saline marsh toward the Gulf of Mexico. The nearby waterways include Spindletop Ditch, approximately five km (three mi) south of the site, which connects to the Intracoastal Waterway located three km (two mi) further south and oriented in a northeast to southwest direction. Freshwater impoundments are located south of the site. Numerous sloughs, bayous, and lakes, including Willow Slough Marsh,

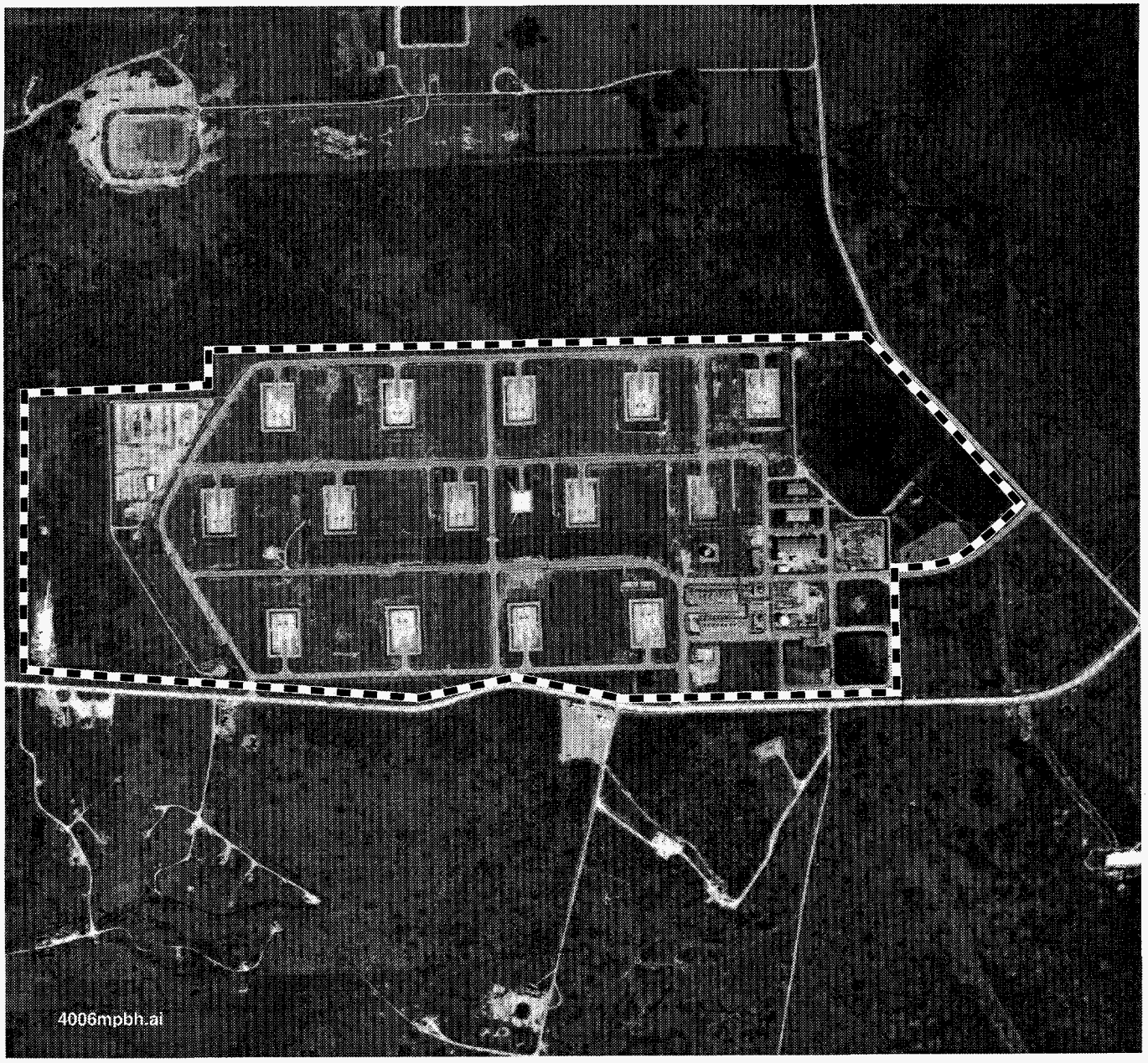


Figure 1-3. Big Hill SPR Site

Salt Bayou, Star Lake, and Clam Lake, connect with the Intracoastal Waterway. Natural ridges (cheniers) paralleling the coastline isolate the marsh from the Gulf of Mexico. Existing habitats in the vicinity of the site are related to agricultural use. There are petroleum-related industrial operations on and off the salt dome which have altered land use.

There are two ponds present on the eastern edge of the dome, one of which is located on the northeast corner of the site and the other just north of the site. The upland habitat, which comprises the majority of the site, consists of many tall grasses such as bluestem, indiangrass, switchgrass, and prairie wildgrass. A few 150 year old live oak trees are present on the site. Identified bird concentrations and rookeries are about eight km (five mi) south and west of the site.

No rare, threatened, or endangered species habitat is identified in the vicinity of the Big Hill site on the Texas Natural Resource Conservation Commission (TNRCC), Coastal Regional Spill Response Map. The paddlefish, a state regulated species, has been identified in Taylor Bayou in the vicinity of the oil pipeline crossing. Fauna typical in the area include coyote, pocket gopher, rabbit, raccoon, rodents, snakes, turtle, and numerous upland game birds and passerines. The nearby ponds and marsh south of the site provide excellent habitat for the American alligator. The McFaddin National Wildlife Refuge located south of the site provides important habitat for over-wintering waterfowl.

The Big Hill site capacity is 25.4 million m^3 (160 mmb) of crude oil in 14 caverns, and the 1997 year-end inventory is 12.9 million m^3 (81.5

mmb). Appurtenant facilities include a raw water intake structure 8.4 km (5.2 mi) south on the Intracoastal Waterway with a 107 cm (48 in) raw water intake pipeline extending to the site, a 107 cm (48 in) brine disposal pipeline extending 15.1 km (9.4 mi) onshore and 7.6 km (4.7 mi) offshore in the Gulf of Mexico, and a 39.3 km (24.4 mi) 91 cm (36 in) pipeline for transporting crude oil between the site and the Sunoco Terminal in Nederland, Texas. The brine pipeline has a series of 72 brine diffuser nozzles which disperse and mix brine with receiving sea water.

1.3 BRYAN MOUND

The Bryan Mound (BM) site is located in Brazoria County, about 105 km (65 mi) due south of Houston, Texas, and five km (3 mi) south of Freeport, Texas, on the east bank of the Brazos River Diversion Channel, near the Gulf of Mexico. The area is highly industrialized, and includes several petrochemical related facilities. Approximately 50 percent of the area's population work in the local area, although many commute to work from outside the immediate vicinity.

The site occupies 202.3 ha (500 ac) in the southwest apex of a triangle formed by the Brazos River Diversion Channel, the old Brazos River, and the Intracoastal Waterway. A U.S. Army Corps of Engineers silt gate controls the flow of water between the Intracoastal Waterway and the Diversion Channel. A levee parallels the Diversion Channel in a southern direction from Freeport until due west of the site. The levee then turns east, bisecting the site.

Figure 1-4 shows the major water bodies near the site, Blue Lake to the north, and Mud Lake to the southeast. These water bodies generally

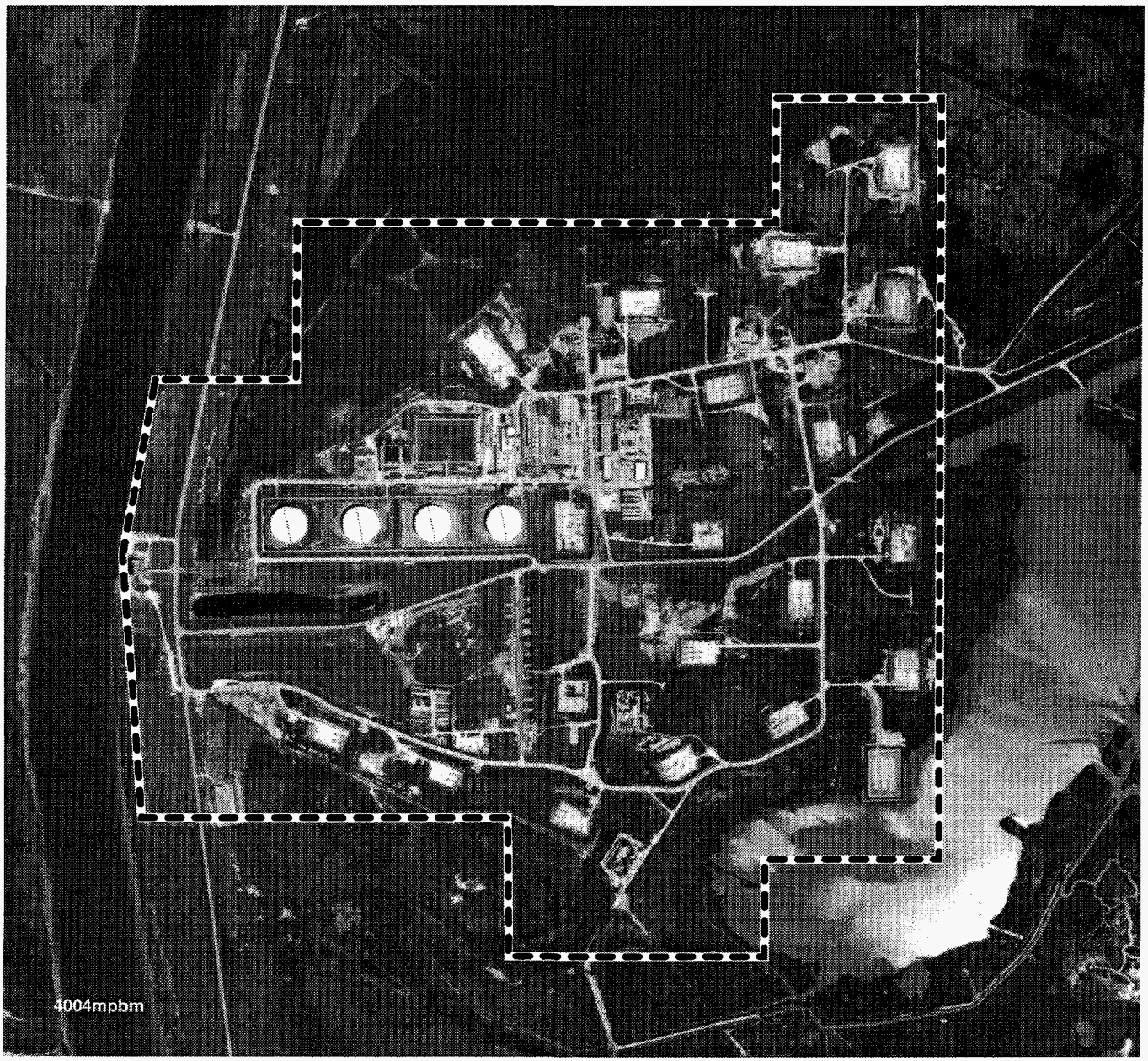


Figure 1-4. Bryan Mound SPR Site

define the mounded aspect of the Bryan Mound dome, which creates a surface expression in the terrain by rising approximately five meters (15 ft) above the surrounding wetlands. Although Blue Lake is within the protective triangle formed by the levee system, with excess rainwater drained off by two large pump stations operated by the city of Freeport, there is some drainage through culverts southward into the Intracoastal Waterway. Mud Lake, on the other hand, is connected by a slough to the Intracoastal Waterway.

The marsh and prairie areas surrounding Bryan Mound are typical of those found throughout this region of the Texas Gulf Coast. Brackish marshland dominates the low-lying portions of the site in all but the northern area, where the coastal prairie ecosystem extends along the levee paralleling the Brazos River Diversion Channel. The coastal prairie is covered with medium to very tall grasses forming a moderate to dense cover for wildlife. These grasses also occur in unmowed "natural" site areas. Those areas periodically inundated by tidal waters are dominated by cordgrass.

A diverse range of habitats is created by water bodies surrounding Bryan Mound. Marshes and tidal pools, such as Mud Lake and Bryan Lake, which connect with the Gulf of Mexico by way of the Intracoastal Waterway or the Brazos River, are ideal habitats for a variety of birds, aquatic life, and mammals. Migratory waterfowl, common egret, snowy egret, great blue heron, killdeer, least tern, and black-necked stilt (the latter two are Texas state-protected species), as well as nutria, raccoon, skunk, rattlesnake, turtles, and frogs can be found on and in the area surrounding Bryan Mound. No federally endangered or threatened species are found on the site; however,

brown pelican, piping plover, and peregrine falcon inhabit nearby areas. Whooping cranes have been recorded occurring just across the Brazos River Diversion Channel to the southwest of the site.

Shrimp, crab, trout, flounder, and redfish are abundant in Mud Lake during various seasons of the year. Black drum, mullet, gar, and blue crab are found in Blue Lake.

Bryan Mound has a total storage capacity of 35.9 million m^3 (226 mmb) of crude oil in 20 solution-mined caverns. The 1997 year-end inventory is 34.6 million m^3 (217.8 mmb). Appurtenant facilities include a 61 cm (24 in) brine disposal pipeline extending 6.6 km (3.5 nautical mi) offshore into the Gulf of Mexico and 4.5 km (2.8 mi) onshore, a raw water intake structure adjacent to the site on the Brazos River Diversion Channel, two 76 cm (30 in) crude oil pipelines connecting the site to the Jones Creek Tank Farm 4.8 km (3 mi) northwest of the site, the Phillips docks 6.4 km (4 mi) northeast of the site, and the 102 cm (40 in) 73.6 km (46 mi) crude oil pipeline from the site to the ARCO refinery in Texas City. The brine pipeline has a series of 18 brine diffusers which disperse and mix brine with receiving sea water.

1.4 ST. JAMES TERMINAL

During 1995 DOE prepared an Environmental Assessment for leasing St. James to private industry as a commercial terminal. The lease was awarded to the Shell Pipe Line Corporation with turnover of the custody of the terminal and its operations on January 31, 1997.

1.5 WEEKS ISLAND

DOE Headquarters announced on December 15, 1994, that the Weeks Island site will be decommissioned. Weeks Island began drawing down oil stocks in November 1995 and transferring them to Big Hill and Bayou Choctaw. Although the oil was, for the most part, removed in 1996, the de-commissioning process is expected to take in excess of three years to complete. The 1997 year-end inventory is approximately 492,900 m^3 (3.1 mmb).

The Weeks Island (WI) site is located in Iberia Parish, Louisiana, about 22 km (14 mi) south of New Iberia. The surrounding area is sparsely populated. New Iberia, the closest major urban center, supplies the greater part of the labor force. The major employment sectors within the parish are mineral production, manufacturing, construction, and agriculture.

The aboveground facility, shown in Figure 1-5, occupies approximately three ha (seven ac). The dome borders Vermilion Bay, which opens to the Gulf of Mexico. The Weeks Island salt mine, developed in the early 1900s by room-and-pillar mining, operated continuously until 1981, at which time operations were moved to another part of the same dome. The land surface over the salt dome forms an "island" caused by domal upthrusting and includes the highest elevation, 52 m (171 ft) above sea level, in southern Louisiana. The area surrounding the island is a combination of marsh, bayous, manmade canals (including the Intracoastal Waterway), and bays contiguous with the Gulf of Mexico. The Weeks Island site consists of a large mechanically excavated salt mine. The 91 cm (36 in) diameter, 108 km (67 mi) long crude oil

Figure 1-5. Weeks Island SPR Site

pipeline connecting the site to the St. James Terminal was sold to Louisiana Intrastate Gas Company on August 22, 1997. A 15 cm (6 in) diameter pipeline, 3.2 km (2 mi) long was installed above ground between the WI facility and the neighboring Shell facility to transport the remaining crude oil via Shell's barge dock.

The vegetation communities on Weeks Island are diverse. Lowland hardwood species proliferate in the very fertile loam soil common at the higher elevations. The predominant tree species are oak, magnolia, and hickory which extend down to the surrounding marsh. Pecan trees are also present. Gull, tern, heron, and egret are common in the marsh area.

Mink, nutria, river otter, and raccoon are the most common inhabitants of the intermediate marshes. Other mammals found at Weeks Island are opossum, bat, squirrel, swamp rabbit, bobcat, white-tailed deer, and coyote. Weeks Island is the home of one of the densest breeding populations of the Louisiana black bear, which has been listed as a threatened species by the U.S. Fish and Wildlife Service under authority of the Endangered Species Act. The endangered red wolf has been sighted in Vermilion Parish about 48.2 km (30 mi) west.

Weeks Island and the surrounding wetlands are also frequented by a variety of endangered or threatened avian species, including the brown pelican, bald eagle, peregrine falcon, the piping plover, and least tern. The wetlands to the southwest of Weeks Island are a breeding area for least terns. The American alligator occurs in the marshes adjacent to the site.

The water bodies surrounding Weeks Island provide a vast estuarine nursery ground for an array of commercially and recreationally important finfish and shellfish.

1.6 WEST HACKBERRY

The West Hackberry (WH) site is located in Cameron Parish 29 km (18 mi) southwest of Lake Charles, Louisiana, and 26 km (16 mi) north of the Gulf of Mexico. Cameron Parish is the largest and least populous parish in Louisiana. The local economy consists of fishing, shrimping, rice farming, and petroleum production. The work force at the site is derived from local residents of the Hackberry community, the towns of Sulphur and Lake Charles, Calcasieu Parish, and from recent arrivals to the area.

The site is situated on 229 ha (565 ac) of land on top of the West Hackberry salt dome (Figure 1-6). The dome is covered by a distinct mounded overburden on its western portion, with elevations up to 6.5 m (21 ft), the highest elevation in Cameron Parish. The majority of the dome is approximately 1.5 m (five ft) above sea level. Two brine disposal well pads occupying approximately 2.5 ha (six ac) are located three km (1.9 mi) south of the site. Waterways near the site include Calcasieu Lake and the Calcasieu Ship Channel approximately five km (three mi) to the east, and the Intracoastal Waterway approximately six km (four mi) north of the site. Black Lake, a brackish water lake, borders the dome on the northern and western sides. Numerous canals and natural waterways, including Black Lake Bayou, connect Black Lake to Alkali Ditch and then to the Intracoastal Waterway on the eastern side of the site. Black Lake Bayou, referred to locally as Kelso

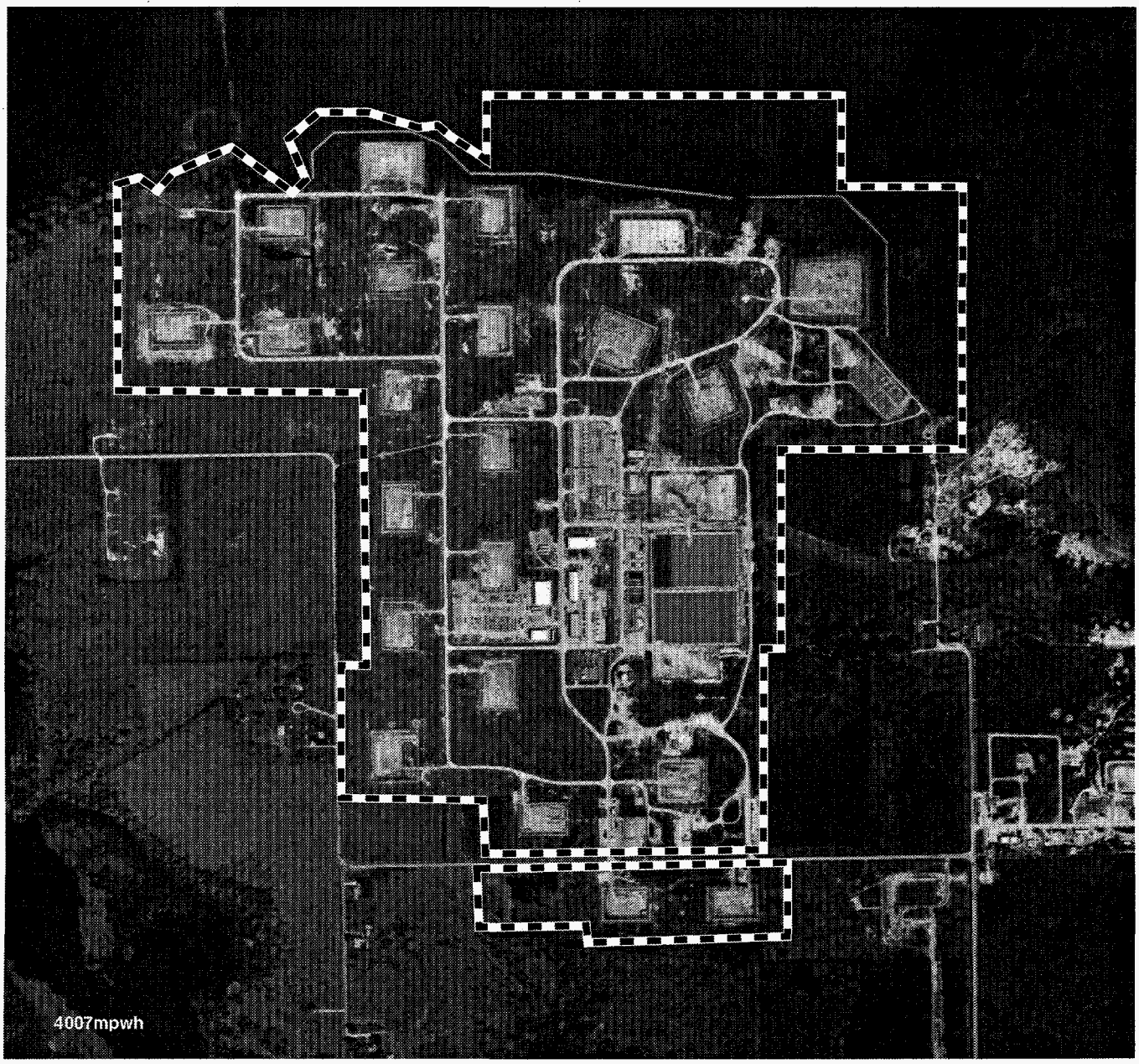


Figure 1-6. West Hackberry SPR Site

Bayou, continues wandering in a generally easterly direction from Black Lake, eventually connecting with the Calcasieu Ship Channel northeast of the town of Hackberry.

The western part of Cameron Parish consists of marshland with natural ridges extending in a generally east-west direction. These ridges, or cheniers, are stranded former beach lines which affect water flow through the marshes. The cheniers typically support grasses and trees. In many areas, lakes, bayous, and canals are concentrated so that the marsh may not seem to be a land mass, but rather a large region of small islands.

Marshland closest to the coast generally has the highest salinity levels and lowest species diversity. Vegetation found on the site and in the surrounding area of the West Hackberry site is dominated by Chinese tallow, willow, various oak species, and numerous species of marsh and upland grasses. The marsh lands surrounding West Hackberry and its appurtenant facilities provides excellent habitat for a variety of wetland species. This area is predominantly brackish marsh with areas of submerged vegetation. Many wading birds, waterfowl, shore birds, seabirds, and diving birds frequent the area, in many cases breeding and nesting here. The American alligator is extremely common, breeding and nesting in this area. A variety of other reptiles, fish, shellfish, and mammals also frequent this area, in many cases breeding and reproducing. Oyster reefs occur in Calcasieu Lake with large concentrations in West Cove near the brine disposal pipeline. Sport and commercial fishing takes place throughout this area for a variety of species, including fresh water and marine fish and shellfish.

Several species that are protected by the U.S. Fish and Wildlife Service under authority of the Endangered Species Act occur in the West Hackberry area. These include the southern bald eagle, Arctic peregrine falcon, and brown pelican. These species also inhabit the lands through which the SPR pipelines pass.

Also inhabiting the area surrounding the West Hackberry site are snakes, egret, heron, migratory waterfowl, red-tailed hawk, red fox, raccoon, nutria, opossum, rabbit, and white-tailed deer. Aquatic inhabitants of Black Lake include crab, shrimp, drum, croaker, spot, sheepshead, mullet, gar, redfish, and catfish. No endangered or threatened species other than the alligator (threatened by similarity of appearance) have been identified on the site.

The West Hackberry site will store 34.8 million m^3 (219 mmb) of crude oil in 22 solution-mined caverns. The 1997 year-end inventory is 30.8 million m^3 (193.7 mmb). Brine is currently transported and disposed by injection into nine brine disposal wells. The 91 cm (36 in), 42 km (26 mi) brine pipeline that goes to an area 11 km (seven mi) south of Holly Beach, Louisiana, in the Gulf of Mexico is currently out of service. Raw water is brought to the site via a 107 cm (42 in), 6.6 km (4.2 mi) pipeline from the Intracoastal Waterway and crude oil is transported between the site and the Sunoco Terminal in Nederland, Texas, via a 107 cm (42 in), 66 km (42 mi) crude oil pipeline.

1.7 NEW ORLEANS HEADQUARTERS

The main office for SPR operations is housed in three adjacent office buildings in Harahan, a suburb of New Orleans, Louisiana. Unlike the crude oil reserve sites, activities conducted at the New Orleans office

complex are predominantly administrative with nearby warehouse capacity to augment project-wide equipment storage. Office space is rented, not owned, by the Department of Energy.

This page intentionally blank

2. COMPLIANCE SUMMARY

General

The SPR operates in conformance with standards established by federal and state statutes and regulations, Executive Orders, and Department of Energy (DOE) orders and directives. A list of environmental federal, state, and many of the DOE standards that, in varying degrees, affect the SPR is found in Appendix A.

The DOE Office of Strategic Petroleum Reserve, Fossil Energy, (OSPR FE) has overall responsibility for environmental monitoring, compliance, and protection activities at the SPR. The Project Manager, Strategic Petroleum Reserve Project Management Office (SPRPMO), is responsible for issuing and updating, as required, a General Environmental Statement (Appendix B) that reflects the statement of policy contained in DOE Order 5400.1 and provides broad environmental protection goals.

The SPR has had an Environmental Protection Program since its inception and initial operation. The Deputy Assistant Secretary for the SPR has delegated primary responsibility for implementation of the SPR Environmental Protection Program to the SPRPMO. The SPRPMO has delegated responsibilities for implementation of the program to the current Management & Operating (M&O) contractor, DynMcDermott Petroleum Operations Company (DM); the Architect-Engineering (A&E) contractor, Walk Haydel and Associates, Inc. (WHA); and SPR subcontractors. DM has been under contract to DOE since April 1, 1993.

The SPRPMO Environmental, Safety and Health (ES&H) division is responsible for development and oversight of ES&H programs and provides direction, technical guidance, and independent oversight to its prime contractors in the implementation of environmental programs and assessment of contractor performance.

It is the SPR's policy and practice to conduct operations in compliance with all applicable environmental requirements with the highest regard for the protection and

preservation of the environment. Compliance status in this year's report reflects compliance activities conducted by DOE and DM personnel.

The SPR has incorporated the following five broad Code of Environmental Management Principles (CEMP) into the implementation of its integrated safety management system:

1. management commitment;
2. compliance assurance and pollution prevention;
3. enabling systems;
4. performance and accountability; and
5. measurement and improvement.

This approach to integrating the protection of workers, the public, and the environment is in the first phase of implementation. Additionally, site decommissioning and life extension include environmental management planning based on the principles of ecosystem management and sustainable development.

A summary of the programs and procedures that presently make up the SPR environmental protection program are:

a. inspections, appraisals, assessments, and surveillance which provide regular monitoring to ensure compliance with regulatory and policy requirements;
b. a non-routine reporting program directed toward notification of oil, brine, or hazardous substance spills, or noncompliant effluent emissions, to identify the impact of such spills or emissions on property and the environment, and to comply with regulatory requirements;
c. a routine reporting program directed toward fulfilling self-reporting obligations under water, air, and waste permits and regulations;
d. a permit monitoring program to ensure compliance with all permit requirements and limitations, onsite operations and maintenance activities;

e. an environmental monitoring program to detect any possible influence the SPR might have on surface waters and ground waters on or near SPR sites and to provide a baseline in the event of an environmental upset;

f. a discharge procedure used by each site when releasing liquid from any authorized containment or control system;

g. an environmental training program to ensure that applicable personnel are aware of environmental laws and regulations, trained in oil and hazardous material spill prevention, and safe handling of hazardous waste;

h. a pollution prevention program which focuses on source reduction of wastes, recycling, and proper disposal of all wastes produced on the SPR sites;

i. an underground injection control program mandated by the Safe Drinking Water Act (SDWA) to ensure sound operation of Class II underground wells/caverns for brine disposal or hydrocarbon storage to protect aquifers; and

j. regulatory review program for new environmental requirements.

Regulatory

The principal regulatory agencies responsible for enforcing environmental regulations at SPR facilities are the Environmental Protection Agency (EPA) Region VI, the U.S. Army Corps of Engineers (COE), the Louisiana Department of Environmental Quality (LDEQ), the Louisiana Department of Natural Resources (LDNR), the Railroad Commission of Texas (RCT), and the Texas Natural Resource Conservation Commission (TNRCC). These agencies issue permits, review compliance reports, inspect facility operations, and oversee compliance with regulations.

Executive Orders (E.O.)

The SPR follows and operates in conformance with numerous Executive Orders applicable to its operation. Two of the major orders include Federal Compliance with

Pollution Control Standards (E.O. 12088) and Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements (E. O. 12856).

DOE Orders/Directives

The SPR follows and operates in conformance with numerous DOE Orders applicable to its operation. Two of the major orders include General Environmental Protection Program (5400.1) and National Environmental Policy Act (NEPA) Compliance Program (451.1). The orders establish some of the policies of the SPRPMO.

2.1 COMPLIANCE STATUS (JAN. 1, 1997 THROUGH DEC. 31, 1997)

During 1997 the SPR submitted four minor noncompliances with state and federal discharge permits to regulatory agencies under the permit self-reporting provisions. These noncompliances are discussed further in Sections 2.3 and 5.3. Much of the SPR's compliance program deals with meeting regulations under the Clean Water Act. The SPR sites have a total of 99 wastewater and storm water discharge monitoring stations. The SPR is also required to meet many requirements under the Clean Air Act and the Safe Drinking Water Act. Site waste management activities are conducted in accordance with the Resource Conservation and Recovery Act (RCRA). The SPR sites do not routinely generate large quantities of hazardous waste and therefore are typically classified as either Conditionally Exempt Small Quantity Generators (CESQG) in Texas, or Small Quantity Generators (SQG) in Louisiana (the smallest level generator in each state). The SPR sites do not treat, store, or dispose of hazardous wastes on site, and therefore, are not RCRA-permitted treatment, storage, and disposal (TSD) facilities. Each site has an EPA generator number that is used to track the manifesting of hazardous waste for off-site treatment or disposal. None of the SPR sites are identified on the National Priority Listing (NPL) under CERCLA. Polychlorinated biphenyl (PCB)

contaminated oils and friable asbestos wastes were not generated at SPR sites in 1997.

The following sections highlight primary compliance activities at the SPR sites by environmental statute.

Clean Water Act (CWA)

The SPR sites comply with the CWA through permitting with the National Pollution Discharge Elimination System (NPDES) program, following the spill prevention regulations (SPCC), complying with the requirements of the Oil Pollution Act of 1990 (OPA), and complying with the wetlands usage program.

Applications for renewal of the NPDES permits were submitted for all sites in 1993 to Region VI EPA and found administratively complete in 1994. Region VI EPA issued a revised NPDES permit for the Bryan Mound site in order to incorporate the new brine disposal line. Region VI EPA has not renewed the other permits giving priority to other non-SPR facilities within the region because the SPR sites are considered minor dischargers. All of the sites can continue to operate under their existing permits until they are renewed because the applications were found to be administratively complete.

On August 27, 1996, Region VI EPA granted LDEQ primacy for the NPDES program that includes responsibility for all compliance and enforcement actions relating to the discharge of water in the state of Louisiana. The SPR has been informed that a single Louisiana Pollutant Discharge Elimination System (LPDES) permit will be issued by the state as each current LWDPS expires. In the interim, both the administratively extended federal permits and the renewed (state) Louisiana Water Discharge Permit System (LWDPS) permits

will be valid. In 1997, a LPDES permit application renewal for West Hackberry was submitted to LDEQ and the permit should be received during 1998. During September 1997, the SPRPMO submitted a Notice of Intent to extend the existing coverage of the storm water discharge associated with industrial activity under EPA's Multi-Sector General permit.

The SPR maintains a Louisiana state-wide permit from LDEQ for discharge of hydrostatic test water which saves filing fees and increases flexibility in support of site construction and maintenance activities.

Since 1994, the two Texas SPR sites also operate under authority granted with Texas Pollutant Discharge Elimination System (TPDES) permits issued by the Railroad Commission of Texas. This required coverage imposes additional testing, reporting, and other administrative duties beyond the federal program.

Each SPR site has to comply with the Federal Spill, Prevention, Control, and Countermeasures (SPCC) regulations and in Louisiana with the state SPCC regulations by following a plan that addresses prevention and containment of hazardous substance spills. During 1997, DM revised the SPCC plans for Weeks Island and Bayou Choctaw to also comply with LDEQ requirements and canceled the St. James Terminal plan. All of the SPR spill plans are now current in accordance with 40CFR112.

The SPR sites have to obtain permits from the U.S. Corp of Engineers and Coastal Zone Management Divisions of the various state agencies whenever fill, discharge, or dredging occurs in a wetland. In early 1997, the Texas Coastal Zone Management program became law.

During 1997, fifteen separate SPR projects occurred in jurisdictional wetlands in Louisiana and Texas requiring Corps of Engineers permit actions from the New Orleans and Galveston districts in addition to Coastal Zone Management approval (Department of Natural Resources – Coastal Zone Management in Louisiana and the General Land Office in Texas). Most of these projects resulted from work involving raw water intake structures (RWIS) and pipelines at the sites. Other projects included maintenance notifications for dredging and related activities.

Oil Pollution Act (OPA) of 1990

SPR emergency programs, planning, and management are guided by OPA 90 regulatory standards for onshore storage facilities, pipelines, and marine terminal facilities. SPR site facility response plans have been developed to meet or exceed the requirement of OPA 90, and have been approved by the appropriate federal regulatory agencies.

The National Preparedness for Response Exercise Program (PREP) has been adopted and incorporated into the SPR Emergency Management exercise program since 1994. SPR sites conduct emergency drills or hands-on training each quarter. A professional staff of emergency management exercise personnel from DM New Orleans conducts two equipment deployment exercises at each site annually. The annual site exercises include the participation of public regulatory/governmental agencies.

The SPR has adopted the National Interagency Incident Management System (NIIMS), the response management system required by the National Oil and Hazardous Substances Pollution Contingency Plan. SPR site and New Orleans response management personnel have been trained in the unified Incident Command System and a team of

selected New Orleans personnel is available to support extended site emergency operations when needed.

Safe Drinking Water Act (SDWA)

The SPR oil storage caverns and brine disposal wells are regulated by the SDWA. The EPA has given primacy under the SDWA to both Louisiana and Texas UIC programs, which regulate underground hydrocarbon storage, related brine disposal, and oil field wastes. The SPR operates 21 salt water disposal wells in Louisiana. In Texas, brine pipelines which extend into the Gulf of Mexico are used for brine disposal, as well as ancillary commercial disposal wells. The 1997 Annual Report Form OR-1 was completed and submitted on schedule to the Louisiana Department of Natural Resources.

Historic ground water evaluations have indicated the presence of shallow ground water impacts from salt water at the Bryan Mound and West Hackberry sites. At Bryan Mound, more recently analyzed data suggests that pre-DOE use of unlined brine storage pits may have contributed significantly to the salt impacted ground water located east of the existing large brine storage pond. The West Hackberry site negotiated a corrective action plan (CAP) for a leaking brine pond with LDNR in February 1992. The CAP requires ground water recovery pumping, ground water monitoring, and submission of quarterly monitoring reports. In 1993, LDNR issued a requirement to continue to monitor the wells for 30 years after closure of the permanent anhydrite disposal pits. This requirement is being met by the quarterly monitoring requirement for the brine pond CAP. Both of these ponds are scheduled for replacement with aboveground tanks during 1998.

Monitoring at West Hackberry during 1997 indicates that the brine contaminated plume remains localized around and east of the pond system with no indications of any off-site migration. Affected ground waters at both sites are naturally brackish and not suited for domestic or agricultural use. This use limitation is a significant factor in determining whether additional action will be needed in the future. The annual hydraulic evaluation and engineering inspection of the Bryan Mound brine pond was conducted in accordance with pond permit provisions, and the resulting report submitted to the RCT.

A program to establish baseline ground water conditions at Weeks Island prior to making post-decommissioning comparisons was initiated in 1996 and maintained as planned in 1997. This activity is establishing background information about the groundwater and then it will provide long-term ground water monitoring assurance. Background conditions are currently being measured triennially until final skimming and brine backfill is completed in 1999. This activity currently involves four wells, and the program is referred to as Weeks Island Long-term (WILT) monitoring.

Clean Air Act (CAA)

The SPR sites comply with the applicable provisions of the CAA and State Implementation Plans (SIP) through permitting with the state agencies having primacy (LDEQ and TNRCC) and following applicable regulations. All of the SPR sites are located in attainment areas for all National Ambient Air Quality Standards (NAAQS) pollutants with the exception of ozone. Weeks Island and West Hackberry are located in attainment areas for ozone; therefore, they are regulated by the Prevention of Significant Deterioration (PSD) permitting program. Big Hill, Bryan Mound, and Bayou Choctaw are located in nonattainment areas for ozone; therefore, the New Source

Review (NSR) permitting program applies. None of the SPR facilities are considered to be major sources during normal operations under PSD, NSR, Title III hazardous air pollutant, or Title V operating permit regulations. All of the facilities operate in accordance with the provisions of the applicable state air permits.

In 1996 an air permit modification application was submitted to LDEQ to install a replacement for the existing flare at Weeks Island. LDEQ issued a new air permit for this modification in January 1997. An air permit modification application was submitted to LDEQ in August 1997, to replace the flare at Weeks Island with a larger 9 ft. diameter flare. LDEQ issued a new air permit for the larger flare in August 1997. This new air permit requires that an annual air emissions inventory report for Weeks Island be submitted to LDEQ.

During 1995, an air permit modification application was submitted to LDEQ to add a 671 hp emergency generator and to update fugitive emissions at Bayou Choctaw. A revision to the permit modification application was submitted to LDEQ in May of 1997 to replace the existing 671 hp emergency generator with a larger 939 hp generator. LDEQ issued a new air permit for Bayou Choctaw in December 1997.

The air permit modification application submitted to LDEQ in August 1997, to replace the existing 939 hp emergency generator with a larger 1371 hp generator at West Hackberry was approved by LDEQ in November 1997.

In July 1997, an air permit modification application was submitted to TNRCC to revise emission estimates at Big Hill and to include new sources. TNRCC issued a new air permit for Big Hill in October of

1997. This new air permit requires that an annual air emissions inventory report for Big Hill be submitted to TNRCC.

Degas plants, which are designed to remove methane and ethane from selected crude oil inventories, operated at Big Hill and Bryan Mound during 1997. A standard air permit modification application submitted to TNRCC during 1996 to degas an additional 24.8 mmb of oil at Big Hill was issued in March 1997. Degas operations were completed in November 1997, and the standard permit was closed. Degas operations at Bryan Mound were completed in December 1997, and the standard permit was closed.

There were numerous permit variance requests made to LDEQ during 1997. A permit variance request must be made to LDEQ when there is a probability that a change in a process (such as maintenance, upset condition, or other) will increase emissions over the permitted allowables. Two permit variance requests associated with the decommissioning were made for Weeks Island to vent mine gas and operate the existing flare. An additional two variance requests were made for West Hackberry to operate the emergency generator for an extended period of time due to a planned electrical shutdown at the site.

Pollution Prevention Act of 1990 (PPA)

Each SPR site operates in accordance with a Pollution Prevention Plan prepared in accordance with the EPA storm water general permits and similar Louisiana requirements. This multimedia document consolidates these regulatory agency requirements with the more general DOE Order 5400.1 required Pollution Prevention Plan, and the related Waste Minimization and Solid Waste Management Plans.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)

The SPR has not needed to conduct response activities pursuant to this act. DOE Order 5480.14 required all DOE-owned sites to evaluate compliance with CERCLA. The SPR completed DOE Phase I and II reports (similar to CERCLA's Preliminary Assessment and Site Investigation process) in 1986 and 1987, respectively. The reports assessed each site for the potential presence of inactive hazardous waste sites, and recommended no further action under CERCLA. The DOE Phase I and II reports were submitted to EPA Region VI, and all SPR sites are considered as No Further Remedial Action Plan (NFRAP) sites (although follow-on inspection is expected) to reflect the findings in the reports.

Superfund Amendments and Reauthorization Act (SARA)

SARA Title III Tier Two reports, also known as Emergency Planning and Community Right-to-Know Act (EPCRA) Section 312 reports, were prepared and distributed as required by March 1st to state and local emergency planning committees and local fire departments. SPR sites are required to report under EPCRA Section 313 when crude oil is transferred to other facilities because of Executive Order 12856 which requires federal facilities to submit TRI Form R reporting even though the facility's SIC Codes are 5171. When crude oil is transferred to other facilities from SPR sites, they are re-packaging the hazardous substance for introduction into commerce. SPR sites did not submit EPCRA 313 (Form R) reports for CY 1997 because they were below the threshold limit that requires reporting. However, TRI reports for West Hackberry, Weeks Island, and Bryan Mound were submitted in December 1997 for CY 1996. When the SPR exceeds the alternate threshold of one million pounds of benzene, EPCRA 313 reports will again be submitted.

Resource Conservation and Recovery Act (RCRA)

Hazardous wastes generated on the SPR are managed in strict compliance with the delegated state and EPA hazardous waste programs. Although EPA has delegated the hazardous waste program in Texas to the TNRCC and in Louisiana to LDEQ, state jurisdiction of SPR sites fall under two other agencies, RCT and LDNR. Therefore, the SPR also complies with EPA regulations.

SPR non-hazardous wastes which are associated with underground hydrocarbon storage activities are regulated under the corresponding state programs for managing drilling fluids, produced waters, and other wastes associated with the exploration, development, production or storage of crude oil or natural gas.

Other non-hazardous wastes generated at SPR facilities are managed in accordance with state solid waste programs. The appropriate waste management strategy is based on the results of waste stream characteristics.

In 1997, the SPR manifested hazardous waste from the Bayou Choctaw, Bryan Mound, Big Hill, and West Hackberry sites to an offsite hazardous waste incinerator. The hazardous wastes consisted primarily of paint solvent and solids, solvent contaminated oils, and laboratory wastes. The SPR submitted notification forms of regulated waste activity to the EPA for all SPR sites. In 1997, Louisiana hazardous waste revised rules allowed annual averaging of monthly waste generation amounts to establish waste generator status. All Louisiana sites averaged hazardous waste generation rates well within the Small Quantity Generator (SQG) limits. In Texas, the Conditionally Exempt Small Quantity Generator (CESQG) status was

exceeded twice at Bryan Mound while Big Hill remained in the CESQG status for the entire year.

There were two corporate policies that stress the SPR's commitment to waste management and environmental protection (Appendix B). In 1998, these corporate policies will be re-evaluated and combined into one.

Toxic Substances Control Act (TSCA)

Friable asbestos was not found at SPR sites in 1997. The small amount of nonfriable asbestos (less than 1,000 lbs) on the SPR is disposed of locally as it is taken out of service, in accordance with applicable solid waste regulations.

No liquid-filled electrical equipment or hydraulic equipment currently used on the SPR has been identified as PCB equipment or PCB contaminated under TSCA. In October 1997, the West Hackberry site received a request for information from EPA on the site's use of P:C.B. Inc. of Missouri for disposal. P.C.B. Inc. is a facility that received waste shipments of PCBs in electrical equipment for processing and destruction in the 1980s and is now a superfund site. In 1986, West Hackberry sent to P.C.B. one transformer for salvage, transformer oil, and earthen material contaminated with transformer oil for destruction. All material was tested prior to shipment and were found to be non-PCB (less than 50 ppm). This information was submitted to EPA and there has been no determination as to DOE's liability as a potentially responsible party.

National Environmental Policy Act (NEPA)

Three hundred and forty-eight design reviews, scopes of work, and purchase requests were evaluated for NEPA review in 1997. Out of

the 348 reviews, only 114 required a NEPA review. None of these projects adversely affected any culturally sensitive resources such as structures of historic, archeological, or architectural significance or any threatened or endangered species or their habitat. Also, no environmentally sensitive areas or wetlands were adversely impacted as a result of these actions. All of these NEPA reviews resulted in categorical exclusions that did not require further action; therefore, no Environmental Assessments (EAs) or Environmental Impact Statements (EIS) were initiated during CY 1997.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

All pesticides and herbicides were used in accordance with manufacturers' labels. Restricted use pesticides were applied only by licensed commercial applicators.

The SPR encompasses 748 hectares (1,849 acres) and uses approximately 2,700 kg (6,000 lbs) of pesticides and herbicides to control weeds, insects, and rodents on the sites annually.

Endangered Species Act (ESA)

The Weeks Island site, along with neighboring facilities on the island, continued to coordinate with the U. S. Fish and Wildlife Service (F&WS), Louisiana Department of Wildlife and Fisheries (LDWF), and the Louisiana Nature Conservancy to prevent harm to resident Louisiana black bears.

In a continuing effort to minimize disruption and provide suitable habitat to the existing migratory birds in the Bryan Mound area, bird nesting areas are quarantined to prevent damage by mowers.

National Historic Preservation Act (NHPA)

No site activities performed in 1997 required coordination with State Historical Preservation Offices. No places on or eligible to the National Register of Historic Places are located on or adjacent to SPR sites.

Executive Order (E.O.) 12088 "Federal Compliance with Pollution Control Standards

In accordance with all applicable pollution control standards, the SPR complies with E.O. 12088 by implementing the SPR Pollution Prevention Plan. The plan includes goals for hazardous and non-hazardous waste reduction.

Since 1994, the SPR has reduced hazardous waste generation by 75 percent down to two tons in 1997. New Orleans and Weeks Island met their 1997 hazardous waste reduction goals. Weeks Island met their 1997 non-hazardous sanitary waste goal. In 1997, the SPR established a 60% paper recycling goal. New Orleans, Bryan Mound, Bayou Choctaw, Weeks Island, and West Hackberry met their 1997 paper recycling goal.

The SPR was the first government member of the Louisiana Environmental Leadership Pollution Prevention Program. The Louisiana sites received the 1997 Governor's Award for Outstanding Achievement in Pollution Prevention for implementing innovative processing techniques to reduce vapor pressure in stored crude oil and avoid generating 8,200 tons of air emissions during 1996. The SPR was also awarded the 1997 DOE Pollution Prevention award for hazardous waste recycling due to its crude oil tank bottom reclamation activities. During 1997, the SPR also applied for the 1998 Governor's Recognition Award for Community Involvement for Mentoring

Projects with Suppliers and Small Companies to Prevent Pollution. This program was to educate and involve on-site construction and service contractors in waste minimization and recycling efforts.

Clean Texas 2000 provides guidelines of an overall reduction of 50 percent or more by the year 2000 in the release of toxics and/or the generation of hazardous pollutants in Texas from 1987 levels. A reduction in the disposal of solid waste in landfills by as much as 60 percent by the year 2000 is also proposed. The SPR sites' specific achievable, measurable waste generation reduction goals satisfy Clean Texas 2000 guidelines.

Pollution prevention was integrated into the SPR mission through policies, procedures, performance measures, and standards. This was accomplished by updating the goals and training; computerizing the regulatory tracking; self-assessments; and continual improvement priority planning. Pollution prevention was also integrated into the Behavioral Safety Program in New Orleans through the development of pollution prevention definitions and addition of pollution prevention behaviors in the critical behavior inventory list. To heighten employee pollution prevention awareness and behavioral safety, observers "observe" the work force and note defined pollution prevention behaviors.

Of over 4,000 documents that received pollution prevention review; 3,400 were purchase requests that were screened against the SPR Qualified Products List to assure that products purchased met environmental criteria established by the list. Products and information provided by the list help minimize specific EPA recognized toxic chemicals and potential hazardous waste, and encourage the purchase of materials containing recycled content.

Executive Order 12856, "Federal Compliance with Right-to-Know Laws and Pollution Prevention Requirements"

In response to Section 5-501 of E. O. 12856, all SPR sites were listed in the Potential Facilities Listing prepared by DOE on April 13, 1994, for potentially meeting reporting requirements under EPCRA Sections 304 and 311-312 requirements.

EPCRA, Section 313, regulations require applicable facilities to complete an annual Toxic Chemical Release Inventory (TRI) Form R Report. These regulations apply to facilities with Standard Industrial Classification (SIC) Codes 20 through 39 that manufacture, process, or otherwise use any listed toxic chemical in quantities above specific threshold limits in a calendar year. EPCRA Section 313 does not require SPR sites, SIC Code 5171, to report until 1999; however, Executive Order 12856 signed by the President on August 3, 1993, requires federal facilities to perform TRI Form R reporting regardless of the facility's SIC Code. In December 1997, TRI reports for West Hackberry, Weeks Island, and Bryan Mound were submitted to the EPA, LDEQ, and TNRCC for CY 1996. The only applicable chemicals were benzene and hexane from the crude oil. The reported quantities were based on crude oil sold from Weeks Island and West Hackberry and SPR oil leased to Phillips Terminal from Bryan Mound during 1996.

The SPR Pollution Prevention Plan has been implemented since 1993. The SPR has also developed and implemented site-specific emergency response plans. Compliance with E. O. 12856 is indicated in Table 2-1. Tables 2-2 through 2-7 provide a summary of 1997 SARA reporting for each site. Offsite SPR pipelines containing crude oil were reported separately from SPR sites (Table 2-8 and 2-9). There

were no extremely hazardous substances in excess of the TPQ in 1997, negating the possibility of reportable releases.

Table 2-1. Compliance with Executive Order 12856

EPCRA 302-303: Planning Notification	Yes [X]	No [ ]	Not Required [ ]
EPCRA 304: EHS Release Notification	Yes [X]	No [ ]	Not Required [ ]
EPCRA 311: Material Safety Data Sheets	Yes [X]	No [ ]	Not Required [ ]
EPCRA 312: Chemical Inventory	Yes [X]	No [ ]	Not Required [ ]
*EPCRA 313: TRI Reporting	Yes [X]	No [ ]	Not Required [ ]

* TRI report was submitted in 1997 for 1996 data.

Table 2-2. Louisiana SARA Title III Tier Two Summary at Bayou Choctaw

Chemical Name (Category)	* Max Daily Amount (lbs)	Location
Bromotrifluoromethane (Halon 1303)	1,000 - 9,999	Control room in Operations Building 401
Crude oil, petroleum flammable and combustible liquid	> 1 billion	Six underground storage caverns in salt dome and site piping
Diesel fuel #2 (clear amber liquid)	10,000 - 99,999	Property tank #2, emergency generator fuel tank
FC-600 3M Light-water ATC/AFFF	10,000 - 99,999	Foam deluge and fire systems, foam storage building
Gasoline	10,000 - 99,999	Property Tank #1
Oil, flammable and combustible	1,000 – 9,999	Flammable storage and maintenance buildings
Paint, flammable or combustible	100 - 999	Flammable storage building
Sodium Chloride	1,000 - 9,999	H20 building

* Reporting range specified by LA SARA Title III Tier Two Reporting Requirement

Table 2-3. Texas SARA Title III Tier Two Summary at Big Hill

Chemical Name (Category)	* Max Daily Amount (lbs)	Location
Ammonium bisulfite	10,000 - 99,999	Near brine pond
Crude oil, petroleum, flammable and combustible liquid	> 1 billion	Site tanks, piping, and underground storage caverns across the salt dome
Diesel fuel #2 (clear amber liquid)	10,000 - 99,999	Fuel station, raw water intake structure, fire pump house, emergency generator tank
FC-600 3M Light-water ATC/AFFF	10,000 - 99,999	Fire truck, fire bay, storage north of 111
Gasoline	10,000 - 99,999	Fuel station
Oil, flammable and combustible	10,000 - 99,999	Warehouse, laboratory, raw water intake structure, maintenance laydown yard, and paint shed

*Reporting range specified by Texas SARA Title III Tier Two Reporting Requirement

Table 2-4. Texas SARA Title III Tier Two Summary at Bryan Mound

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Crude oil, petroleum, flammable and combustible liquid	> 1 billion	Site tanks, piping, underground storage caverns across the salt dome, and degas plant
Diesel fuel #2 (clear amber liquid)	10,000 - 99,999	Fuel tank diked area and degas plant
FC-600 3M Light-water ATC/AFFF	100,000 - 999,000	Fixed systems, foam storage, mobile units, and degas plant
Gasoline	10,000 - 99,999	Fuel station, construction dike area, and degas plant
Oil, flammable and combustible	10,000 - 99,999	Degas plant, construction dike area, construction tool shed, OPS pre-stage, property warehouse, guard force trailer #235-T, and I&E storage
Paints, flammable or combustible	10,000 - 99,999	Paint yard, Building 243, and bin outside of tool shed

* Reporting range specified by Texas SARA Title III Tier Two Reporting Requirement

Table 2-5. Louisiana SARA Title III Tier Two Summary at New Orleans Warehouse

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Antifreeze compound, liquid contains Ethylene Glycol	1,000 - 9,999	Fire cabinet, west wall of warehouse
Diesel fuel #2 combustible contains petroleum distillate napthaline, xylene	10,000 – 99,999	Test pad
Oil, flammable and combustible	10,000 – 99,999	Fire cabinet, west wall of warehouse, L-1

* Reporting range specified by LA SARA Title III Tier Two Reporting Requirement

Table 2-6. Louisiana SARA Title III Tier Two Summary at Weeks Island

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Bromotrifluoromethane (R-13B1 or H-1301)	10,000 - 99,999	Control room in Operations building and mine service shaft
Cement	100 - 999	Property warehouse, flammable storage building
Chlorodifluoromethane (R22) or Freon 22	100 - 999	Property warehouse
Crude oil, petroleum, flammable and combustible liquid petroleum distillates	10,000,000 – 49,999,999	Underground storage cavern in salt dome and site piping
Diesel fuel #2 (clear amber liquid)	10,000 - 99,999	Diesel storage tank, emergency generators
FC-600 3M Lightwater ATC/AFFF	10,000 - 99,999	Fire truck, foam chariot, foam trailer, laydown yard, mainline pump building
Gasoline	10,000 - 99,999	Fuel storage tank
Insecticide, liquid N.O.S.	1,000 - 9,999	Laydown yard, drum storage, and property warehouse
Monoammonium phosphate	100 – 999	All site areas
Oil, flammable and combustible	1,000 - 9,999	Property warehouse, flammable storage building

Table 2-6 (cont.). Louisiana SARA Title III Tier Two Summary at Weeks Island

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Paint, flammable or combustible	1,000 - 9,999	Flammable storage building
Potassium bicarbonate	1,000 - 9,999	Fire truck, all site areas
Propane or liquefied petroleum gas	10,000 - 99,999	Fill site road., main site
Sodium Chloride	1,000 – 9,999	Sinkhole
Sodium metabisufite	1,000 – 9,999	Fill hole (outside of fence)
Thinners, flammable or combustible	100 - 999	Flammable storage building

* Reporting range specified by LA SARA Title III Tier Two Reporting Requirement

Table 2-7. Louisiana SARA Title III Tier Two Summary at West Hackberry

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Alkydimethylbenzylammonium Chloride in Methanol and Water	10,000 - 99,999	Sun Oil Terminal
Antifreeze compound	1,000 – 9,999	D-Warehouse
Bromotrifluoromethane (Halon 1301)	1,000 - 9,999	Building 301
Compressed gas (except helium, neon, argon, krypton, xenon)	1,000 - 9,999	Property yard, Lake Charles meter station tank area, LSW laydown, and building 301
Crude oil, petroleum, flammable and combustible liquid	> 1 billion	Underground storage caverns in salt dome, site piping, tankage, and E-Warehouse
Diesel fuel #2 (clear amber liquid)	10,000 - 99,999	Site fuel station and workover rig yard, and LSW laydown
FC-600 3M Lightwater ATC/AFFF	10,000 - 99,999	Foam storage and site fire systems
Gasoline	10,000 - 99,999	Fuel station and pipeline shed, and maintenance laydown yard
Insecticides, liquid N.O.S.	100 - 999	Flammable storage shed, pipeline shed, and D-Warehouse
Oil, flammable and combustible	10,000 - 99,999	Workover rig yard, OCB 5KV substation, high pressure pump, LSW flammable storage, pipeline shed, and D-Warehouse

Table 2-7(cont.). Louisiana SARA Title III Tier Two Summary at West Hackberry

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Paint, flammable or combustible	1,000 - 9,999	Site flammable storage, warehouses, paint blast area, workover yard, LSW flammable storage
Potassium bicarbonate	1,000 - 9,999	Building 303, LSW Tool Trailer
Propane or liquefied petroleum gas	1,000 - 9,999	Lake Charles meter station
Silica, crystalline-quartz	1,000 - 9,999	Paint laydown
Thinners, flammable or combustible	1,000 - 9,999	LSW flammable storage, site flammable storage, fuel station cabinet, laboratory, workover yard

* Reporting range specified by LA SARA Title III Tier Two Reporting Requirement

Table 2-8. Louisiana SARA Title III Tier Two Summary in Offsite Pipelines

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Crude oil, petroleum, flammable and combustible liquid	1,000,000 - 9,999,999	Off-site pipeline in Ascension Parish, LA
Crude oil, petroleum, flammable and combustible liquid	50,000,000 - 99,999,999	Off-site pipelines in Assumption Parish, LA
Crude oil, petroleum, flammable and combustible liquid	50,000,000 - 99,999,999	Off-site pipelines in Calcasieu Parish, LA
Crude oil, petroleum, flammable and combustible liquid	10,000,000 - 49,999,999	Off-site pipelines in Cameron Parish, LA
Crude oil, petroleum, flammable and combustible liquid	1,000,000 - 9,999,999	Off-site pipeline in Iberia Parish, LA
Crude oil, petroleum, flammable and combustible liquid	10,000,000 - 49,999,999	Off-site pipeline in Iberville Parish, LA
Crude oil, petroleum, flammable and combustible liquid	10,000,000 - 49,999,999	Off-site pipeline in St. Martin Parish, LA
Crude oil, petroleum., flammable and combustible liquid	50,000,000 - 99,999,999	Off-site pipeline in St. Mary Parish, LA
Crude oil, petroleum, flammable and combustible liquid	10,000,000 - 49,999,999	Off-site pipelines in St. James Parish, LA

* Reporting range specified by LA SARA Title III Tier Two Reporting Requirement

Table 2-9. Texas SARA Title III Tier Two Summary in Offsite Pipelines

Chemical Name (Category)	*Max Daily Amount (lbs)	Location
Crude oil, petroleum, flammable and combustible liquid	50,000,000 - 99,999,999	Off-site pipelines in Brazoria County, TX
Crude oil, petroleum, flammable and combustible liquid	10,000,000 - 49,999,999	Off-site pipeline in Galveston County, TX
Crude oil, petroleum, flammable and combustible liquid	50,000,000 - 99,999,999	Off-site pipeline in Jefferson County, TX (Big Hill)
Crude oil, petroleum, flammable and combustible liquid	1,000,000 - 9,999,999	Off-site pipeline in Jefferson County, TX (W. Hackberry)
Crude oil, petroleum, flammable or combustible liquid	10,000,000 - 49,999,999	Off-site pipeline in Orange County, TX

* Reporting range specified by Texas SARA Title III Tier Two Reporting Requirement

2.2 MAJOR ENVIRONMENTAL ISSUES AND ACTIONS

Gassy Oil

The SPR confirmed in 1993 that the crude oil stored at Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry presented environmental problems during oil movements to other terminals. Methane gas (non-regulated) that migrated from the salt in the salt dome into stored crude oil would increase the emissions of the regulated pollutants and it would also increase the true vapor pressure (TVP) of the crude oil in the tanks. When SPR crude oil would go to surface facilities, the methane would strip and release regulated pollutants (VOC) in the oil into the atmosphere. Also, the methane and high crude oil temperature elevated the TVP to a point where it was above the regulatory limits for storage in floating roof tanks affecting some of the SPR sites and the receiving private terminals. The best option was to blend crude oil that had methane gas removed from it with other untreated oil during drawdown in order to minimize the impact to air quality. SPR procured, installed, and began operating equipment to separate and collect the gas. Operations were started at Bryan Mound and West Hackberry in 1995. Due to the amount of gas

in the oil at Bryan Mound, operations continued and were completed in 1997. Operations were completed at West Hackberry in 1996, and equipment from that site was moved to Bayou Choctaw and then Big Hill, in turn, to process crude oil at those sites. Degas operations have been completed at both of these sites and state air quality permits have been closed.

Weeks Island Decommissioning

As a result of the two sinkholes found on the ground surface above the storage facility at Weeks Island, DOE HQ announced on December 15, 1994 the decision to decommission Weeks Island because these sinkholes may be linked to the integrity of the mine. The plan to draw down and decommission Weeks Island commenced in 1995 with removal of oil beginning in late 1995. The majority of the oil was removed in 1996 and was either transferred to other SPR sites or sold to private industry. The remaining oil will be removed by skimming operations before the end of 1998. The mine will be filled with saturated brine while removing the oil. Long-term monitoring of the groundwater is being conducted at the site to look for crude oil release from the mine.

St. James Soil Clean-Up

A due diligence was conducted at St. James Terminal in February 1997 as part of the activities for leasing the facility to Shell Pipeline. Two small (<1 acre) areas contained within the main site's property boundary exhibited indications of free-phase petroleum product in the shallow subsurface. Each of the two affected areas were associated with routine bulk crude oil handling facilities (a booster pump pad and an on site pipeline pig trap) that could potentially produce minor releases over time. The area of contamination at the booster pump area is approximately 750 square feet and the pig trap area is

approximately 100 square feet. In June 1997, DOE and DM met with representatives from LDEQ's Solid Waste Division to propose a clean-up plan for both areas that would follow the Risk Based Corrective Action (RBCA) guidelines. LDEQ suggested digging up the pig trap area and perform mechanical bailing at the booster pump pad area via four wells. Subsequently, DOE removed all the contaminated soil in the pig trap area receiving LDEQ's approval for closure and has continued to bail small quantities of crude oil from the four wells located in the booster pump pad area.

CERCLA Reclassification

BH was successful in their Comprehensive Environmental Response Compensation and Liability Act (CERCLA) inspection by EPA contractors which addressed environmental risk from abandoned waste sites and other sources of contamination. The EPA inspectors found that the site does not have any open CERCLA issues and will recommend that "no further action be taken". This will reclassify the BH facility in line with the other SPR facilities, as having no abandoned waste site issues, in the semi-annual federal register notice published on the status of federal facilities under this program.

DOE On-Site Appraisal

DOE SPRPMO On-Site Appraisal teams conduct formal visits to every DOE site annually. The teams meet with site contractor management staff, auditing environmental practices, surveying performance indicators, and reviewing audit findings with the contractor staff during exit briefings. Of the twenty environmental issues identified during 1997, all were resolved within 45 days of notification and none were associated with significant environmental impacts.

M&O Contractor Self-Assessment

All site and New Orleans environmental groups conducted the annual self-assessment in accordance with the self-assessment plan for 1997. Self-assessments are reviewed annually for adequacy through the DM Internal Assessment program. Internal assessment findings are tracked to completion in the Consolidated Corrective Action Plan (PMO) and the Action Tracking System (contractor).

The 1997 Environmental internal assessment findings fell under categories II and III. Category II findings were primarily administrative in nature and disclosed no environmental impact. Category III findings were minor deviations from environmental policies and regulations. Table 2-10 is a tabulation of 1997 findings by site. Appropriate corrective actions have been scheduled.

Table 2-10.
1997 M&O Contractor Internal Assessment Environmental Findings

Site	Category I	Category II	Category III
Bayou Choctaw	0	0	1
Big Hill	0	0	2
Bryan Mound	0	2	3
New Orleans	0	0	0
West Hackberry	0	0	2

Regulatory Inspections/Visits

There were twelve inspections or visits by regulatory agencies to SPR facilities in 1997. There were no findings associated with these inspections. Table 2-11 below is a summary of these inspections/visits.

Table 2-11. Summary of Regulatory Inspections/Visits During 1997

Site	Regulatory Agency	Remarks
BC	USCG, NRC	Site visited by agencies in response to oil sheen notification from SPR on adjacent property. No findings
	LDEQ	Site inspected because of near-by oil spills. No findings.
	USCG	Visited site to discuss Area Contingency Plan.
BH	RCT	Inspection of Cavern 104 pressure test with nitrogen. No findings.
	EPA	Inspection by EPA contractors for CERCLA violations from abandoned waste sites. Recommended "no further action".
	TNRCC	Visited by TNRCC contractor to gather information concerning location of outfall for the Basin Study.
	TXGLO	Site inspected for compliance with OSPRA. No findings.
BM	TNRCC	Inspected potable water system. No findings.
	TNRCC	Annual SIP inspection for compliance with air permit and Texas regulations. No findings.
SJ	LDEQ	Office of Groundwater and Solid Waste inspected SJ during cleanup of the pig launcher and manifold area. No findings.
WH	LDEQ	Inspection for compliance with LWDPS permit. No findings.
	LDEQ	Inspection for compliance with air permit. No findings

Non-Routine Releases

In 1997, the SPR sites reported only one oil spill and zero brine spills in quantities of one barrel (42 gallons) or greater or as required by regulation.

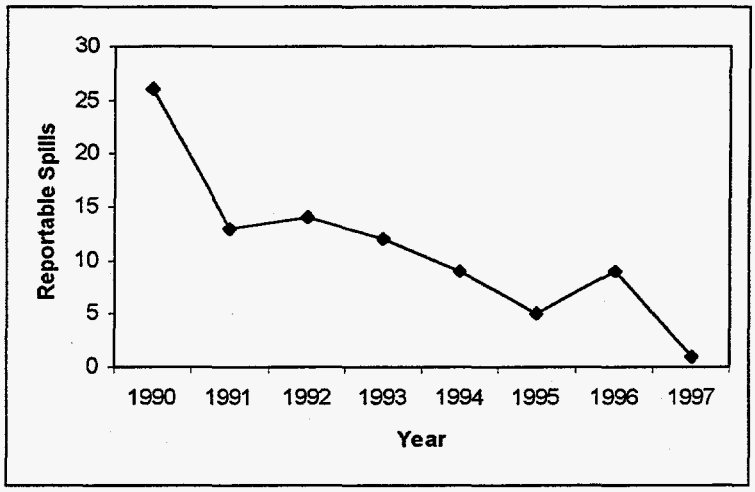
The total volume of oil spilled in 1997 was 0.32 m^3 (2 bbls). Oil spills are reported to the National Response Center (NRC) if they cause a film or sheen on navigable waters. For further spill incident information, see Sections 5.4.1 and 5.4.2.

During CY 1997, the SPR moved (received and transferred internally) 9.6 million m^3 (60.185 mmb) of oil.

State and Federal agencies require notification if an oil spill equals or exceeds one barrel (LA) or five barrels (TX) or if there is a potential for significant impact. Brine spills are reported if they equal or exceed one barrel (LA) or may affect water quality (TX). The specified oil spill was reported to the appropriate agency and immediately cleaned up, with no long-term impacts observed.

The long term trend for spills and releases has declined substantially from 26 in 1990 to 1 in 1997 as depicted below in Figure 2-1.

Figure 2-1, Number of Reportable Spills, 1990-97



2.3 SUMMARY OF PERMITS (JAN. 1, 1997 THROUGH DEC. 31, 1997)

General

Permits currently in effect during 1997 include five NPDES permits, seven CAA permits (two are for the degassing plants), 42 COE wetlands permits (Section 404 of CWA), and over 100 oil field pit, underground injection well, and mining permits. In addition, a number of corresponding state discharge and other state and local permits are in effect. These permits are presented in tabular form in Section 3, Tables 3-2 through 3-7.

Permit Compliance

Compliance with environmental permits is assured by meeting the conditions detailed within the permit. These conditions can be monitoring of components or processes, monitoring of pollutant effluents to ensure they meet permit limits, maintaining structures in their original condition, and inspecting facilities.

Air quality operating permits require that piping components such as valves, flanges, pressure relief valves, and pump seal be inspected for leaks of VOC on a regular basis (quarterly in Texas and annually in Louisiana) using OVAs. In addition, the Texas permits require that the flanges be inspected visually or by olfactory methods to identify any possible leaks on a weekly basis. All SPR air permits contain permit limitations based on pollutant discharge rate in lbs per hour and annual totals in tons per year. The SPR ensures compliance with these permit limits by monitoring the processes that emit the pollutants. This includes monitoring usage of generators, volumes of crude oil and gasoline movements through tanks, volume of painting, and others. The results of this effluent monitoring are reported to the agencies annually at Bryan Mound, Big Hill, and Weeks Island through an EIS. Bayou Choctaw and West Hackberry do not require reporting because they are below the required emission limit to report. If a Louisiana facility is going to exceed its permitted limit during a year, LDEQ allows facilities to submit permit variance requests. All air reports were submitted to the appropriate agencies on time.

Water discharge permits require visual monitoring of the effluents to ensure that they have no visible sheens or foaming. Other permit conditions relate to ensuring that permit limits are met and reported. All SPR sites require periodic (monthly and/or quarterly) reporting of

permit limit compliance through the NPDES Discharge Monitoring Reports (DMRs). All of these were submitted to the appropriate agencies.

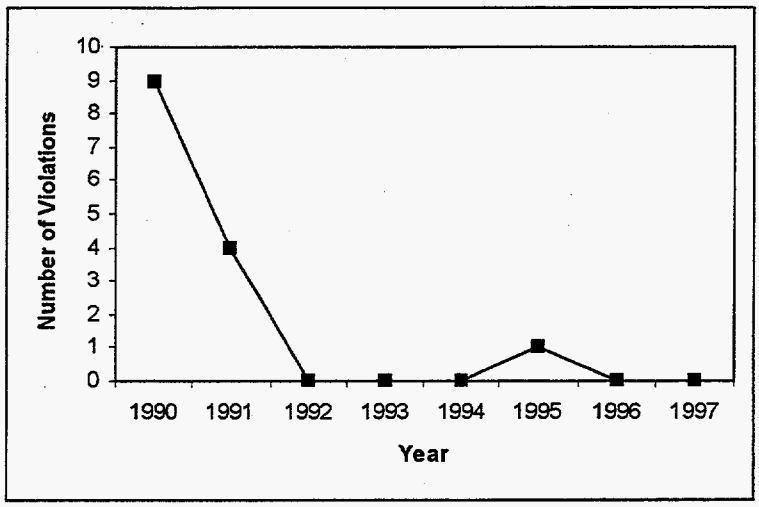
Noncompliances

Four National Pollutant Discharge Elimination System (NPDES) permit noncompliances occurred out of a total of 10,773 permit related analyses performed in 1997. All four noncompliances were the result of samples being outside of the permit parameter limits. The four noncompliances produced an overall project-wide 99.96 percent compliance rate for 1997. All noncompliances were of short duration and immediately resolved, causing no observable adverse environmental impact. Corrective actions implemented to mitigate noncompliance recurrence included developing or modifying applicable procedures, retraining and certifying personnel, initiating special studies, and repairing faulty equipment. Summary information of NPDES exceedances and noncompliances is contained in Section 5.3, Tables 5-8, 5-10, 5-13, and 5-15.

Notice of Violation (NOV)

During 1997, the SPR continued to maintain a status of low risk to the environment. NOVs have declined significantly from 9 (all administrative) in 1990 to zero in 1997 as depicted below in Figure 2-2.

Figure 2-2, Number of Violations, 1990-97



3. ENVIRONMENTAL PROGRAM INFORMATION

The environmental program is implemented by a prime contractor for the SPR on behalf of DOE (permittee) and is designed to support the SPR through tasks aimed at avoiding or minimizing adverse environmental effects from the SPR on surrounding lands, air, and water bodies.

The monitoring and inspection program, originally developed under guidance of the SPR Programmatic Environmental Action Report and Site Environmental Action Reports, now conforms with the monitoring program by DOE Order 5400.1. This program includes monitoring permitted NPDES outfalls and air emissions, conducting other required federal and state inspections, and surveillance sampling and analysis of site-associated surface and ground water quality. This makes possible the assessment of environmental impacts and early detection of water quality degradation that may occur from SPR operations.

The results of the individual program areas such as air emissions monitoring and reporting, NPDES compliance, water quality monitoring, and ground water monitoring for 1997 are discussed in sections 5 and 6.

3.1 ASSOCIATED PLANS AND PROCEDURES

Associated plans that support the SPR environmental program include site specific Facility Response Plans with spill reporting procedures; the site specific Spill Prevention, Control, and Countermeasures Plans (SPCC); the Ground Water Protection Management Program (GWPMP) document; and the Environmental Monitoring Plan (EMP). The GWPMP document and the EMP were revised during 1996 and published in 1997.

Associated procedures that support the SPR environmental program are located in the DM Environmental Instructions Manual. These

procedures identify requirements, responsible personnel, deadlines, and governing standards. Each site has developed instructions that implement the environmental program specific to their facility.

3.2 REPORTING

Proper operation of the SPR with respect to the environment involves several types of reports and reporting procedures. The basic reports are summarized briefly in this section.

3.2.1 Spill Reports

The Facility Response Plans include procedures for reporting spills to the SPR contractor, DOE, and appropriate regulatory agencies. Specific reporting procedures are dependent upon several key factors including the quantity and type of material spilled, immediate and potential impacts of the spill, and spill location (e.g., wetland or water body). Any spill considered significant at the site is first verbally reported to site management and then to the SPR contractor management in New Orleans and the onsite DOE representative. Verbal notification and associated written reports to the appropriate regulatory agencies occur as required. Final written reports from the site are submitted after cleanup, unless otherwise directed by the DOE or appropriate regulatory agency.

3.2.2 Discharge Monitoring Reports

Wastewater and stormwater discharges from SPR sites are authorized by EPA through the NPDES Program; through the LDEQ by the Louisiana Water Discharge Permitting System (LWDPS), Louisiana Pollutant Discharge Elimination System (LPDES) after August 27, 1996; and through the Railroad Commission of Texas (RCT)

by the Texas Pollutant Discharge Elimination System (TPDES) Program. Depending upon site-specific permit requirements, discharge sampleanalyses are reported monthly to EPA for Big Hill, Bryan Mound, and West Hackberry and quarterly for the remaining SPR sites. All state permits issued to the SPR require quarterly reporting to the appropriate state agency (LDEQ and RCT). Included in each report is an explanation of the cause and actions taken to correct any noncompliance or bypass that may have occurred during the reporting period. State permits received during 1993 and 1994 reduce the frequency of testing and reporting for all SPR water discharge sources.

3.2.3 Other Reports

The SPR contractor provides several other reports to, or on behalf of DOE. Table 3-1 contains a comprehensive list of environmental plans and reports.

Table 3-1. Federal, State, and Local Reporting Requirements

Regulation, Statute or Directive	Regulated Area	Enforcement Agency	Types of Required Permits, Applications, or Documentation	Routine Reporting Requirements
Clean Water Act as amended (FWPCA)	Wastewater Discharges	U.S. EPA, Region VI	NPDES Permit	Quarterly & monthly monitoring reports
		Louisiana Department of Environmental Quality (LDEQ)	Water Discharge Permit	Quarterly monitoring reports
		Railroad Commission of Texas (RCT)	Water Discharge Permit	Quarterly monitoring reports
Clean Water Act	Spill Prevention, Control and Countermeasures (SPCC)	U.S. EPA, LDEQ	SPCC Plan	Submit existing plan when spills on navigable waters exceed 1000 gallons or occur two or more times in 1 year.
	Discharge Notification	LDEQ, TNRCC, RCT, U.S. DOT, EPA	Verbal and written notification	Non-permitted discharges over RQ
Clean Water Act	Dredging, maintenance, and any construction in wetlands for structures.(Section 404 & 10)	U.S. Army Corps of Engineers (COE)	Construct & Maintain Permit, Maintenance Notifications	Two week advance of work start, notice suspension, and end.
	Wildlife Refuges	U.S. Fish and Wildlife Service	Right-of-way for Construction and Maintenance	None

Table 3-1 (Continued). Federal, State, and Local Reporting Requirements

Regulation, Statute or Directive	Regulated Area	Enforcement Agency	Types of Required Permits, Applications, or Documentation	Routine Reporting Requirements
Coastal Zone Management Act	Wetlands Construction within state coastal management zones	Louisiana Dept. of Natural Resources (LDNR), General Land Office (GLO)	Federal project consistency determinations	None
Oil Pollution Act of 1990 (amendment of FWPCA)	Oil Spill Response	U.S. EPA, LDEQ, USCG, TNRCC	Facility Response Plan, Oil Spill Response Certification	None
Oil Pollution Act of 1990 (amendment of FWPCA)		U.S. Dept. of Transportation	Pipeline Response Plan	None
Oil Spill Prevention and Response Act of 1991	Oil Spill Response in Texas Coastal Zone	GLO	Discharge Prevention and Response Plan	Report spills of oil as required
			Discharge Prevention and Response Facility Cert.	None
Safe Drinking Water Act	Cavern formation, well workovers, and salt-water disposal wells	LDNR, Office of Conservation, Under-ground Injection and Mining Division	Well Workover Permit (WH-1)	Well Workover Report.
			Cavern Inspection (29-M)	Semi-Annual Cavern Inspection Report
			Saltwater Disposal (UIC-10)	Annual Saltwater Disposal Well Report
			Cavern Integrity Test Report	Annual Cavern Integrity
			Oil Wells Integrity (W-10)	Annual Oil Well Status Report
Safe Drinking Water	Cavern formation, well workovers, and salt-water disposal wells	Railroad Commission of Texas (RCT)	Brine Injection Permit (H-10)	Annual Disposal/Injection Well Reports
	Potable Water	LDHH	Chlorine Concentration	Monthly Chlorine Report
Clean Air Act	Control of hydrocarbon emissions from tanks, valves, and piping	LDEQ, TNRCC	Air Emissions Permit	Annual Emissions Inventory Questionnaires
		TNRCC	Air Emissions Permit Special Requirement	Monthly Tank Emissions
Resource Conserva-tion and Recovery Act	Hazardous waste generation and disposal	LDEQ	Annual Generators Report	Annual report to agency
			LA Notification of HW Activity	New Waste stream, change in generator status
			LA Uniform HW Manifest	Complete and submit form with disposal
	Hazardous Waste Disposal	RCT	TX Uniform HW Manifest	Complete and submit form with disposal
	Used Oil Burned for Recovery	LDEQ, TNRCC	Uniform HW Manifest (Recycling)	Complete and submit form with disposal to state

Table 3-1 (Continued). Federal, State, and Local Reporting Requirements

Regulation, Statute or Directive	Regulated Area	Enforcement Agency	Types of Required Permits, Applications, or Documentation	Routine Reporting Requirements
Resource Conservation and Recovery Act (cont.)	Non-hazardous Oil Field Waste Disposal	LDNR	Non-Haz. Oil Field Waste Shipping Control Ticket	Complete and submit form with disposal
		RCT	Minor Permit	Complete and submit for non-RCT permitted disposal facilities
	Non-hazardous Special	LDEQ, TNRCC	Shipping Paper	Complete and submit form with disposal
Superfund Amendment Reauthorization Act	Reporting of inventories of hazardous substances and materials stored on the site	Louisiana Department of Public Safety and and Corrections, Texas Dept. of Health	Title III, Tier II	Annual Inventory Report
Pollution Prevention Act of 1990	Strategy to incorporate pollution prevention into ES&H goals	EPA, DOE	Pollution Prevention Plan Waste Minimization. Plan, Waste Management Plan, Storm water Pollution Prevention Plan	Annual Inspection and Update of Plan (re-write every 3 years)
Toxic Substances Control Act	PCB Storage and Use Asbestos	EPA	Plan	None
National Environmental Policy Act	Review of proposed projects for environmental considerations	U.S. Council on Environmental Quality (CEQ)	Environmental Impact Statements, Environmental Assessments	Only when not tiered under other EIS or EA.
			Categorical Exclusions	For projects that require consent.
Federal Migratory Bird Act	Disturbance of bird nests	US FWS	Special Purpose Permit	AS requested by USFWS
Miscellaneous State Environmental Regulations	Use of Salt Domes	LDNR	Permit for Use of Salt Domes for Hydrocarbon Storage	None
	Water withdrawal from coastal areas	TNRCC	Water Appropriation Permit	Annual Usage Report
	Pipeline Usage	RCT	Pipeline and Gathering System Certification (T-4C)	Annual Certification
	Storage of Oil in Underground Salt Domes	LDNR, RCT	Storage Permit	None
	Operation of Brine Ponds	LDNR, RCT	Operate and Maintain Permit	None
	Waste Management	LDEQ, TNRCC	Monthly Waste Inventory Form	Complete form for documentation
	Waste Management	LDEQ, TNRCC	Weekly waste inspection Form	Complete form for documentation
DOE Orders	Environmental Planning (5400.1)	DOE	Environmental Protection and Implementation Plan	Annual revision
	Environmental Planning (5400.1)	DOE	Ground Water Protection Management Program Plan	Annual review (revision every 3 years)

Table 3-1 (Continued). Federal, State, and Local Reporting Requirements

Regulation, Statute or Directive	Regulated Area	Enforcement Agency	Types of Required Permits, Applications, or Documentation	Routine Reporting Requirements
DOE Orders	Environmental Planning (5400.1)	DOE	Environmental Monitoring Plan	Annual review (revision every 3 years)
	Environmental Planning (5400.1)	DOE	Site Environmental Report	Annual revision
	Environmental Monitoring	DOE	Performance Indicator	Quarterly Report
	Waste Management	DOE	Annual Report on Waste Generation and Waste Minimization Progress	Annual summary of all wastes
	Waste Management	DOE	Affirmative Procurement Report	Annual report
	Budget/Planning	DOE	ES&H Management Plan	Annual update

3.3 ENVIRONMENTAL PERMITS

The active environmental permits, required by regulatory agencies to construct, operate, and maintain the SPR are discussed by site.

The SPR holds a general permit to discharge hydrostatic test water in the state of Louisiana and it applies to all Louisiana SPR facilities, including offsite pipelines. This permit requires annual written renewal with quarterly reporting.

On August 27, 1996, Region VI EPA granted LDEQ primacy for the NPDES program in Louisiana that includes responsibility for all compliance and enforcement actions relating to the discharge of water in Louisiana. In the interim, both the administratively extended federal permits and the renewed (state) LWDPS permits will be valid. The SPR has been informed that a single LPDES permit will be issued by the state as each current LWDPS expires.

On September 9, 1997, the original coverage received from US EPA for Storm Water Discharges Associated with Industrial Activity expired. In the EPA's

proposed action several alternative coverage methods were offered; however, each carried a specific response-by time usually tendered or associated with the expiration date of some existing coverage. The SPRPMO elected to extend its existing coverage by an administrative process and await the finalization of a proposed Multi-Sector General Permit (MSGP). The latter was neither completed nor promulgated by the close of CY 1997. The SPRPMO submitted appropriately signed Notices of Intent on September 4, 1997.

3.3.1 Bayou Choctaw

Table 3-2 lists the active permits at Bayou Choctaw. Individual work permits are received from the Louisiana Underground Injection Control Division of LDNR for each well workover performed. State inspectors periodically visit the site to observe SPR operations. The site operated under a current LWDPS permit issued in March 1994. The NPDES renewal application, forwarded to Region VI EPA in November 1993, and accepted as administratively complete on January 3, 1994, was not acted upon in 1997. Louisiana receiving primacy, as described in Paragraph 3.3 of this section, has affected both discharge permits for Bayou Choctaw. A Nationwide Permit (NWP) authorization to construct a microwave tower in the wetlands located adjacent to Salt Water Disposal Well Pad 2 and the verification that additional security fencing was covered under a previously authorized NWP were obtained in 1997 from the New Orleans District of the U. S. Army Corps of Engineers (NODCOE). Permit LMNOD-SP (Bayou Plaquemine) 17 was acknowledged as transferred to Shell Pipeline Corporation as part of the leasing of that 36-inch diameter crude oil service pipeline. Some additional coordination with the NODCOE was performed prior to commencing life extension construction at the Bayou Choctaw site.

After almost 13 months of administrative and site implemented field activities, the SPR received a letter of closure from the Louisiana Department of Transportation and Development (LDOTD) regarding their outstanding request for reconciliation of the Bayou Choctaw well registration database file. This letter acknowledged that the actions

Table 3-2. Active Permits at Bayou Choctaw

PERMIT NUMBER	ISSUING* AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0053040	EPA	NPDES	1/03/94		(1)
LAR00A280	EPA	NPDES*	12/31/92		(2)
WP0179	LDEQ (Disch.)	Water	3/06/94	3/05/99	(3)
1280-00015- 01	LDEQ	Air	12/12/97	Open	(4)
None	LDNR	Injection	1/11/83	Open	(5)
SDS-1	LDNR	Injection	9/09/77	Open	(6)
LMNOD-SP (Bull Bay)3	COE	Constr. & Maintain	1/30/79	-	(7)
LMNOD-SP(Iberville Parish Wetlands)7	COE	Constr. & Maintain	9/26/77	-	(8)
LMNOD-SP(Iberville Parish Wetlands)10	COE	Constr. & Maintain	6/12/78	-	(9)
LMNOD-SP(Iberville Parish Wetlands)17	COE	Constr. & Maintain	11/6/78	-	(10)
LMNOD-SP(Iberville Parish Wetlands)31	COE	Constr. & Maintain	5/27/80	-	(11)
LMNOD-SP(Iberville Parish Wetlands)102	COE	Constr. & Maintain	9/26/77	-	(12)

(1) Renewal application of 11/24/93 accepted as administratively complete on 1/3/94.
(2) NPDES* General Permit for Storm Water Associated with Industrial Activity effective 12/31/92; Notice of Intent made 9/30/92, Renewal NOI sent 9/4/97.
(3) Renewal permit effective 3/6/94. Fully implemented on 4/1/94.
(4) Site air operating permit modified 12/97
(5) Letter of financial responsibility to plug and abandon injection wells.
(6) Permit approved use of salt dome cavities for storage of liquid hydrocarbons.

Transferred to Shell Pipeline in CY97.

(7) Maintain Bull Bay 24" brine disposal pipeline recorded with applicable Registrar of Deeds.

(8) Construct and maintain well pads (brine disposal wells).

(9) Enlarge existing well pads and construct access roads (brine disposal Wells 1, 2, & 3.)

(10) Construct and maintain access road to brine disposal well area. NOTE: brine disposal pipeline was constructed under NWP authority and maintenance is allowed in conjunction with the access road permit. Major maintenance performed in 1996.

(11) Construct and maintain well pad, levees, access road & appurtenances to cavern 102 and additional bank stabilization, warehouse pad and culvert per additions of 1983.

(12) Construct and maintain ring levee, drill site and appurtenances, Well 101.

taken to discover and properly plug and abandon three wells noted in their original request of December 1996, had reached an amicable and satisfactory end-point. In addition to the three wells noted, a complete review and reconciliation of the site's state-file database also resulted.

An application to amend the air quality permit for the facility operations was submitted to LDEQ in December 1995 and revised in May, 1997 to replace the existing 671 hp emergency generator with a larger 939 hp generator. LDEQ issued a new air permit for Bayou Choctaw in December 1997.

3.3.2 Big Hill

Table 3-3 lists the active permits at Big Hill. In 1997, the site appropriated 1.317 million m^3 (1060.76 acre-feet) of water from the Intracoastal Waterway exclusive of water for fire protection. This represents only 3.54 percent of the new revised total allowable withdrawal for a year.

The NPDES renewal application, forwarded to Region VI EPA in November 1993 and accepted as administratively complete on December 22, 1993, was not acted upon in 1997.

A minor modification to both the state and federal discharge permits was granted for the purpose of performing "smart pigging" operations upon the brine disposal pipeline. This operation, completed in early October 1997 entailed a succession of cleaning pig runs preceding the

electronic pigging run which measured and recorded physical conditions for the entire length of the line. These data are used for documentation of pipeline integrity and to identify early any developing problems.

Table 3-3. Active Permits at Big Hill

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
TX0092827	EPA	NPDES	12/22/93		(1)
TXR00B608	EPA	NPDES*	12/31/92		(2)
SWGCO-RP 16536 (01,02,03,04)	COE	Constr. & Maintain	01/11/84	-	(3)
P-7	F&WS	Constr. Operate	07/31/86 07/31/86	07/31/88 06/30/36	(4) (5)
9256	TNRCC	Air	10/30/97	5/16/98	
32432	TNRCC	Air	6/12/96	Open	(6)
02939	RCT	Operate	11/28/83	Open	(7)
P000226A & P000226B	RCT	Operate/ Maintain	09/19/84	Open	(8)
0048295 0048320	RCT	Operate	05/09/83 06/23/83	Open Open	(9)
UHS-006	RCT	Water (Disch.)	09/01/94	08/31/99	(10)
4045A	TNRCC	Water(Use)	11/14/83	Open	(11)

(1) Renewal submitted 11/24/93 - accepted as administratively complete 12/22/93.
(2) NPDES* General Permit for Storm Water Associated with Industrial Activity effective 12/31/92; Notice of Intent made 9/30/92, Renewal NOI sent 9/4/97.
(3) Permits to construct and maintain RWIS, raw water 48" pipeline, brine disposal 48" pipeline, crude oil 36" pipeline. Maintenance dredging clause renewed as needed. Modified in 1996 for new integrity test method.
(4) Completion of raw water, brine disposal, and crude oil pipeline extended. Amended to install offshore pipeline by trenching.
(5) Completion of pipeline construction extended. (48" Brine Pipeline)
(6) Standard air permit to degas crude oil. Closed 11/11/97
(7) Valid until ownership changes, system changes, or other physical changes are made in the system controls only the crude oil distribution system.
(8) Permits to operate and maintain anhydrite and brine/oil pits.
(9) Permits to create, operate, and maintain an underground hydrocarbon storage facility consisting of 14 caverns.
(10) Corresponds to TX0092827 (EPA-NPDES). Permit renewed by RCT with an effective date of 9/01/94.
(11) Permit amended in 1990 to allow for annual diversion of no more than 117,291 acre feet of water and to authorize diversion until termination of the project as a SPR operation. Modified in 1996 to reduce water set aside down to 30,000 ac/ft per year.

The Big Hill site continues to mix slightly higher pH raw water with the intermittent low pH brines in the onsite brine pond, sufficiently buffering the low pH prior to discharge in order to meet permitted effluent limitations as required. This approach appears satisfactory to avoid future noncompliant discharges of brines. Maintenance notifications made to the U. S. Army Corps of Engineers Galveston District (GALCOE) included repair and replacement activities for two traveling screens at the RWIS during 1997 and fencing replacement activity at the RWIS and the beach valve station pad location on the offshore brine disposal pipeline. In a separate COE permitting action, a request to extend the maintenance dredging clause for the RWIS was submitted to the agencies. Only the consistency determination had been received from the GLO by the close of 1997 for the extension.

The SPR submitted an application to modify the facility's air quality operating permit to the TNRCC in July 1997. This application reflects the addition of small sources and existing sources that were not identified in the original permit. TNRCC issued a new air permit for Big Hill in October 1997. This new air permit requires that an air emissions inventory report for Big Hill be submitted to the TNRCC annually.

The degassing plant was installed, became operational, and was permitted as a standard permit during 1996. Due to the requirement to degas additional crude oil as a result of decommissioning Weeks Island, a permit modification application was submitted to the TNRCC in early 1997 to include an additional 3.9 million m^3 (24.8 mmb) of Weeks Island crude oil. Approval was received by the TNRCC in March 1997 to degas the additional crude oil. Degas operations at Big Hill were finished in November 1997, and the standard permit was closed.

3.3.3 Bryan Mound

Table 3-4 lists the active permits for the Bryan Mound site. The Bryan Mound site has a second TNRCC permit for the appropriation of state waters for the leaching program, site utility, and fire protection systems. The permit requires a yearly report of the quantity of water used. In 1997, the site used a total of 2.504 million m^3 (2,017.09 acre-feet) of water from the Brazos River Diversion Channel. A total of 150.71 million m^3 (122,166.09 acre-feet) of water has been appropriated to date for site activities which represents 35.63 percent of the total volume permitted.

Maintenance dredging was performed in 1997 under COE permit 12347 (as amended in 1995). A COE permit for construction and maintenance of the site's RWIS was modified to accommodate the life extension renovations proposed there. Also, a nationwide (NWP) permit was obtained for work in onsite wetland areas for life extension pipeline work.

Bryan Mound continued to report under the modified state TPDES permit UHS-004 reflecting monthly storm water testing.

Table 3-4. Active Permits at Bryan Mound

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
TX0074012	EPA	NPDES	09/01/95	08/31/00	(1)
TXR00B609	EPA	NPDES*	12/31/92		(2)
SWGCO-RP-12347(03)	COE	Dredging	04/24/95	12/31/06	(3)
3-67-782 (Docket#)	RCT	Injection	08/21/78	Open	(4)
3-70-377 (Docket#)	RCT	Injection	12/18/78	Open	(4)
P001447	RCT	Operate	10/30/84	Open	(5)

Table 3-4 (cont.). Active Permits at Bryan Mound

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
P001448	RCT	Operate	10/30/84	Closed	(6)
3681A	TNRCC	Water	07/20/81	Open	(7)
UHS-004	RCT	Water Disch	10/01/93	09/30/98	(8)
6176B	TNRCC	Air	01/11/95	Open	
28076	TNRCC	Air	03/03/95	03/03/99	(9)
82-8475	TDH&PT	Constr.	01/01/83	Open	(11)
SWGCO-RP-11666	COE	Constr. & Maint.	10/15/77	-	(12)
SWGCO-RP-12112	COE	Constr. & Maint.	07/25/77	-	(13)
SWGCO-RP-12062(03)	COE	Constr. & Maint.	10/10/78	-	(14)
SWGCO-RP-14114(01)	COE	Constr. & Maint.	05/18/85	-	(15)
SWGCO-RP-16177	COE	Constr. & Maint.	09/07/82	-	(16)
04994	RCT	Operate	*06/95	-	(17)

(1) Renewal submitted 11/24/93. Accepted as administratively complete 1/3/94.
(2) NPDES* General Storm Water permit effective 12/31/92; Notice of Intent sent 9/30/92 , Renewal NOI sent 9/4/97.
(3) Maintenance dredging of raw water intake extended to 12/31/06. (SWGCO-RP 12347 authorized constr. of RWIS). Extension/renewal authorizes spoil area addition.
(4) Approval of oil storage and salt disposal program.
(5) Authority to operate brine pond.
(6) Small brine pond closed August, 1989.
(7) Permit expires after consumption of 367,088 acre-feet of water or project ends.
(8) Corresponds with TX0074012 (EPA-NPDES). (Renewal submitted 1/30/89, RCT acted on permit in August, 1993; effective 10/1/93)
(9) Standard air operating permit to degas crude oil. Closed 12/19/97.
(11) Corresponds with SWGCO-RP-16177.
(12) for 30-inch crude oil pipeline to 3 miles SW from Freeport
(13) for 30-inch crude oil pipeline to 2 miles S from Freeport
(14) for 36-inch brine disposal pipeline & diffuser. Revision/amendment (01) deleted special condition (a) requiring maximized deep well injection; (02) approved construction of 24 inch replacement pipeline and diffuser in January 12, 1993. (03) added the offshore additions the new integrity test method.
(15) general permit for pipeline crossings by directional drilling in navigable waters
(16) place an 8-inch water line (PVC, potable)
(17) Pipeline distribution system registration to operate crude oil lines. Renewed annually.

Both the state and federal discharge permits maintained for the degas unit which remained and operated onsite during most of 1997.

Two permits for the placement of deep cathodic protection holes to be constructed on the main site were granted by the RCT; and, in addition, a time extension for closure and conditional approval of the conceptual plan for closure of the RCT permitted brine storage pond.

Bryan Mound continued to operate under the 1995 revised TNRCC air emission permit. This permit recognizes the standby status of the site and the concept that a presidentially-mandated drawdown and refill would be treated as a variance from the permitted emission limitations.

Degas operations at Bryan Mound were finished in December 1997 and the standard permit was closed.

3.3.4 St. James

The SPRMO successfully completed a long-term leasing arrangement for use of the St. James facility by the private corporation Shell Oil Pipeline in 1997. Table 3-5 lists the status of the permits for the St. James Terminal. The NPDES renewal application, forwarded to Region VI EPA in November 1993, and accepted as administratively complete on January 3, 1994, was not acted upon in 1997. This renewal application was transferred to Shell Oil Pipeline Corporation, along with the other necessary operating permits, as part of a long-term leasing situation from the DOE.

Table 3-5. Active Permits at St. James Terminal

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0054674	EPA	NPDES	1/03/94	TRANSFERRED	(1)
LAR00A276	EPA	NPDES*	12/31/92		(2)
LMNOD-SP(Mississippi River)998	COE	Constr.& Maintain	03/20/78	TRANSFERRED-	(3)
WP 0929	LDEQ	Water (Disch.)	05/04/90	WITHDRAWN(4)	

(1) Permit renewal submitted 11/24/93. Accepted as administratively complete 01/03/94.
(2) NPDES* General Storm Water permit; Notice of Intent made 9/30/92, Renewal NOI sent 9/4/97. Will be held until DOE activity completely ceases..
(3) Permit and all amendments recorded with Registrar of Deeds in St. James Parish. Maintenance dredging clause renewed as needed.
(4) LDEQ Water Permit renewal submitted. Withdrawn per guidance from LDEQ.

The outstanding LWDPS renewal application of 1990 was updated and revised at the request of LDEQ in June 1994. This application was officially withdrawn at the request of LDEQ as part of the transfer of operator from DOE and their contractor to Shell Oil Pipeline.

3.3.5 Weeks Island

The active permits for Weeks Island are listed in Table 3-6. Several subcontracted projects implemented as part of the Weeks Island decommissioning have required permitting activity during 1997.

Freeze Wall Inc. continued to report as required on permits obtained for its separately permitted water discharges during 1997. The freeze wall plug constructed during 1995 over a crevasse in the salt that corresponds with the sink hole, grew and was maintained throughout 1996. By freezing the ground water via refrigeration wells, this plug provides a means of protecting against a sudden inflow of ground water into the Weeks Island mine through the crevasse as the oil is being removed from the mine. The final volume of directly pumpable oil

from the mine storage was transported via pipeline to the Big Hill site in mid-November, 1996. Portions of the crude oil inventory had also been relocated earlier in the year to the Bayou Choctaw oil storage site.

Several Phases of crude oil skimming operations were conducted throughout the year in 1997 and continued into 1998. SOFREGAZ, Inc. remains on site supplying supplies of brine for backfilling purposes as the crude oil stores continue to by removed by skimming operations.

Table 3-6. Active Permits at Weeks Island

PERMIT NUMBER	ISSUING AGENCY	PERMIT TYPE	EFFECTIVE DATE	EXPIRATION DATE	COMMENTS
LA0056243	EPA	NPDES	12/22/93		(1)
LAR00A278	EPA	NPDES*	12/31/92	12/31/97	(2)
LMNOD-SP(Atchafalaya Floodway) 251	COE	Constr. Maintain	07/12/78	-	(3)
1260-00065-03	LDEQ	Air	08/20/97	Open	(4)
SDS-8	LDNR	Injection	02/16/79	Open	(5)
WP1051	LDEQ	Water (Disch.)	01/17/87	01/16/92	(6)

(1) Renewal submitted 11/24/93. Accepted as administratively complete 12/22/93.
(2) NPDES* General Storm Water permit effective 12/31/92; Notice of Intent made 9/30/92.
(3) Recorded permit and amendments with applicable Parish Registrar of Deeds. Maintenance dredging clause renewed as needed.
(4) Requires annual air emission inventory questionnaire.
(5) Approval for use of salt dome cavities for storage of liquid hydrocarbons.
(6) Permit interpreted via LAC to expire 1/16/93; LWDPS renewal submitted for June 1992; accepted for review on 7/24/92. Draft permit received 1/10/94, currently processing.

The NPDES renewal application, forwarded to Region VI EPA in November 1993, and accepted as administratively complete on December 22, 1993, was not acted upon in 1997. The state, since receiving primacy for this program, became the single agency for renewal of the discharge permitting and enforcement.

receiving primacy for this program, became the single agency for renewal of the discharge permitting and enforcement.

A consistency determination was obtained for the construction of an aboveground pipeline connecting the main site with the Shell Corporation's barge loading docks. The action was taken for the purposes of loading barges for the transporting the skimmed crude oil and excess brine from the mine.

During 1996, an application to modify the site operating air permit to include a new thermal destruction unit source replacing the existing flare, was submitted to LDEQ. This replacement flare is more efficient and will require less fuel gas to burn the mine vent gas, which reduces the emissions from the mine while filling it up with brine during decommissioning of the mine. LDEQ issued a new air permit for this modification in January 1997. An air permit modification application was submitted to LDEQ in August 1997 to replace the flare with a larger 9-ft. diameter flare. LDEQ issued a new air permit for the larger flare in August 1997. This new air permit requires that an air emissions inventory report for Weeks Island be submitted to LDEQ annually.

Two permit variance requests associated with the decommissioning were approved by LDEQ in 1997 to vent brine fill gas containing less than 3 percent VOCs directly to the atmosphere and to operate the existing flare with mine gas containing a higher Btu content than expected.

3.3.6 West Hackberry

Active permits for West Hackberry are listed in Table 3-7.

LAR00A279	EPA	NPDES*	12/31/92		(2)
LMNOD-SP (LTCS) 26	COE	Dredging	02/08/79	02/08/99	(3)
LMNOD-SP (Black Lk)31	COE	Dredging	10/26/82	09/39/96	(4)
LMNOD-SP (Black Lk)43	COE	Constr.& Maintain	07/26/84	-	(5)
LMNOD-SP (Gulf of Mexico)2574	COE	Constr.& Maintain	08/11/80	-	(6)
LMNOD-SE (LTCS)40	COE	Constr.& Maintain	05/25/88	-	(7)
LMNOD-SP (Cameron Parish Wetlands)162	COE	Constr. & Maintain	03/09/78	-	(8)
None	LDNR	Injection	08/07/79	Open	(9)
971198-9	LDNR	Injection	10/06/83	Open	(10)
WP1892	LDEQ	Water (Disch.)	03/10/94	03/09/99	(11)
0560-00019-02	LDEQ	Air	11/24/97	Open	
SWGCO-RP-12342	COE	Constr. & Maint.	3/28/78	-	(14)
LMNOD-SP (Cameron Parish Wetlands) 152		Constr. & Maint.	3/16/78	-	(15)
LMNOD-SP (Cameron Parish Wetlands)276		Constr. & Maint.	2/11/80	-	(16)

(1) Renewal submitted 11/24/93. Accepted as administratively complete 1/3/94.
(2) NPDES* General Storm Water permit effective 12/31/92; Notice of Intent made 9/30/92, Renewal NOI sent 9/4/97..
(3) Maintenance dredging for raw water intake.
(4) Maintenance dredging for fire water canal and extended boat slip access amendment of 1993.
(5) Construction of erosion control dike completed in 1986. Maintenance dredging open until 7/26/94; addition of rip-rap amendment of 1993 open until 1995.
(6) Amended to install parallel pipeline (05/29/86).
(7) Permit to construct and maintain 36" crude oil pipeline from site to Texoma/LC Meter Station.
(8) Permit to maintain 42" crude oil pipeline.
(9) Approval to create 16 additional salt dome cavities.
(10) Approval to construct and operate wells 117A and B.
(11) Includes Texoma/Lake Charles Meter Station-Outfall 004. Permit renewal issued with an effective date of 3/10/94; fully implemented on 4/1/94. Renewal for LPDES permit sent 9/97
(14) For 42" crude oil pipeline crossings of waters & waterways in Texas
(15) For brine disposal wells, well pads, and brine disposal pipelines, (12", 20", & 24")
(16) For well pads, levees, and access roads (Wells 110, 111, 112, 113, 114, & 115)

(15) For brine disposal wells, well pads, and brine disposal pipelines, (12", 20", & 24")
(16) For well pads, levees, and access roads (Wells 110, 111, 112, 113, 114, & 115)

An LPDES discharge permit renewal application was prepared and forwarded to LDEQ in September 1997. An approval to discharge washwater with an additive for cleaning surfaces prior to painting was obtained in 1997.

Permit amendments and/or permitting actions for West Hackberry projects in 1997 include the permits from the COE, CMD, and a Water Quality certification for modifications to the RWIS for Life Extension improvements. Also permitted in 1997 was a deep cathodic protection anode bed for the 42-inch crude oil distribution line in a Texas location. A letter request was made to LDEQ in Baton Rouge, Louisiana, to add the two new outfalls associated with the discharge of retained storm water from required secondary containments around the new slop oil system completed in 1996. These outfalls were not successfully added by the end of 1997 and an interim "work around" transporting this water to an adjacent discharge point has been implemented until permit actions are completed by the state.

The NPDES renewal application, forwarded to Region VI EPA in November 1993, and accepted as administratively complete on January 3, 1994, was not acted upon in 1997. Primacy for the NPDES program to LDEQ in 1996 has affected this and all other Louisiana SPR sites in a similar fashion.

In August 1997 an air permit modification application was submitted to LDEQ to replace the existing 939 hp emergency generator with a larger 1341 hp generator. LDEQ issued a new air permit for West Hackberry

in November 1997. Two permit variance requests were approved by LDEQ to operate the emergency generator for an extended period of time due to a planned electrical shutdown at the site and due to an unforeseen power outage to the site.

3.4 WASTE MINIMIZATION PROGRAM

The waste minimization program reduces the generation of all wastes including hazardous and non-hazardous sanitary wastes.

The SPR generated only RCRA hazardous and sanitary (non-hazardous municipal and non-hazardous oil field) wastes during 1997. The SPR sent 1.83 metric tons (4,048 lbs.) of hazardous waste off site for incineration during 1997.

The SPR sent 2,414.4 metric tons (5,322,872 lbs.) of sanitary waste off site for disposal during 1997. Paper, used oil burned for energy, antifreeze, scrap metals, and laser printer cartridges were reclaimed or recycled off site. The SPR collected 55.9 metric tons (122,897 lbs.) of paper and 1.9 metric tons (4,123 lbs.) of cardboard for reclamation off site. During 1997 the SPR recycled more than 70 percent of the paper delivered. The SPR generated 14.8 metric tons (32,706 lbs.) of used oil burned for energy during 1997.

Even though the SPR has not met the hazardous waste generation goals established in 1993 by DOE Headquarters, it has reduced by 75% since 1994 down to two tons in 1997. New Orleans and Weeks Island met their 1997 hazardous waste generation reduction goals. In 1997, Weeks Island also met its nonhazardous sanitary waste generation goal. New Orleans, Bryan Mound, West Hackberry, Weeks Island, and Bayou Choctaw met their 1997 paper recycling goals.

New Orleans, West Hackberry, Bryan Mound, Weeks Island, and Big Hill sites received certificates on Earth Day 1997 in recognition of the accomplishment of their waste generation reduction and recycling goals. To encourage pollution prevention awareness, waste minimization, and affirmative procurement (use of recycled products) throughout the SPR, DM provided SPR employees an "Earth Day is Everyday at the SPR" green ribbon. DM encouraged employees to participate in the international activity by wearing the green ribbon on Earth Day and reusing the ribbon as a bookmark to remind them to buy recycled products on the job and in the home. The SPR Pollution Prevention Interdepartmental Team, including a DOE representative, conducted SPR-wide monthly conference calls to discuss pollution prevention topics, thus increasing its scope of activity. Pollution prevention information was communicated to the entire SPR via e-mail and handouts.

3.5 POLLUTION PREVENTION

During 1997, the SPR provided waste minimization guidance to over 20 on-site contractors by explaining pollution prevention requirements, assisting with waste management plans, providing facilities lists and showing an in-house produced awareness video. A continuous quality improvement team of contract and DM personnel combined solvent substitution, process modification, and procedures to eliminate on-site security contractor's hazardous waste. The SPR provided the team's products (waste management plan, waste determination worksheet, revised process, and procedure) as models for suppliers and smaller companies. More than 400 people from a five state area learned about the SPR's contractor mentoring activities by attending the SPR Expo.

3.6 TRAINING

Site Environmental and Emergency Response Team (ERT) personnel have received training in environmental plans and procedures. Site management personnel are knowledgeable of environmental procedures, spill reporting procedures, the site-specific Spill Prevention Control and Countermeasures (SPCC) Plans, Facility Response Plans, and compliance awareness. ERT personnel from all sites participate in annual spill response refresher and hazardous materials technician training currently provided by the Texas A&M University, Engineering Extension Service. Onsite drills and exercises are also provided to practice spill cleanup and sharpen control skills. Site response personnel are trained to rapidly and effectively contain and cleanup oil, brine, and hazardous substance spills under the circumstances typical at each SPR site.

All site personnel and unescorted site visitors receive compliance awareness training via "The Active Force of Protection" videotape. SPCC and Hazardous Waste Handling training is mandatory and provided to site personnel annually.

4. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION

There are no radioactive process effluents from any SPR site. The only radioactive materials at any SPR site are sealed sources in certain field instruments.

4.1 SEALED SOURCES

A total of 2 nuclear density gauges located on the metering skid at the West Hackberry site. The gauges are used for monitoring fluid density changes (oil versus brine) in pipelines. Each gauge unit contains between 2000 and 4000 millicuries (mCi) of cesium 137. Gauge wipe tests are performed every three years as required by the general license. All of the gauges for the Bryan Mound pipelines and the majority of the gauges for the West Hackberry pipelines were removed in 1996 during the Life Extension project. The two remaining gauges at West Hackberry will be removed as part of life extension projects in FY '97. The DOE is a general licensee under the manufacturer, Texas Nuclear. No radiation leakage has been detected from any of the gauges to date.

4.2 NATURALLY OCCURRING RADIOACTIVE MATERIALS (NORM)

A contracted survey, conducted at all SPR sites and the commercial pipe yard where SPR piping is stored, was completed in early 1991. The results, no readings of elevated levels at any location, were submitted to the state as required by Louisiana and Texas regulations. No additional monitoring is required due to the negative results of this 1991 NORM survey.

This page intentionally blank

5. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION

A primary goal of DOE and the SPR contractor is to ensure that all SPR activities are conducted in accordance with sound environmental practices and the environmental integrity of the SPR sites and their respective surroundings is maintained.

There are two types of monitoring conducted at the SPR sites to assess the impact of SPR activity on air, surface water, and groundwater; effluent and surveillance monitoring. Effluent monitoring consists of measuring the pollutants of concern in airborne and liquid effluents at all the sites while surveillance monitoring consists of sampling the environmental media at or around the sites.

5.1 AIR QUALITY EFFLUENT MONITORING

The air pollutants of concern that are emitted by the SPR sites are either hazardous or have an impact on the ambient air quality. The non-hazardous pollutants that have an impact on air quality are non-methane/non-ethane volatile organic compounds (VOC), nitrous oxides (NO_x), sulfur dioxides (SO_2), carbon monoxide (CO), and particulate matter (PM_{10}). The hazardous air pollutants (HAP) are benzene, toluene, ethylbenzene, and xylene.

Effluent monitoring for air pollutants consists monitoring processes and calculating the effluent volume through the use of acceptable industry practices. These results are compared to the permitted limits to ensure that they are in compliance. Effluent monitoring at the SPR consists of measuring the run-time of diesel generators; measuring the volume and type of crude oil flowed through frac tanks, floating roof tanks, gasoline tanks, and oil/water separators; counting the number of piping components that emit over the acceptable regulatory limits (leakers) by sniffing all components with an OVA; measuring the volume of paint and solvent used on site; and measuring the volume of brine placed into the brine pond.

Effluent monitoring for air pollutants is conducted at both Texas sites (Big Hill and Bryan Mound) and three Louisiana sites (Bayou Choctaw, Weeks Island, and West Hackberry). The results of this monitoring is reported to state agencies through EIQs except for Bayou Choctaw and West Hackberry. These sites are exempt from reporting because their emissions are below the regulatory threshold for reporting in their respective ozone attainment areas. Even though the results of the monitoring for Bayou Choctaw and West Hackberry are not reported, they are used to determine compliance with the permit.

Another type of monitoring conducted at the SPR sites is air pollution control equipment monitoring. The air regulations require that the seals on internal and external floating roof tanks be inspected for visible tears, holes, or cumulative gaps that exceed a regulatory limit at frequent intervals to ensure that they are operating accordingly. Big Hill has an external floating roof tank that requires inspection of the primary (every five years) and secondary (semi-annual) seals. The three internal floating roof tanks at Bryan Mound require seal inspections every year because the roofs only have a mechanical shoe seal.

5.1.1 Bayou Choctaw

Bayou Choctaw, located in a serious nonattainment area for ozone, is permitted to emit 8.3 metric tpy (9.1 tpy) of VOC. Since it emits less than nine metric tpy (10 tpy), it does not require an EIQ to report its annual emissions. Even though Bayou Choctaw is exempt from reporting emissions, effluent monitoring was conducted in 1997 on all permitted sources such as the volume of crude oil in slop tanks and frac tanks, volume of brine into the brine pond, sniffing piping components to determine number of leakers, and monitoring the run-time of the emergency generators. Bayou Choctaw operated in accordance with all

air quality regulatory requirements in 1997. Below is a summary (Table 5-1) of the permitted limit requirements for Bayou Choctaw.

Table 5-1. Parameters for the Bayou Choctaw Emission Points

Emission Point Description	Parameter	Permit Limits Metric tpy (tpy)
Crude & Slop Oil Tanks	VOC	0.59 (0.65)
Gasoline Fuel Tank	VOC	0.37 (0.41)
Frac Tanks	VOC	2.63 (2.90)
Brine Pond	VOC	1.14 (1.26)
Fugitive Emissions	VOC	3.28 (3.62)
Air Eliminator	VOC	0.06 (0.07)
Emergency Generators/Pumps	VOC	0.16 (0.18)
	PM_{10}	0.08 (0.09)
	SO_2	0.70 (0.77)
	NO_x	5.29 (5.83)
	CO	1.15 (1.27)

5.1.2 Big Hill

The Big Hill site, located in a moderate nonattainment area for ozone, is permitted to emit 13.7 metric tpy (15.1 tpy) of VOC. Since it emits more than nine metric tpy (10 tpy), it requires an EIQ to report its annual emissions. Effluent monitoring was conducted in 1997 on all permitted sources such as the volume of crude oil in slop tanks, frac tanks, and surge tank; volume of brine into the brine pond; sniffing piping components to determine number of leakers; and monitoring the run-time of the emergency generators. Big Hill operated in accordance with all air quality regulatory requirements in 1997.

Below is a summary (Table 5-2) of the permitted limit requirements for Big Hill.

Table 5-2. Parameters for the Big Hill Emission Points

Emission Point Description	Parameter	Permit Limits, Metric tpy (tpy)
Crude & Slop Oil Tanks	VOC	0.59 (0.65)
Gasoline & Diesel Fuel Tanks	VOC	0.25 (0.28)
Brine Pond	VOC	2.86 (3.15)
Fugitive Emissions	VOC	8.47 (9.34)
Air Eliminator	VOC	1.36 (1.50)

Table 5-2 (cont.). Parameters for the Big Hill Emission Points

Emission Point Description	Parameter	Permit Limits, Metric tpy (tpy)
Solvent Recycler	VOC	0.05 (0.06)
Emergency Generators/Pumps	Acetone	0.01 (0.01)
	VOC	0.11 (0.12)
	PM_{10}	0.07 (0.08)
	SO_2	0.64 (0.71)
	NO_x	2.38 (2.62)
	CO	0.52 (0.57)

5.1.3 Bryan Mound

The Bryan Mound site, located in a severe nonattainment area for ozone, is permitted to emit 17.2 metric tpy (19 tpy) of VOC. Since it emits more than nine metric tpy (10 tpy), it requires an EIQ to report its annual emissions. Effluent monitoring was conducted in 1997 on all permitted sources such as the volume of crude oil in slop tanks, frac tanks, and three internal floating roof tanks; volume of brine into the brine pond; sniffing piping components to determine number of leakers; and monitoring the run-time of the emergency generators. Bryan Mound operated in accordance with all air quality regulatory requirements in 1997.

Below is a summary (Table 5-3) of the permitted limit requirements for Bryan Mound.

Table 5-3. Parameters for the Bryan Mound Emission Points

Emission Point Description	Parameter	Permit Limits, Metric tpy (tpy)
Crude Oil Tanks	VOC	12.34 (13.60)
Gasoline & Diesel Fuel Tanks	VOC	0.20 (0.22)
Brine Pond	VOC	1.05 (1.16)
Fugitive Emissions	VOC	2.95 (3.25)
Paints & Solvents	VOC	0.63 (0.69)
Emergency Generators/Pumps	VOC	0.05 (0.06)
	PM_{10}	0.15 (0.17)
	SO_2	0.19 (0.21)
	NO_x	1.63 (1.80)
	CO	0.46 (0.51)

5.1.4 Weeks Island

Weeks Island, located in an attainment area for ozone, is permitted to emit 84.3 metric tpy (92.9 tpy) of VOC. Since it emits more than 45.4 metric tpy (50 tpy), it requires an EIQ to report its annual emissions. Effluent monitoring was conducted in 1997 on all permitted sources such as the flare, piping components, and monitoring the run-time of the emergency generators. Weeks Island operated in accordance with all air quality regulatory requirements in 1997.

Below is a summary (Table 5-4) of the permitted limit requirements for Weeks Island.

Table 5-4. Parameters for the Weeks Island Emission Points

Emission Point Description	Parameter	Permit Limits, Metric tpy (tpy)
Portable Enclosed Flare	VOC	78.81 (86.87)
	BTEX	0.07 (0.08)
	NO_x	5.81 (6.40)
	CO	7.74 (8.53)
Gasoline Fuel Tank	VOC	0.21 (0.23)
Fugitive Emissions	VOC	4.61 (5.08)
Air Eliminator	VOC	0.44 (0.48)
Emergency Generators/Pumps	VOC	0.24 (0.27)
	PM_{10}	0.77 (0.85)
	SO_2	0.97 (1.07)
	NO_x	8.19 (9.03)
	CO	2.11 (2.33)

5.1.5 West Hackberry

West Hackberry, located in an ozone attainment area, is permitted to emit 37 metric tpy (40.8 tpy) of VOC. Since it emits less than 45.4 metric tpy (50 tpy), it does not require an EIQ to report its annual emissions. Even though West Hackberry is exempt from reporting emissions, effluent monitoring was conducted in 1997 on all permitted sources such as such the volume of crude oil in slop tanks and frac tanks, volume of brine into the brine pond, sniffing piping components to determine number of leakers, and monitoring the run-time of the

emergency generators. West Hackberry operated in accordance with all air quality regulatory requirements in 1997.

Below is a summary (Table 5-5) of the permitted limit requirements for West Hackberry.

Table 5-5. Parameters for the West Hackberry Emission Points

Emission Point Description	Parameter	Permit Limits, Metric tpy (tpy)
Slop Oil Tanks	VOC	1.81 (1.99)
Gasoline Fuel Tank	VOC	0.25 (0.28)
Frac Tanks	VOC	23.86 (26.30)
Brine Pond	VOC	0.95 (1.05)
Fugitive Emissions	VOC	9.71 (10.70)
Air Eliminator	VOC	0.06 (0.07)
Emergency Generators/Pumps	VOC	0.41 (0.45)
	PM_{10}	0.20 (0.22)
	SO_2	0.02 (0.02)
	NO_x	12.59 (13.88)
	CO	2.75 (3.03)

5.2 WATER DISCHARGE EFFLUENT MONITORING

The water discharge permit monitoring program fulfills the requirements of the EPA NPDES, and corresponding state TPDES, LWDPS, and the new LPDES programs. All SPR point source discharges are conducted in compliance with these federal and state programs. SPR personnel regularly conducted point source discharges from all sites during 1997. These discharges are grouped as:

a. brine discharge to the Gulf of Mexico;
b. stormwater runoff from tank, well, and pump pads;
c. rinse water from vehicles at specific locations draining to permitted outfalls;
d. effluent from package sewage treatment plants; and
e. hydrostatic test water for piping or tanks (LA only).

Approximately 88.6 percent of the brine was disposed in the Gulf of Mexico via the Bryan Mound (62 percent of the total) and the Big Hill

(26.6 percent of the total) brine disposal pipelines. The remainder was disposed in saline aquifers via injection wells at the Bayou Choctaw (3.9 percent of the total) and West Hackberry (7.5 percent of the total) sites. In 1997 less than 0.1 percent of the total was disposed at permitted off-site disposal wells. Saltwater recirculation was continued at the Weeks Island site throughout the year. The saltwater is taken from sumps within the oil storage chamber and reintroduced at the top of salt near the sinkhole location. This permitted activity has been found to be an effective mitigative factor in preventing continued sinkhole growth and water seepage. This recirculating volume of 36,291 bbls is not considered in the disposal figures but is incorporated in the brine spill performance calculation.

In 1997, 10,773 measurements and analyses were performed to monitor wastewater discharge quality from the SPR in accordance with NPDES and corresponding state permits. The SPR was in compliance with permit requirements for approximately 99.96 percent of the analyses performed. A total of four permit noncompliances were reported (Tables 5-7, 5-9, 5-11, and 5-13) during CY 1997. All noncompliances involved some form of minor effluent limitation exceedance this year. Three of these four (75 percent) were related to sewage treatment plant upsets, which were of a temporary and relatively innocuous nature and therefore quickly mitigated. The remaining exceedance involved a single stormwater discharge from a construction excavation that exceeded a salinity limit.

Parameters monitored varied by site and discharge. Separate tables provide specific parameters and the most frequent sampling interval (based on permit limitations). More frequent measurements are often made of certain parameters that assist with unit operations, these

additional data are reported as required by law. The data measurement variations observed during CY1997 are discussed in separate sections presented by site.

5.2.1 Bayou Choctaw

Bayou Choctaw personnel performed a total of 1,136 measurements on permitted outfalls and reporting stations to monitor NPDES and state permit compliance during 1997. Table 5-6 provides the permit required monitoring parameters and limits for the Bayou Choctaw outfalls. There was one noncompliance in 1997 resulting in a site compliance performance of 99.91 percent.

Most monitoring is related to water discharges regulated under the EPA (NPDES) permit and a corresponding permit issued by the Louisiana Department of Environmental Quality (LDEQ) Office of Water Resources. Discharges are from two package sewage treatment plants (STP), and stormwater runoff from well pads, pump pads (containment areas), and the site vehicle rinsing station.

Table 5-6. Parameters for the Bayou Choctaw Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Sewage Treatment Plants	Flow	1/mo	(Report only)
	BOD_5	1/mo	<45 mg/l max <30 mg/l avg
	TSS	1/mo	<45 mg/l max <30 mg/l avg
	pH	1/mo	6.0 - 9.0
	Fecal Coliform	1/6 mo	<400 co./100 ml
Stormwater and Vehicle Rinsing	Flow	Daily when disch	(report only)
	Oil and Grease	Daily	<15 mg/l
	pH	Daily	6.0 - 9.0
	TOC	Daily	<50 mg/l

Table 5-7. 1997 Permit Noncompliance at Bayou Choctaw

Date	Outfall Location	Permit Parameter	Value (Limit)	Cause
05/15/97	Outfall 001	BOD_5	70 mg/l (45 mg/l)	Discharge sample from the Sewage Treatment Plant BCS2 indicated a BOD_5 level of 70 mg/l which exceeds both the LWDPS and NPDES permitted daily maximum limit of 45 mg/l. Additional samples taken during the month brought the monthly average below the NPDES permitted daily average limit of 30 mg/l. The cause is believed to be due to temporary passage of floating solids throughout the plant.

5.2.2 Big Hill

During 1997, 2,345 measurements were performed to monitor NPDES and state discharge permit compliance. Table 5-8 provides the permit required monitoring parameters and limits for the Big Hill outfalls. There was one noncompliance during 1997 (Table 5-9) resulting in a 99.96 percent site compliance performance level.

Water discharges at Big Hill are regulated and enforced through the EPA NPDES permit program and the similar RCT discharge permit program (TPDES). The discharges at the site involve brine to the Gulf of Mexico, hydroclone blowdown into the Intracoastal Waterway, effluent from the sewage treatment plant, vehicle rinsing station, and stormwater from well pads and pump pads. There were no discharges during 1997 from the hydroclone blowdown system.

Table 5-8. Parameters for the Big Hill Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Brine to Gulf	Flow	Continuously	0.27 million m^3/day
	Velocity	Per flow	>6.1 m/sec (20 ft/sec)
	Oil & Grease	Daily	<15 mg/l max, <10 mg/l avg
	TDS	1/wk	(report only)
	TSS	1/wk	(report only)
	pH	1/mo	6.0 - 9.0 su
	DO	Daily	detectable (when using 0_2 scavenger)
	Integrity Tests	1/6 mo	within 4%

Table 5-8 cont.). Parameters for the Big Hill Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Stormwater and Car Wash	Oil and Grease	Daily	<15 mg/l
	TOC	Daily	< 50 mg/l
	pH	Daily	6.0 - 9.0 su
	Salinity	1/mo	<8 ppt (RWIS report only)
Sewage Treatment Plant (TPDES only)	Flow	5 days/wk	(report only)
	BOD_5	1/mo	<45 mg/l max <20 mg/l avg
	COD	1/mo	<250 mg/l max <150 mg/l avg
	TSS	1/mo	<45 mg/l max <20 mg/l avg
	pH	1/mo	6.0 - 9.0 su
Hydroclone Blowdown (not used)	Flow	1/wk	report
	TSS	1/wk	report
	pH	1/wk	6.0 - 9.0 su

Table 5-9. 1997 Permit Noncompliance at Big Hill

Date	Outfall Location	Permit Parameter	Value (Limit)	Cause
12/23/97	STP 004	BOD_5	43.7 mg/l (20 mg/l max. monthly avg.)	The monthly sample BOD_5 for STP was 43.7 mg/l. This is within the permitted limits for a daily maximum of 45 mg/l, but exceeds the maximum monthly average of 20 mg/l. Excess loading combined with sudden drop in temperature are believed to have created the high BOD_5.

5.2.3 Bryan Mound

Bryan Mound personnel made 3,126 measurements on permitted outfalls for the purpose of monitoring NPDES and state discharge permit compliance during 1997. Table 5-10 provides the permit-required parameters and limits for the Bryan Mound outfalls. There was one noncompliance during 1997 (Table 5-11) resulting in a 99.97 percent site compliance performance level.

Water discharges at Bryan Mound are regulated and enforced through the EPA NPDES permit program and the similar RCT discharge permit program for state waters (TPDES). Under provisions of the new permit Bryan Mound was able to reduce the frequency of its biomonitoring to

annual based on the lethal No Observed Effect Concentration (NOEC) being below the permitted limit. The three permitted discharges are brine to the Gulf of Mexico; stormwater from the tank farm, well pads, and pump pads; and package sewage treatment plant effluent.

Table 5-10. Parameters for the Bryan Mound Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Brine to Gulf	Flow	Continuously	report only
	Velocity	Per flow	>6.1 m/sec (20 ft/sec)
	Oil & Grease	Daily	<15 mg/l max <10 mg/l avg.
	TDS	1/mo	(report only)
	TSS	1/mo	(report only)
	pH	1/mo	6.0 - 9.0 su
	Copper	1/mo	<0.21 mg/l
	Biomonitoring	1/yr if no exceedance	Lethal NOEC 1.53%
	Integrity test	1/6 mo when flow	Offshore within 4% of onshore
Stormwater	Flow	1/wk	(report only)
	Oil and Grease	1/mo	<15 mg/l
	TOC	1/mo	< 50 mg/l (RCT)
	pH	1/mo	<75 mg/l (EPA)
	Copper	1/mo	6.0 - 9.0 su
	Salinity	1/mo	< 8 ppt
Recirculated Raw Water	Flow	1/mo	Report only
Sewage Treatment Plant	Flow	5/wk	(report only) (RCT only) <.006 mgd max <.004 mgd avg.
	BOD_5	every 2 wk	<45 mg/l max <20 mg/l avg.
	COD	every 2 wk	<250 mg/l max (RCT only) <150 mg/l avg.
	Chlorine	2/mo	1.0 mg/l
	pH	every 2 wk	6.0 - 9.0 su
	TSS	every 2 wk	<45 mg/l max <20 mg/l avg.

Table 5-11. 1997 Permit Noncompliance at Bryan Mound

Date	Outfall Location	Permit Parameter	Value (Limit)	Cause
07/22/97	Trenches near Cavern 5	Salinity	>8 ppt (8 ppt)	Contractor was in process of excavating trenches on site for life extension piping installation. These trenches had accumulated storm water that, in some cases, had a salinity of >8 ppt (RCT permitted discharge criteria). On 7/11/97 the contractor dewatered excavation (approximately 6 bbls >8 ppt) near Cavern 5 prior to having water tested by the Environmental lab.

5.2.4 Weeks Island

During 1997, 288 measurements were performed on permitted outfalls to monitor NPDES compliance. Table 5-12 provides the permit required monitoring parameters and limits for the Weeks Island outfalls. There was one noncompliance in 1997 (Table 5-13) resulting in a site compliance performance level of 99.65 percent.

The water discharges at Weeks Island are regulated and enforced in accordance with the new LPDES program which incorporates the old EPA NPDES permit and the current LWDPS (state) water discharge permit. There are separate outfalls (01B and 002) for each package sewage treatment plant. Outfall 01A handles all of the stormwater runoff collected in an onsite retention pond (Figure 5-7). There was no discharge from the iron removal unit (Outfall 003) in 1997. The water condensing unit for the mine air (Outfall 004) operated nearly continuously in 1997.

Table 5-12. Parameters for the Weeks Island Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Stormwater	Flow	1/mo	(report only)
	Oil and Grease	1/mo	<15 mg/l
	pH	1/mo	6.0 - 9.0 su
	TOC	1/mo	<50 mg/l
	TSS	1/mo	<45 mg/l
	COD	1/mo	<125 mg/l

Table 5-12 (cont.). Parameters for the Weeks Island Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Sewage Treatment Plant	Flow	1/mo	(report only)
	BOD_5	1/mo	<45 mg/l
	TSS	1/mo	<45 mg/l
	Fecal Coliform	1/mo	<400 colonies/100 ml
	pH	1/mo	6.0 - 9.0 su
Mine Air Dryer Condensate Water	Flow	1/mo	(report)
	pH	1/mo	6.0 - 9.0 s.u.
	TOC	1/mo	(report)

Table 5-13. 1997 Permit Noncompliance at Weeks Island

Date	Outfall Location	Permit Parameter	Value (Limit)	Cause
02/06/97	STP 002	TSS	39.5 mg/l (30 mg/l max. monthly average)	The monthly average for TSS for STP 002 was 39.5 mg/l which passed the state and EPA daily maximum of 45 mg/l, but exceeded the EPA maximum monthly average of 30 mg/l. Operations performed additional cleaning, and the subsequent sample collected on 03/06/97 indicated the unit had returned to normal conditions.

5.2.5 West Hackberry

West Hackberry personnel performed 3,878 measurements on permitted outfalls to monitor NPDES compliance during 1997. Table 5-14 provides the permit-required parameters and limits for the West Hackberry outfalls. There were zero noncompliances during 1997; therefore, the 1997 site compliance level was 100 percent.

Table 5-14. Parameters for the West Hackberry Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Brine to Gulf	Flow	Continuously	0.17 million m^3/day
	Velocity	Per flow	>7.6 m/sec (25 ft/sec)
	Oil & Grease	1/day	<15 mg/l
	TSS	1/day	(report only)
	TDS	1/day	(report only)
	pH	1/mo	6.0 - 9.0 su
	DO	1/day	detectable (when using 0_2 scavenger)

Table 5-14 (cont.). Parameters for the West Hackberry Outfalls

Location/Discharge	Parameter	Frequency	Compliance Range
Sewage Treatment Plant	Flow	1/mo	(report only)
	BOD_5	1/mo	<15 mg/l
	TSS	1/mo	<45 mg/l
	Fecal Coliform	1/6 mo	400 col./100 ml
	pH	1/mo	6.0 - 9.0 su
Stormwater	Flow	1/day	(report only)
	Oil and Grease	1/day	<15 mg/l
	TOC	1/day	< 50 mg/l
	pH	1/day	6.0 - 9.0 su
Vehicle Rinse Station	TSS		< 45 mg/l

The water discharges at the West Hackberry site are regulated and enforced in accordance with the new LPDES program which incorporates the old EPA NPDES permit and the former LWDPS state water discharge permit. The three categories of discharges and their parameters at West Hackberry are brine disposal to the Gulf of Mexico; sewage treatment plant effluent; vehicle rinsing, station, and stormwater runoff from well pads and pump pads.

5.3 SURFACE WATER QUALITY EFFLUENT MONITORING

During 1997, surface waters of the Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry SPR sites were sampled and monitored for general water quality according to the SPR Environmental Monitoring Plan which is required by DOE Order 5400.1. Monitoring is conducted to provide early detection of surface water quality degradation resulting from SPR operations. It is separate from, and in addition to, the water discharge permit monitoring program. Surface water quality monitoring was not conducted at Weeks Island because of the low potential to impact surface waters at this site.

Data and statistics are presented in tabular form by site in Tables 5-15 through Table 5-18. All observed values that were below detectable limit (BDL) were evaluated as one-half the detection limit for statistical

calculation purposes. In addition to commonly used statistical methods, the coefficient of variation (CV) was incorporated to evaluate the data. The coefficient of variation is used to quickly identify data sets with a high incidence of variation. Values approaching or exceeding 100 percent indicate that one standard deviation from the stated mean encompasses zero. Such occurrences invalidate the data from a statistical utility standpoint. This method draws attention to highly variable data sets for further evaluation. Extremely low values of CV (approaching or equal 0.0) indicate little or no variation which may be caused by a preponderance of measurements below the method limit of detectability.

5.3.1 Bayou Choctaw

Samples were collected and analyzed monthly, where possible, for seven surface water monitoring stations. Monitoring stations A through G are identified in Figure 5-1. Parameters monitored include pH, salinity (SAL), temperature, dissolved oxygen (DO), oil and grease (O&G), and total organic carbon (TOC) (Table 5-15). A discussion of each parameter follows.

5.3.1.1 Hydrogen Ion Activity (pH)

The annual median values of pH for all the monitored stations ranged from 6.7 to 8.7 s.u. which is consistent with the ambient conditions of the surrounding waters. Fluctuations observed are attributed to environmental and seasonal factors such as variations in rainfall, temperature, and aquatic system flushing.

5.3.1.2 Temperature

Observed temperature ranged from 2.1° C to 28.1° C. Temperature fluctuations were consistent among all stations and are attributed solely to meteorological conditions since Bayou Choctaw produces no thermal discharges.

BAYOU CHOCTAW

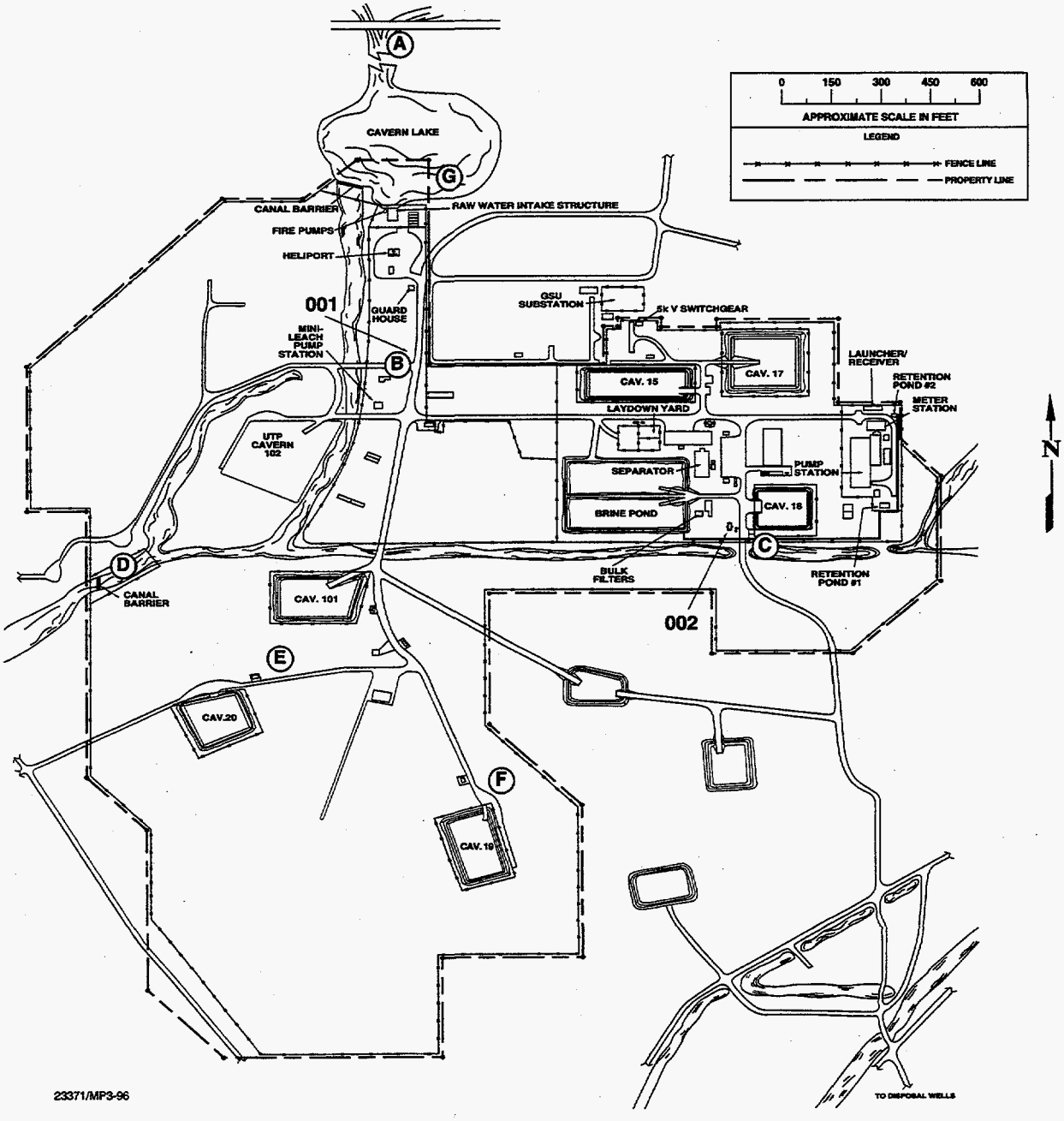


Figure 5-1
(Sheet 1 of 2) Bayou Choctaw Environmental Monitoring Stations

Federal Discharge Monitoring Stations

001 Discharge from sewage treatment plant (administration building)

002 Discharge from sewage treatment plant (control building)

Stormwater Discharges

Stormwater and pump flush from pump pads

Stormwater runoff from well pads 15, 17-20, and 101

Water Quality Monitoring Stations

A Canal north of Cavern Lake at perimeter road bridge

B Ditch running under the road to warehouse on West side of the road in area of heat exchangers.

C East-West Canal at Intersection of road to brine disposal wells

D East-West Canal at cavern 10

E Wetland Area near well pad 20

F Wetland Area near well pad 19

G Near Raw Water Intake

Figure 5-1
(Sheet 2 of 2) Bayou Choctaw Environmental Monitoring Stations

Table 5-15. 1997 Data Summary for Bayou Choctaw Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
A							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	12	4	0	0
	Maximum	8.2	27.4	0.5	2.5	5.6	25.0
	Minimum	6.7	2.1	0.5	2.5	1.0	1.1
	Mean	NV	18.2	0.5	2.5	3.6	9.6
	Median	7.3	18.1	0.5	2.5	4.0	9.0
	Standard Deviation	NV	7.4	0.0	0.0	1.5	7.2
	Coefficient of Variation	NV	40.5	0.0	0.0	41.7	74.7
B							
	Sample Size	11	11	11	4	11	11
	Number of BDL	0	NV	7	4	0	1
	Maximum	8.6	27.7	7.0	2.5	14.9	15.3
	Minimum	7.3	3.9	0.5	2.5	2.0	0.5
	Mean	NV	18.2	1.5	2.5	5.3	6.5
	Median	7.5	18.7	0.5	2.5	3.1	4.6
	Standard Deviation	NV	7.1	1.9	0.0	4.1	5.5
	Coefficient of Variation	NV	39.1	130.0	0.0	77.8	84.2
C							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	12	3	0	2
	Maximum	7.8	26.9	0.5	6.1	8.8	30.7
	Minimum	6.7	2.8	0.5	2.5	2.5	0.5
	Mean	NV	17.8	0.5	3.4	4.5	9.3
	Median	7.3	17.8	0.5	2.5	4.2	8.4
	Standard Deviation	NV	7.8	0.0	1.8	1.8	8.4
	Coefficient of Variation	NV	43.6	0.0	52.9	40.4	91.0
D							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	12	4	0	1
	Maximum	8.1	26.7	0.5	2.5	5.4	28.9
	Minimum	6.9	3.1	0.5	2.5	2.0	0.5
	Mean	NV	18.3	0.5	2.5	3.5	10.0
	Median	7.3	18.0	0.5	2.5	3.3	10.0
	Standard Deviation	NV	7.4	0.0	0.0	1.1	7.0
	Coefficient of Variation	NV	40.7	0.0	0.0	30.6	70.2
E							
	Sample Size	8	8	8	4	8	8
	Number of BDL	0	NV	8	4	0	1
	Maximum	7.8	27.4	0.5	2.5	10.2	14.2
	Minimum	6.9	2.6	0.5	2.5	3.0	0.5
	Mean	NV	16.1	0.5	2.5	4.8	8.8
	Median	7.3	17.0	0.5	2.5	4.3	9.2
	Standard Deviation	NV	8.2	0.0	0.0	2.4	4.3
	Coefficient of Variation	NV	51.4	0.0	0.0	50.1	48.3

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table 5-15 (Continued).
1997 Data Summary for Bayou Choctaw Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
F							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	12	4	0	1
	Maximum	7.9	27.6	0.5	2.5	11.6	29.1
	Minimum	6.9	3.7	0.5	2.5	1.5	0.5
	Mean	NV	18.6	0.5	2.5	4.3	11.8
	Median	7.3	18.8	0.5	2.5	4.0	9.7
	Standard Deviation	NV	7.6	0.0	0.0	2.7	7.8
	Coefficient of Variation	NV	41.0	0.0	0.0	62.6	66.3
G							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	12	4	0	1
	Maximum	8.7	28.1	0.5	2.5	9.0	20.3
	Minimum	6.8	3.1	0.5	2.5	1.0	0.5
	Mean	NV	18.7	0.5	2.5	4.4	9.2
	Median	7.4	18.4	0.5	2.5	4.7	9.4
	Standard Deviation	NV	7.3	0.0	0.0	2.2	6.1
	Coefficient of Variation	NV	39.1	0.0	0.0	50.7	66.8

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

5.3.1.3 Salinity (SAL)

In 1997, average annual salinities were 0.5 at all stations except B which averaged 1.5 ppt. Similar to last year, several spikes were observed at this station that could possibly be due to off-site sources, traces of historical contamination, or the result of evaporation where dissolved salts were concentrated.

5.3.1.4 Oil and Grease (O&G)

Oil and grease levels were below detectable levels (<5 mg/l) at all stations throughout 1997 except for one reading at Station C, the East - West Canal. The 6.1 mg/l sample is possibly attributed to drift caused by barge movement in the Intracoastal Canal. Overall, the data favorably reflect continued good site housekeeping and effective site spill prevention, control, and response efforts.

5.3.1.5 Dissolved Oxygen (DO)

The consistency in DO observations suggests that SPR runoff and discharges do not significantly reduce the DO of receiving waters. Low levels observed below 1.0 mg/l at various times are attributed to high temperature and high organic loading combined with low flow and minimal flushing typically observed in a wetland environment. Peak levels above 11.0 mg/l are attributed to high primary productivity.

5.3.1.6 Total Organic Carbon (TOC)

Average annual TOC concentrations ranged from 0.5 to 30.7 mg/l. High TOC readings correlate with high organic loading which is usually found in stagnant or sluggish water bodies of limited volume, such as an evaporating pool of water. This range of TOC is indicative of biologically stable surface waters.

5.3.1.7 General Observations

Based on the above discussion, the following general observations are made regarding the quality of Bayou Choctaw surface waters.

a. The surrounding surface waters continue to have a relatively neutral pH.

b. Observed salinities remained generally low and within the historical range. Those areas of slightly elevated salinities are not attributed to SPR activity in 1997.

c. Temperature variations were caused by seasonal changes. There are no thermal processes used at any SPR site.

d. Occasionally low DO levels are attributed to high temperatures and organic loading resulting from low flow and minimal flushing typically observed in backwater swamp areas.

e. Consistently low oil and grease levels observed indicate that site oil spills are effectively managed, minimizing any impact on the Bayou Choctaw environs.

5.3.2 Big Hill

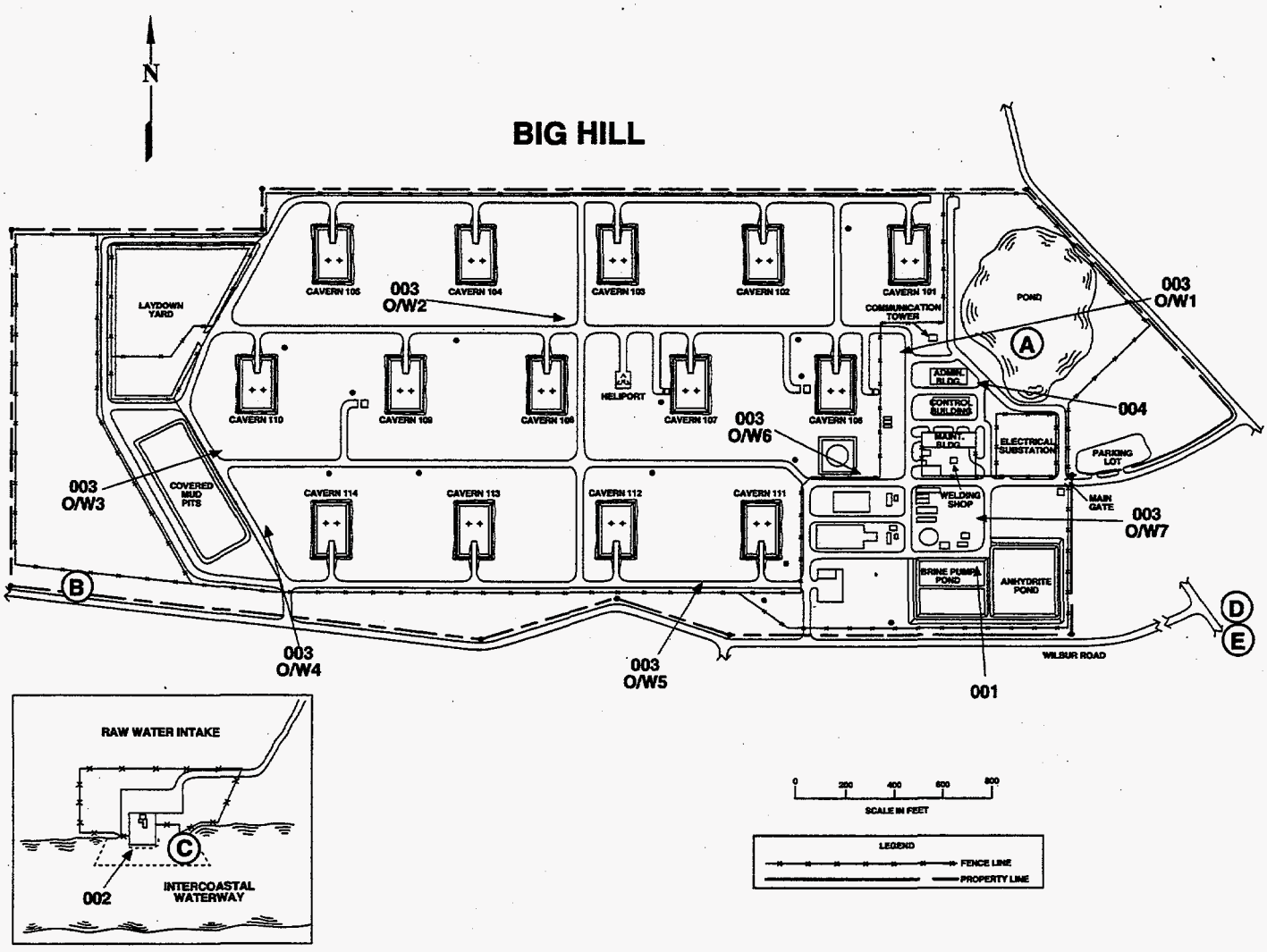
Monitoring stations were established at five locations (Figure 5-2) to assess site-associated surface water quality and to provide early detection of any surface water quality degradation that may result from SPR operations. Parameters including pH, temperature, salinity (SAL), oil and grease (O&G), dissolved oxygen (DO), and total organic carbon (TOC) were monitored (Table 5-16).

5.3.2.1 Hydrogen Ion Activity (pH)

The 1997 data show the pH of site and surrounding surface waters remained between 6.2 and 8.3 s.u. The annual median values of pH for each of the monitored stations ranged from 6.5 to 7.5 s.u. No seasonal trend was observed, but higher pHs were generally observed in more saline waters. The pH was slightly higher throughout the year at the RWIS located at the brackish Intracoastal Waterway (ICW) than at any other station. A single monthly measurement of 8.3 s.u. observed at the Wilber Road Ditch (Station B) produced the overall highest value this year and may be associated with the brackish water occasionally found there.

5.3.2.2 Temperature

Temperatures observed in 1997 ranged from 11.0°C to 32.0°C and exhibited the characteristics expected from seasonal meteorological



2071/BHMP/4-96

Figure 5-2
(Sheet 1 of 2). Big Hill Environmental Monitoring Stations

Federal Discharge Monitoring Stations

001 Brine disposal to Gulf of Mexico

002 Hydroclone and blowdown at raw water intake structure

003 Stormwater discharges

O/W1 Stormwater from well pads 101, 102, 106, 107

O/W2 Stormwater from well pads 103, 104, 105

O/W3 Stormwater from well pads 108, 109, 110

O/W4 Stormwater from well pads 113, 114

O/W5 Stormwater from well pads 111, 112

O/W6 Stormwater from BHT-7 (crude oil surge tank) diked area

O/W7 Stormwater from pump and meter pads

004 Discharge from sewage treatment plant (RCT only)

Water Quality Monitoring Stations

A Pond receiving effluent from site sewage treatment plant (STP)

B Wilber Road ditch - southwest of site

C RWIS at Intracoastal Waterway

D Pipkin Reservoir - (1.8 Miles from map location)

E Gator Hole (3.1 Miles from map location)

Figure 5-2
(Sheet 2 of 2). Big Hill Environmental Monitoring Stations

Table 5-16. 1997 Data Summary for Big Hill Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
A							
	Sample Size	11	11	11	10	10	10
	Number of BDL	0	NV	11	10	1	0
	Maximum	7.4	32.0	0.5	2.5	7.1	13.9
	Minimum	6.2	11	0.5	2.5	0.2	4.0
	Mean	NV	20.5	0.5	2.5	2.9	8.2
	Median	6.5	21.0	0.5	2.5	1.9	8.2
	Standard Deviation	NV	6.6	0.0	0.0	2.5	3.7
	Coefficient of Variation	NV	32.2	0.0	0.0	87.0	45.3
B							
	Sample Size	12	12	12	11	12	12
	Number of BDL	0	NV	3	11	0	0
	Maximum	8.3	31.0	6.0	2.5	9.3	25.8
	Minimum	7.1	12.0	0.5	2.5	2.0	6.6
	Mean	NV	21.6	2.2	2.5	5.3	11.8
	Median	7.5	22.0	1.8	2.5	5.1	10.8
	Standard Deviation	NV	6.6	1.7	0.0	2.3	5.4
	Coefficient of Variation	NV	30.4	77.9	0.0	43.0	45.8
C							
	Sample Size	12	12	12	11	10	12
	Number of BDL	0	NV	3	11	0	0
	Maximum	7.8	31.0	18.0	2.5	8.3	16.2
	Minimum	6.4	12.0	0.5	2.5	4.8	4.5
	Mean	NV	21.7	8.2	2.5	6.7	9.2
	Median	7.5	22.5	8.0	2.5	7.1	8.8
	Standard Deviation	NV	7.2	6.8	0.0	1.2	3.5
	Coefficient of Variation	NV	33.0	82.5	0.0	17.6	38.6
D							
	Sample Size	12	12	12	11	12	12
	Number of BDL	0	NV	8	11	1	0
	Maximum	7.2	31.0	6.0	2.5	20.0	31.3
	Minimum	6.3	11.0	0.5	2.5	0.3	12.9
	Mean	NV	21.1	1.4	2.5	4.4	19.1
	Median	6.8	21.0	0.5	2.5	2.1	17.9
	Standard Deviation	NV	6.0	1.7	0.0	5.5	6.1
	Coefficient of Variation	NV	28.5	126.9	0.0	122.9	31.9
E							
	Sample Size	12	12	12	11	12	12
	Number of BDL	0	NV	2	11	0	0
	Maximum	7.6	31	16	2.5	7.8	16.9
	Minimum	6.3	12	0.5	2.5	1.1	5.3
	Mean	NV	21.3	5.3	2.5	3.8	12.8
	Median	6.7	21.0	3.2	2.5	3.7	14.4
	Standard Deviation	NV	6.1	5.1	0.0	2.3	3.9
	Coefficient of Variation	NV	28.4	97.5	0.0	59.9	30.7

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

changes. Temperature fluctuations were very similar among all stations.

5.3.2.3 Salinity (SAL)

Annual average salinities were generally low, ranging from fresh on the site throughout the year to a maximum of 18.0 ppt at the RWIS during late autumn. The fresh water environment evident at the STP pond (Station A) and the Pipkin Reservoir (Station D) transitioned tobrackish at the Gator Hole (Station E) and the ICW (Station C). Marsh changes from fresh to intermediate regime were evident.

5.3.2.4 Oil and Grease (O&G)

Results for all stations at all times were below the detectable limit. No indication of crude oil from SPR activities was found at any of these stations during sampling episodes.

5.3.2.5 Dissolved Oxygen (DO)

Dissolved oxygen was generally greatest in the winter and spring and lowest from summer through fall. The lowest variability was at the RWIS where the greater flow and depth of the ICW provided a more constant dissolved oxygen level. The most variable station was the Pipkin Reservoir (Station D).

5.3.2.6 Total Organic Carbon (TOC)

Average annual TOC concentrations ranged from 4.0 to 31.8 mg/l. The higher TOC levels observed are indicative of potential biological decomposition events.

5.3.2.7 General Observations

Based on the above discussion, the following general observations are made regarding the quality of Big Hill surface waters.

a. The fresh surface waters had a near neutral pH, but pH was generally higher in brackish water.

b. Observed salinities were low on the site and increased in natural fashion from fresh water at the site to intermediate brackish water regimes at the ICW

c. Surrounding surface waters were not contaminated by SPR crude oil.

d. Temperature variations followed seasonal meteorological changes.

e. Dissolved oxygen and total organic carbon fluctuations were within typical ranges indicative of seasonal and meteorological influences.

5.3.3 Bryan Mound

Surface waters surrounding the Bryan Mound site were monitored during 1997. Blue Lake was sampled at seven stations and Mud Lake was sampled at three stations during the months of February, May, June, September, and October.

Surface water monitoring stations are identified in Figure 5-3. Stations A through C and E through G are located along the Blue Lake shoreline to monitor effects of site runoff. Station D, located farther away from the site in Blue Lake, serves as a control. Stations H and I are located along the Mud Lake shoreline to monitor effects of site runoff. Station J, located near the central point of Mud Lake, serves as a control.

BRYAN MOUND

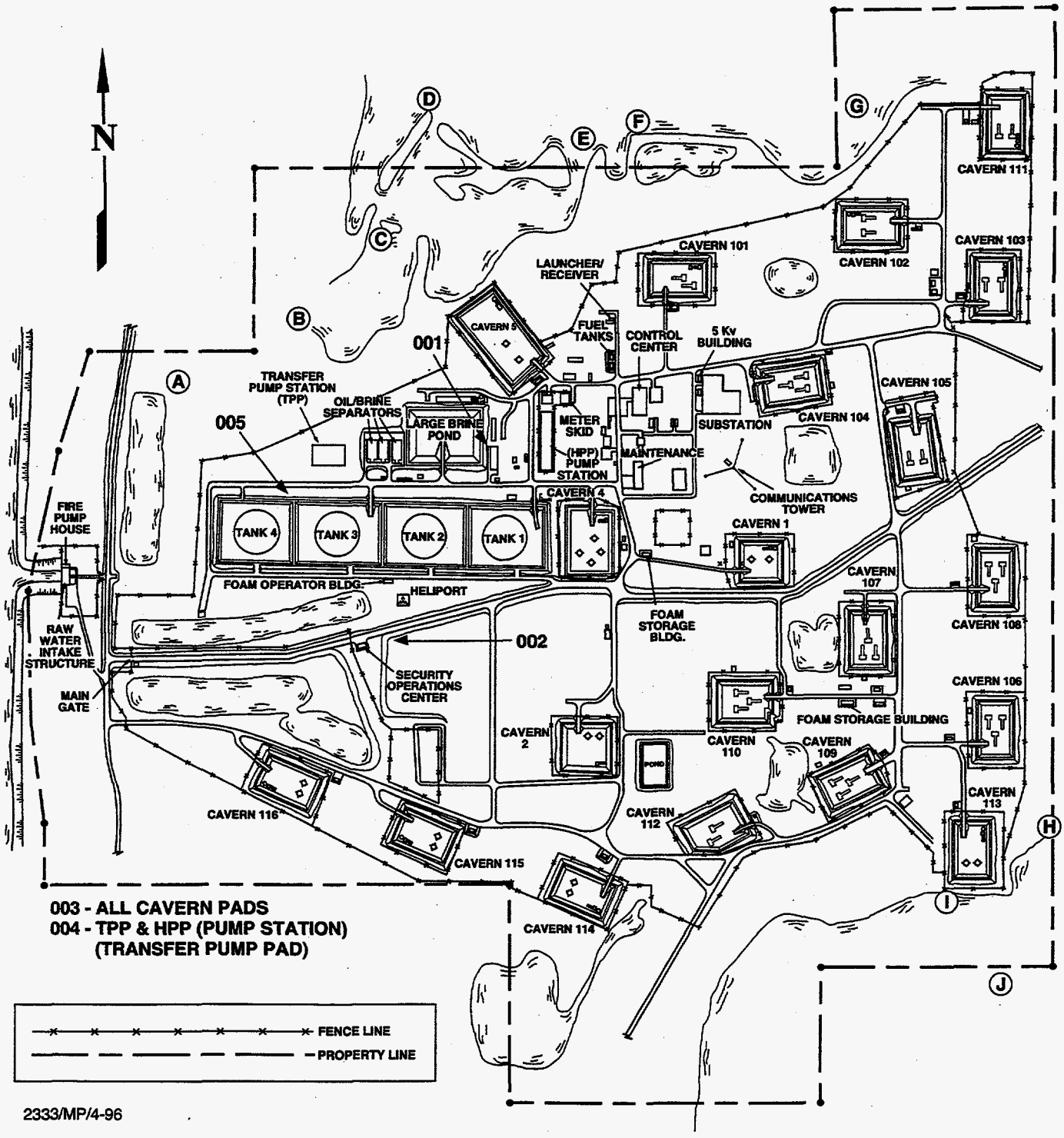


Figure 5-3
(Sheet 1 of 2) Bryan Mound Environmental Monitoring Stations

Federal Discharge Monitoring Stations

001 Brine disposal
002 Discharge from the sewage treatment plant
003 Stormwater discharges
Runoff from well pads 1, 2, 4, 5, and 101-116
Runoff from the high-pressure pump pad
Runoff from transfer pump pad
Runoff from surge tank area

Water Quality Monitoring Stations

A Blue Lake
B Blue Lake
C Blue Lake
D Blue Lake - Control Point 1
E Blue Lake
F Blue Lake
G Blue Lake
H Mud Lake
I Mud Lake
J Mud Lake - Control Point 2

Figure 5-3
(Sheet 2 of 2). Bryan Mound Environmental Monitoring Stations

Table 5-17. 1997 Data Summary for Bryan Mound Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
A							
	Sample Size	11	11	11	6	10	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	9.5	34.0	6.0	2.5	20.0	27.0
	Minimum	7.8	12.0	0.5	2.5	4.2	9.2
	Mean	NV	22.58	2.7	2.5	10.7	13.6
	Median	8.6	22.0	2.8	2.5	10.7	11.9
	Standard Deviation	NV	7.6	1.7	0.0	4.6	4.8
	Coefficient of Variation	NV	33.8	64.1	0.0	43.4	35.5
B							
	Sample Size	11	11	11	6	10	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	9.7	32.0	4.3	2.5	14.9	13.3
	Minimum	7.8	12.0	0.5	2.5	4.5	9.4
	Mean	NV	22.2	2.4	2.5	10.3	11.6
	Median	8.5	22.0	2.9	2.5	10.3	11.7
	Standard Deviation	NV	7.3	1.3	0.0	3.1	1.4
	Coefficient of Variation	NV	32.9	53.7	0.0	30.0	11.8
C							
	Sample Size	11	11	11	6	11	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	9.5	32.0	4.3	2.5	16.3	16.6
	Minimum	7.9	11.9	0.5	2.5	7.6	9.1
	Mean	NV	22.2	2.5	2.5	10.7	11.8
	Median	8.2	22.0	3.0	2.5	10.2	11.2
	Standard Deviation	NV	7.5	1.3	0.0	2.8	2.1
	Coefficient of Variation	NV	33.8	53.6	0.0	26.5	17.6
D							
	Sample Size	11	11	11	6	11	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	8.8	32.0	4.0	2.5	13.8	13.5
	Minimum	8.0	12.0	0.5	2.5	7.1	8.7
	Mean	NV	22.5	2.5	2.5	9.7	11.4
	Median	8.3	22.0	3.0	2.5	9.2	10.8
	Standard Deviation	NV	7.7	1.3	0.0	1.9	1.6
	Coefficient of Variation	NV	34.1	52.6	0.0	19.7	13.8
E							
	Sample Size	11	11	11	6	11	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	8.8	32.0	4.1	2.5	13.5	13.3
	Minimum	8.0	12.0	0.5	2.5	5.9	8.9
	Mean	NV	22.5	2.5	2.5	10.1	11.4
	Median	8.4	22.0	3.0	2.5	10.1	11.3
	Standard Deviation	NV	7.7	1.3	0.0	2.4	1.4
	Coefficient of Variation	NV	34.1	53.0	0.0	23.4	11.9

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table 5-17 (Continued).
1997 Data Summary for Bryan Mound Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
F							
	Sample Size	11	11	11	6	11	11
	Number of BDL	0	NV	3	6	0	0
	Maximum	8.8	32.0	4.0	2.5	13.5	13.4
	Minimum	8.0	11.8	0.5	2.5	5.7	8.7
	Mean	NV	22.5	2.5	2.5	9.7	11.2
	Median	8.2	22.0	3.0	2.5	9.6	11.2
	Standard Deviation	NV	7.7	1.3	0.0	2.2	1.3
	Coefficient of Variation	NV	34.6	52.7	0.0	22.2	11.7
G							
	Sample Size	11	11	11	6	11	10
	Number of BDL	0	NV	3	6	0	0
	Maximum	8.9	32.0	4.0	2.5	15.1	14.3
	Minimum	8.0	11.7	0.5	2.5	5.3	9.0
	Mean	NV	22.43	2.5	2.5	10.4	11.4
	Median	8.5	22.0	3.0	2.5	10.7	11.0
	Standard Deviation	NV	7.7	1.3	0.0	3.0	1.6
	Coefficient of Variation	NV	34.5	52.6	0.0	28.8	14.0
H							
	Sample Size	5	5	5	4	5	5
	Number of BDL	0	NV	1	4	0	0
	Maximum	8.2	30.0	15.5	2.5	12.1	10.2
	Minimum	6.9	15.0	0.5	2.5	3.3	4.8
	Mean	NV	23.0	4.8	2.5	7.7	7.0
	Median	8.0	21.0	2.2	2.5	7.5	6.9
	Standard Deviation	NV	6.0	6.1	0.0	3.3	2.0
	Coefficient of Variation	NV	26.3	125.8	0.0	43.0	29.2
I							
	Sample Size	5	5	5	4	5	5
	Number of BDL	0	NV	1	4	0	0
	Maximum	8.1	31.0	22.8	2.5	10.9	9.9
	Minimum	7.3	15.0	0.5	2.5	3.7	5.0
	Mean	NV	23.8	6.1	2.5	7.8	6.7
	Median	8.0	22.0	2.3	2.5	7.7	6.5
	Standard Deviation	NV	6.4	9.4	0.0	2.7	2.0
	Coefficient of Variation	NV	26.8	155.1	0.0	34.2	29.3
J							
	Sample Size	5	5	5	4	5	5
	Number of BDL	0	NV	1	4	0	0
	Maximum	8.4	31.0	22.8	2.5	14.5	10.0
	Minimum	7.4	15.0	0.5	2.5	3.7	4.7
	Mean	NV	23.6	6.3	2.5	8.8	6.7
	Median	7.9	23.0	2.8	2.5	8.3	6.7
	Standard Deviation	NV	6.0	9.3	0.0	3.9	1.9
	Coefficient of Variation	NV	25.4	148.7	0.0	43.9	27.4

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Parameters monitored in the Bryan Mound surface waters include pH, temperature, salinity (SAL), oil and grease (O&G), and total organic carbon (TOC) (Table 5-17). Summary statistic tables were prepared for each of the stations and although only two samples were taken during the year, summary statistics were compiled to aid with the review, as appropriate.

5.3.3.1 Hydrogen Ion Activity (pH)

In 1997 the pH of Blue Lake and Mud Lake was slightly basic, indicative of natural waters devoid of carbon dioxide and generally hard in regard to mineral content. Marine and brackish waters, such as those in Blue Lake and Mud Lake, typically have somewhat elevated pH levels and high mineral content. The pH fluctuations in these Bryan Mound surface waters were quite small and considered within the normal range of variability.

5.3.3.2 Temperature

Temperatures observed in 1997 ranged from 11.7°C to 34.0°C and exhibited the characteristics expected from seasonal meteorological changes.

5.3.3.3 Salinity (SAL)

Observed salinity fluctuations ranged from 0.5 to 6.0 ppt in Blue Lake and 0.5 to 22.8 ppt in Mud Lake. Salinity fluctuations are attributed to meteorological and tidal conditions rather than site operations, since salinity observed at control sample stations D and J were consistent with those found along the site shoreline. The higher salinities in Mud Lake are primarily caused by the strong tidal and wind influence on the lake, and its more direct link with the Gulf of Mexico.

5.3.3.4 Oil and Grease (O&G)

All of the O&G measurements made during the course of the 1997 calendar year were found below the method detectable limit of 5 mg/l. These data reflect effective spill prevention and good housekeeping practices being maintained throughout the year.

5.3.3.5 Dissolved Oxygen (DO)

All DO measurements observed at all stations were found to be suitable for aquatic life. Dissolved oxygen was not highly variable either during the season's of the year or between various stations. The CV's at all stations indicate low variability or in other words, fairly stable oxygen levels. The Blue Lake station varied from a low of 4.2 to 20.0 mg/l; as compared to their control point which ranged from 7.1 to 13.8 mg/l, on the year. In Mud Lake the test stations ranged from 3.3 to 12.1 mg/l; versus their control point which varied from 3.7 to 14.5 mg/l. The larger ranges for single stations were found at those locales where water is more shallow and protected from wave action such as station A. All values reflect "no discernible impact" from SPR operations.

5.3.3.6 Total Organic Carbon (TOC)

In 1997 observed average TOC in Blue Lake ranged from 8.7 to 27.0 mg/l. Observed TOC in Mud Lake was lower (range: 4.8 to 10.2 mg/l) than Blue Lake. Higher TOC measured in Blue Lake is attributed to primary productivity and low flushing. The TOC levels observed in both lakes are indicative of healthy conditions.

5.3.3.7 General Observations

Based on the above discussions, the following general observations are made regarding the quality of Bryan Mound surface waters.

a. The observed pH was stable for the period tested and slightly basic in Blue Lake and Mud Lake, typical of brackish waters.

b. Temperature and salinity fluctuations observed during the period tested are attributed to meteorological and tidal conditions rather than site operations.

c. Higher TOC levels observed in Blue Lake are attributed to higher primary productivity and low flushing of this surface water body.

5.3.4 Weeks Island

The Weeks Island site is located on the Weeks Island salt dome approximately 30 m (100 ft) above sea level. The surrounding topography is of rather sharp relief with several small ponds located outside of SPR boundaries. None of the SPR outfalls discharge directly into these ponds. Other surface waters at this site are intermittent in nature, draining rapidly and thoroughly after any precipitation. The site outfalls (Figure 5-4) discharge small volumes into surface runoff at a substantial distance from receiving waters. The lack of potentially impacted DOE-owned surface waters precludes the need for surface water quality monitoring. Outfalls 004 and 01B are discharged with 01A through a single surface drain.

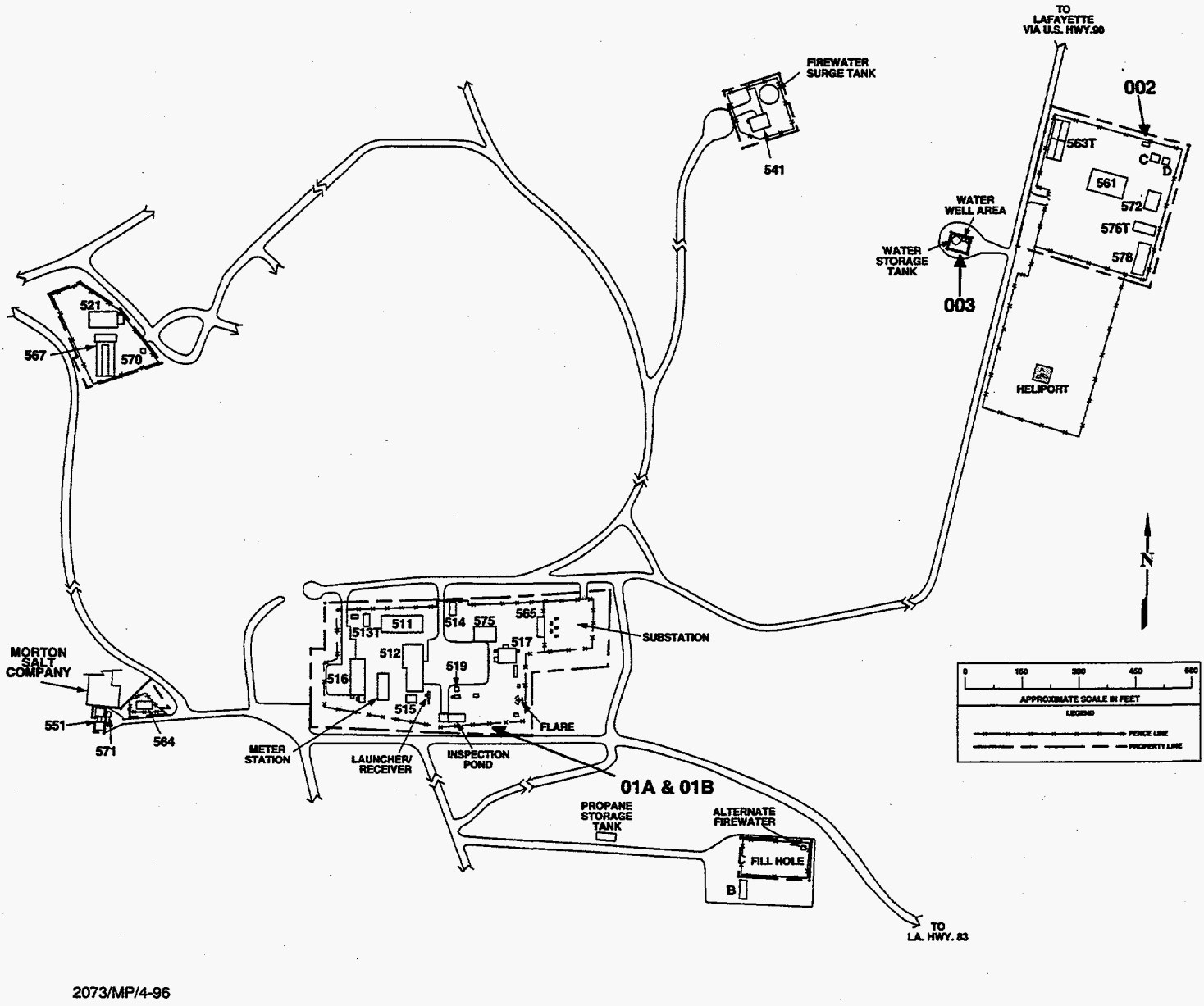


Figure 5-4
(Sheet 1 of 2). Weeks Island Environmental Monitoring Stations

Federal Discharge Monitoring Stations

01A Storm water runoff
01B Discharge from sewage treatment plant
002 Discharge from sewage treatment plant
003 Discharge from iron removal system
004 Discharge from mine air dryer condensate

There are no water quality monitoring stations at Weeks Island.

Figure 5-4
(Sheet 2 of 2). Weeks Island Environmental Monitoring Stations

5.3.5 West Hackberry

In 1997, six surface water quality stations (Figure 5-5) were monitored monthly at West Hackberry. Parameters monitored include pH, temperature, salinity (SAL), dissolved oxygen (DO), oil and grease (O&G), and total organic carbon (TOC) (Table 5-18).

5.3.5.1 Hydrogen Ion Activity (pH)

The pH of site and surrounding waters ranged between 6.8 and 8.5 s.u., and median values ranged from 7.3 to 8.1 s.u. Readings were consistently higher and exhibited less variability at the concrete north foam retention pond at the high pressure pump pad on the site (Station E) than at other locations. Water sampled at the retention pond is primarily phreatic (commonly well water) run-off from the site high-pressure pump pad, which is buffered by the concrete retention pond. Surface water sampled at other stations was meteoric in origin.

Fluctuations observed are relatively minor and attributed to environmental and seasonal factors such as variation in rainfall, temperature, algae and biotic growth, and aquatic system flushing.

5.3.5.2 Temperature

Observed temperatures in 1997 were consistent with observations at other sites and were indicative of regional climatic effects. No off-normal measurements were observed. Recorded temperatures ranged from 17°C to 32°C and were generally consistent among stations. This may be due to its closer proximity to brackish coastal waters and associated salt water intrusion, and to the larger surface area per volume of water in Black Lake, making it more susceptible to evaporative induced salinity effects.

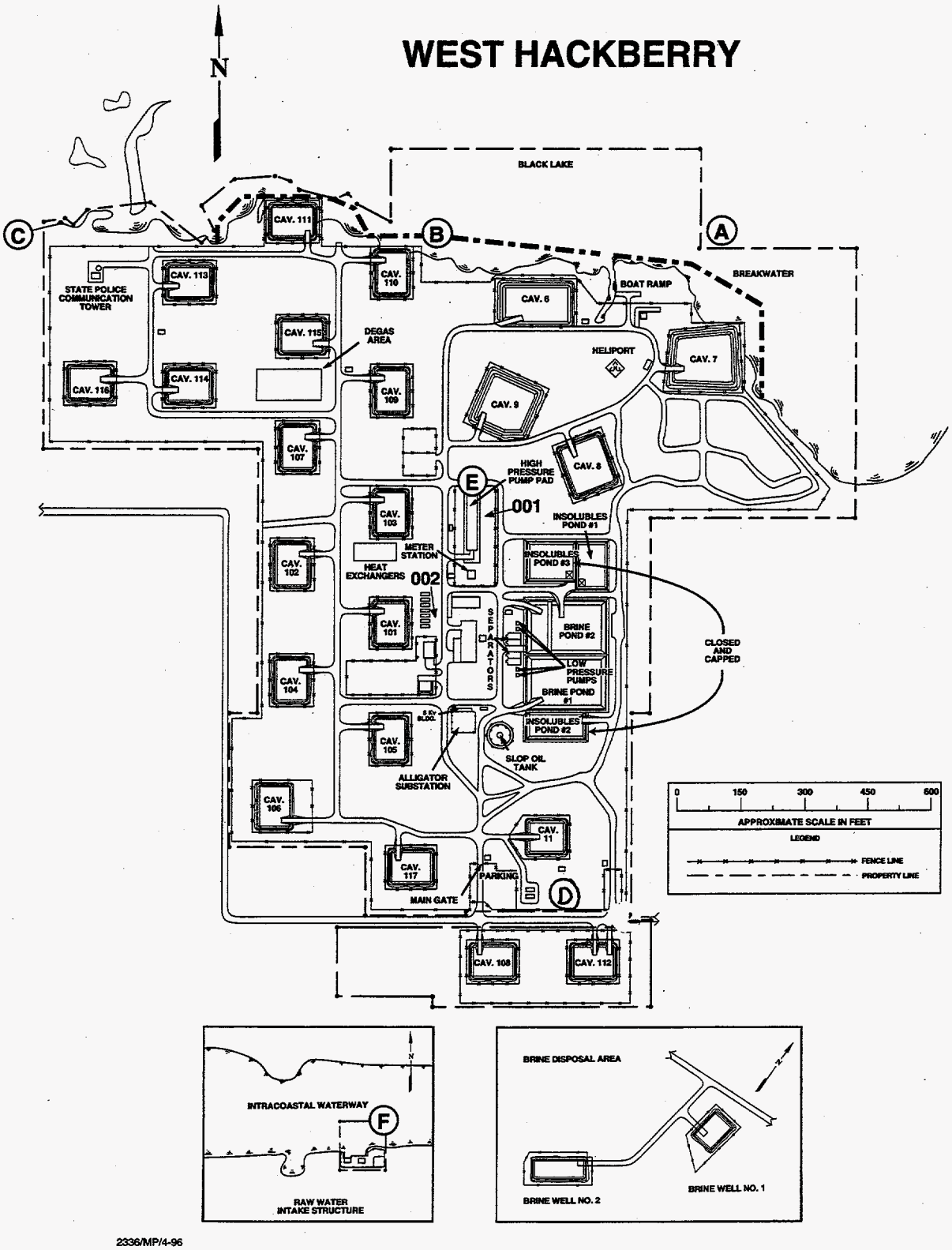


Figure 5-5
(Sheet 1 of 2) West Hackberry Environmental Monitoring Stations

Federal Discharge Monitoring Stations

001 Brine disposal

002 Discharge from sewage treatment plant

003 Storm water and pump flush from high-pressure pump pad Storm water runoff from well pads 6-9, 11, and 101-117

004 Storm water from the Texoma/Lake Charles meter station

Water Quality Monitoring Stations

A Black Lake

B Black Lake

C Black Lake

D Southeast drainage ditch

E High-pressure pump pad

F Raw water intake structure (Intracoastal Waterway)

Figure 5-5
(Sheet 2 of 2). West Hackberry Environmental Monitoring Stations

Table 5-18. 1997 Data Summary for W. Hackberry Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
A							
	Sample Size	12	12	12	4	12	12
	Number of BDL	0	NV	0	4	0	0
	Maximum	8.2	31.0	17.0	2.5	11.3	11.6
	Minimum	6.8	17.0	2.0	2.5	6.5	6.3
	Mean	NV	22.8	8.6	2.5	8.2	9.7
	Median	7.4	21.0	10.1	2.5	7.5	10.3
	Standard Deviation	NV	5.0	4.9	0.0	1.7	1.9
	Coefficient of Variation	NV	22.0	57.2	0.0	20.2	19.7
B							
	Sample Size	12	12	12	5	12	12
	Number of BDL	0	NV	0	5	0	0
	Maximum	8.0	30.0	15.8	2.5	11.2	11.7
	Minimum	7.0	17.0	1.5	2.5	6.4	6.3
	Mean	NV	22.9	8.5	2.5	8.0	9.1
	Median	7.4	21.5	10.3	2.5	7.5	9.5
	Standard Deviation	NV	5.0	4.6	0.0	1.4	1.6
	Coefficient of Variation	NV	21.7	53.5	0.0	17.9	17.7
C							
	Sample Size	12	12	12	5	12	12
	Number of BDL	0	NV	0	5	0	0
	Maximum	8.5	31.0	16.0	2.5	10.8	14.7
	Minimum	7.0	18.0	1.2	2.5	6.5	7.0
	Mean	NV	23.2	8.4	2.5	8.1	10.0
	Median	7.4	21.5	9.8	2.5	7.6	10.2
	Standard Deviation	NV	4.9	4.7	0.0	1.3	2.1
	Coefficient of Variation	NV	21.3	56.8	0.0	16.3	20.2
D							
	Sample Size	8	8	8	4	8	8
	Number of BDL	0	NV	7	4	0	0
	Maximum	8.4	31.0	1.0	2.5	14.0	16.1
	Minimum	6.9	17.0	0.1	2.5	1.5	6.2
	Mean	NV	23.1	0.4	2.5	6.7	10.2
	Median	7.8	22.0	0.3	2.5	6.5	9.1
	Standard Deviation	NV	4.9	0.3	0.0	3.5	3.8
	Coefficient of Variation	NV	21.2	77.8	0.0	51.5	36.8

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

Table 5-18 (Continued).
1997 Data Summary for W. Hackberry Monitoring Stations

Station	Statistical Parameters	pH (s.u.)	Temperature (deg. C)	Salinity (ppt)	Oil & Grease (mg/l)	Dissolved Oxygen (mg/l)	Total Organic Carbon (mg/l)
E							
	Sample Size	7	7	7	4	7	7
	Number of BDL	0	NV	5	4	0	0
	Maximum	8.5	28.0	1.0	2.5	10.7	14.8
	Minimum	7.2	19.0	0.2	2.5	2.5	6.7
	Mean	NV	23.1	0.6	2.5	7.8	10.2
	Median	8.1	22.0	0.5	2.5	8.0	10.3
	Standard Deviation	NV	3.5	0.3	0.0	2.5	2.8
	Coefficient of Variation	NV	15.3	59.4	0.0	32.7	27.9
F							
	Sample Size	12	12	12	5	12	12
	Number of BDL	0	NV	5	5	0	0
	Maximum	7.9	32.0	12.8	2.5	9.4	17.7
	Minimum	6.7	18.0	0.2	2.5	4.3	5.1
	Mean	NV	22.9	3.9	2.5	7.0	9.7
	Median	7.3	20.5	3.0	2.5	7.3	9.2
	Standard Deviation	NV	5.3	4.1	0.0	1.3	3.5
	Coefficient of Variation	NV	23.1	107.5	0.0	17.8	36.2

Note: BDL = Number of samples that were below the detectable limit.
NV = Not a valid number or statistically meaningful.

5.3.5.3 Salinity (SAL)

Meteorological factors such as wind, tide, and rainfall contributed to the salinity variation observed in brackish Black Lake (stations A, B, and C) and the Intracoastal Waterway (ICW) (Station F). Salinity ranges observed in these water bodies (1.2 to 17.0 ppt in Black Lake and 0.2 to 12.8 ppt in the ICW) are more conducive to supporting euryhaline organisms and those with sufficient mobility to avoid salinity stresses that occur with seasonal changes. Mean annual salinity observed at the ICW (3.9 ppt) was lower than that of Black Lake (8.4 to 8.6 ppt).

Salinities observed at the two upland site stations were affected by surface runoff not Black Lake. Maximum salinities in the drainage ditch at the southwest corner of the site (Station D) and at the high

pressure pump pad (Station E) were 1.0 ppt, which is not uncommon for this brackish environment.

5.3.5.4 Oil and Grease (O&G)

Observed O&G levels were below the detectable level (5 mg/l) at all stations throughout 1997. The data reflect effective spill prevention and housekeeping by the site.

5.3.5.5 Dissolved Oxygen (DO)

The DO levels observed at all stations are suitable for aquatic life. Dissolved oxygen was somewhat variable at all site stations. Greater surface area and water movement through currents and wave action provided continuous aeration of the lake and ICW water. Water movement at the ditch (Station D) and the retention pond were sufficient to provide some aeration throughout 1997.

5.3.5.6 Total Organic Carbon (TOC)

Average annual TOC concentrations ranged from 9.1 to 10.2 mg/l. Monthly TOC concentrations were generally quite similar at all stations throughout 1997.

5.3.5.7 General Observations

The following observations are made, based on the above discussion, concerning operational impacts on the West Hackberry aquatic environs.

a. pH and temperature remained fairly stable and were only affected by seasonal factors.

b. The salinities observed throughout 1997 were consistent with the ambient brackish environment.

c. Oil and grease levels were below the detectable limit at all stations throughout 1997 which is indicative of good housekeeping.

d. Dissolved oxygen levels at site and Black Lake stations were consistently high and did not appear adversely affected by site operations.

e. Total organic carbon concentrations were quite similar at all stations throughout the year suggesting no substantial transient biological events.

5.4 ENVIRONMENTAL OCCURRENCES

The majority of the non-routine releases of pollutants occur with the spills of crude oil and brine into the environment from the SPR operations.

5.4.1 Oil Spills

State agencies require notification if an oil spill exceeds one barrel in LA, five barrels in TX. Along with the state agencies, the National Response Center (NRC) requires notification if a sheen is on a navigable waterway. There was only one reportable oil spill during 1997 totaling .32 m^3 (2 bbls). This spill did not result in environmental damage.

In 1997, the total volume of oil moved (received and transferred internally) was approximately 13.9 million m^3 (87.3 mmb). The total number of reportable crude oil spills, total volume spilled, and the percent volume spilled of total volume moved are shown in Table 5-19 for each year from 1982 through 1997. During 1997, the SPR

experienced the fewest number of spills and lowest volume spilled since it has been in operation.

Table 5-19. Number of Reportable Crude Oil Spills

Year	Total Spills	Volume Spilled m^3 (barrels)	Percent Spilled of Total Throughput
1982	24	847.0 (5,328)	0.00704
1983	21	380.9 (2,396)	0.00281
1984	13	134.8 (848)	0.00119
1985	7	85.4 (537)	0.00122
1986	5	1232.5 (7,753)	0.01041
1987	5	2.5 (16)	0.00002
1988	6	8.8 (55)	0.00001
1989	11	136.4 (858)	0.00004
1990	14	74.8 (467)	0.00003
1991	6	37.9 (237)	0.0004
1992	5	1.9 (12)	0.00006
1993	6	36.9 (232)	0.0007
1994	7	6.2 (39)	0.0003
1995	2	56.3 (354)	0.0006
1996	4	4.7 (30)	0.00002
1997	1	0.32 (2)	4.0×10^{-9}

The reportable oil spill that occurred during 1997 is presented in Table 5-20.

Table 5-20. 1997 Reportable Oil Spills

Date	Location	Amount	Cause/ Corrective Action
09/22/97	WH	.32 m^3 (2 Bbls)	Tank 12C was overfilled during vacuum truck offloading. Approximately 1 ½ - 2 Bbls leaked from the foam chamber. The spill was contained on the pad and completely cleaned up.

5.4.2 Brine Spills

There were no SPR brine spills in quantities of one barrel (42 gallons) or greater or reportable as required by regulation during 1997. Brine spills are reported if they may affect water quality.

The SPR disposed of 6.02 million m^3 (37.63 mmb) of brine (mostly saturated sodium chloride solution, some discharges were of lower salinities than normally attributed to brine) during 1997. Table 5-21 illustrates the total number of brine spills, total volume spilled, and percent volume spilled of total volume disposed for each year from

1982 through 1997. This past year has been the first year without a single reportable brine spill.

Corrosion/erosion has been the leading cause of brine spills over the past few years. Other types of failures (gasket/flange/other equipment) have contributed somewhat. The second major factor is operator error.

Table 5-21. Number of Reportable Brine Spills

Year	Total Spills	Volume Spilled m^3 (barrels)	Percent Spilled of Total Throughput
1982	43	443.8 (2,792)	0.0005
1983	44	259.4 (1,632)	0.0002
1984	17	314.0 (1,975)	0.0003
1985	16	96,494.8 (607,000)	0.1308
1986	7	275.6 (1,734)	0.0017
1987	22	96.5 (608)	0.0003
1988	12	93.8 (586)	0.0001
1989	17	31,231.6 (825,512)	0.1395
1990	12	11,944.3 (74,650)	0.0170
1991	7	1,156.8 (7,230)	0.004
1992	9	48.0 (302)	0.003
1993	6	59.2 (370)	0.001
1994	2	14.4 (90)	0.0006
1995	3	131.1 (825)	0.0028
1996	5	179.7 (1,130)	0.0014
1997	0	0	0.0

6. GROUND WATER MONITORING AND PROTECTION INFORMATION

Ground water monitoring is performed at the Bayou Choctaw, Big Hill, Bryan Mound, and West Hackberry sites to comply with either DOE Order 5400.1 or a State agency agreement. Salinity and the presence of hydrocarbons are measured at Bayou Choctaw, Big Hill, and Bryan Mound. The monitoring performed at West Hackberry is required by an agreement between DOE and the LDNR. West Hackberry ground water monitoring and recovery activities were reported quarterly to the LDNR in 1997.

Ground water data collected for the past five years and are discussed within each site section.

6.1 BAYOU CHOCTAW

The Plaquemine Aquifer is the main source of fresh water for the site and several surrounding municipalities. It is located approximately 18 m (60 ft) below the surface and extends to a depth of 150 to 182 m (500-600 ft). The upper 18 m (60 ft) of sediments in the aquifer consist of predominantly Atchafalaya clay. The interface of freshwater and saline water occurs at a depth of 122 to 150 m (400-500 ft) below the surface. Ground water in the Plaquemine Aquifer communicates locally with the Mississippi River, flowing away from it during the high river stage and towards the river in the low stage. Other local influences to the general flow patterns are manifested by structural features such as the piercing salt domes and proximity to offtake.

Historically, there have been four monitoring wells (MW1, MW2, MW3, and MW4) at Bayou Choctaw (Figure 6-1). These wells were drilled roughly 30 feet below land surface (bls) to monitor impact from the brine pond and other shallow contamination. The verification well study placed seven additional similarly screened wells around the main site and one remotely down near a selected brine disposal well pad.

BAYOU CHOCTAW

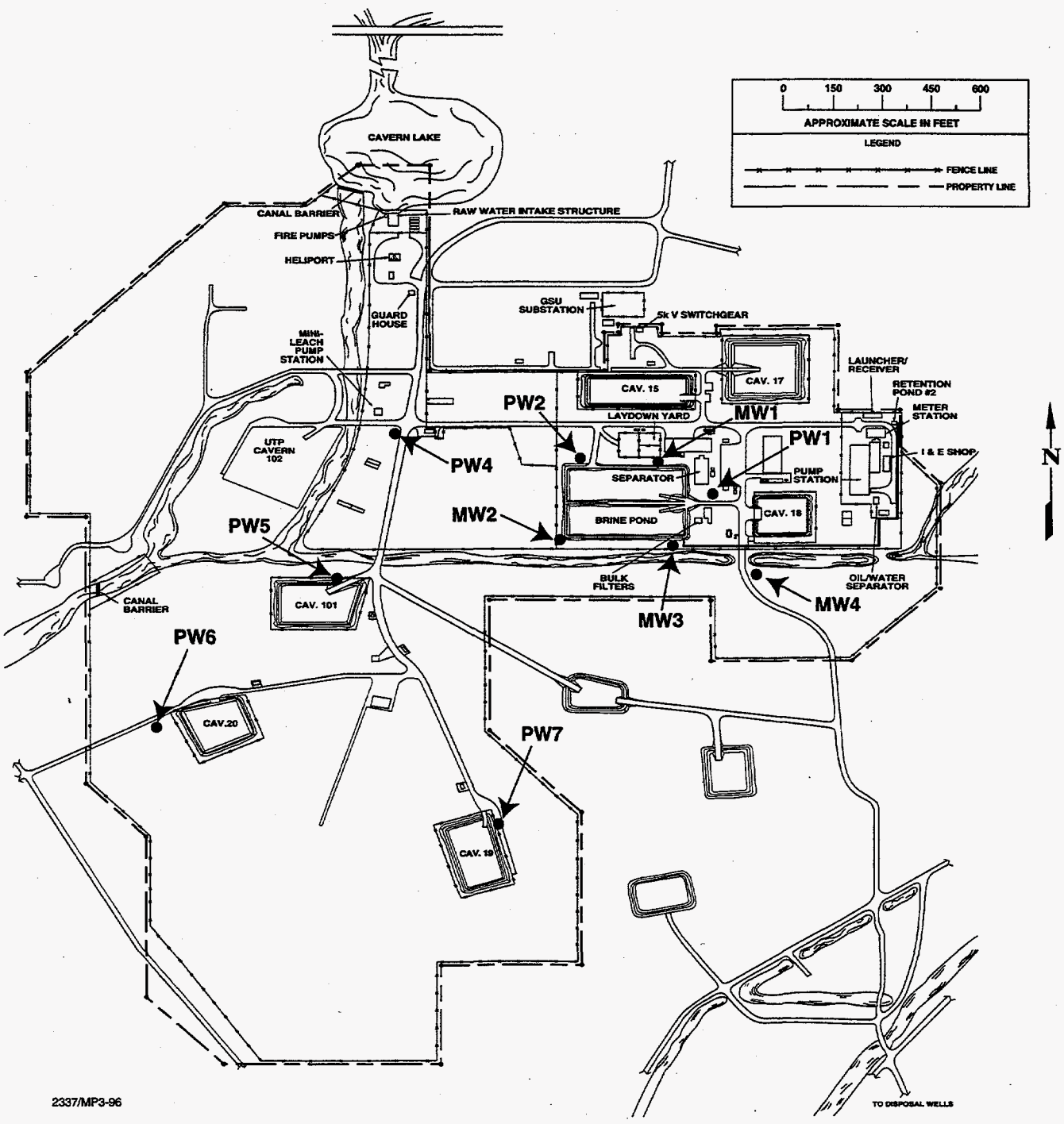


Figure 6-1.
Bayou Choctaw Ground Water Monitoring Wells

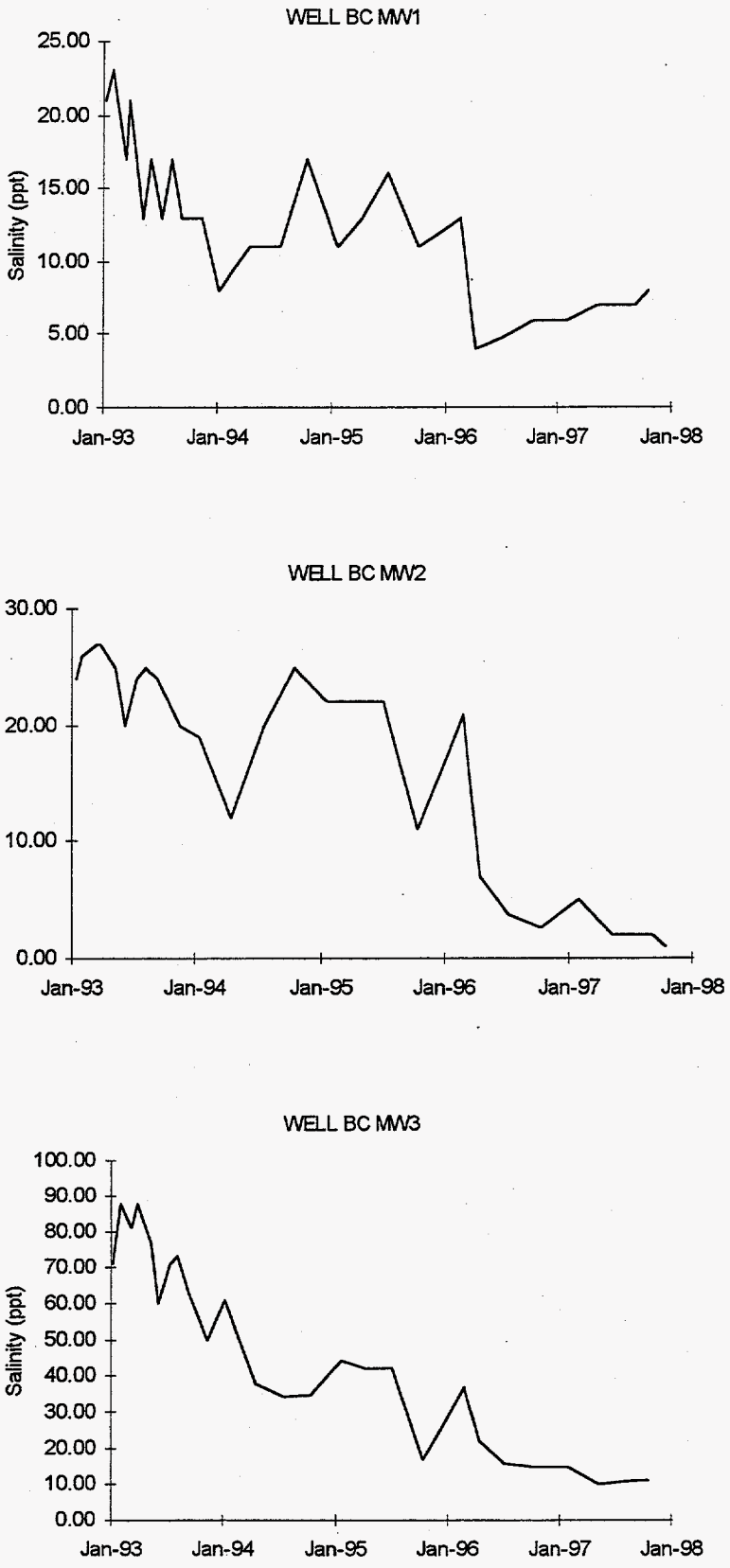


Figure 6-2.
Bayou Choctaw Ground Water Monitoring Well Salinities

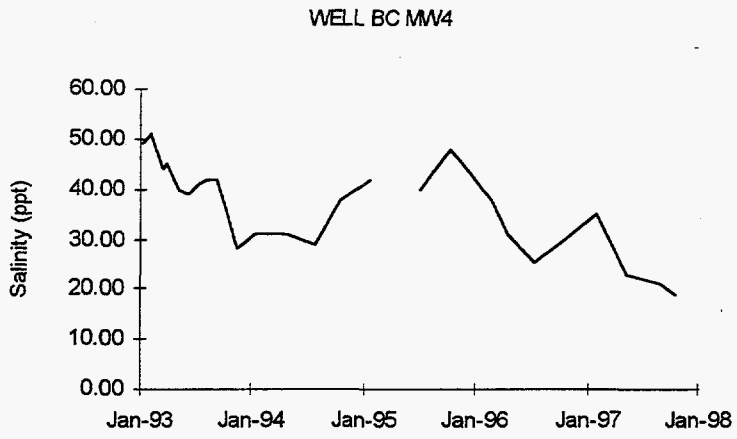


Figure 6-2. (Continued)
Bayou Choctaw Ground Water Monitoring Well Salinities

These wells have been added to the site's monitoring scheme to enhance evaluation of ground water flow direction and outlying salinity movement. The results of monitoring these wells are not being graphed and included in this report at this time because there is insufficient data to have a representative chart. Details of the Phase II studies were provided in the Site Environmental Report for Calendar Year 1996.

Ground water salinity observed at the four historical wells (Figure 6-2) are above ambient for a fresh water environment and are presumably elevated by past and possibly present brine handling activities.

All four wells exhibit seasonal salinity fluctuations that are affected by rainfall. Highest salinities have usually occurred in late winter and early spring, and lowest salinities have been observed in late spring and summer. The five year trends at each of these wells continues to decrease with time.

Past surface brine spills and other activities from previous occupants of the area may have also affected the ground water salinity observed in these shallow wells. The salinity range observed at well MW3 is much greater than that of the other three historical wells. Ground water surface piezometric data of all the wells indicate that ground water movement is radial in all directions from the high point on the dome around Cavern 15. A 1992 brine spill on the nearby low pressure pump pad north of the well may have elevated the salinity in that area, and its southerly movement was captured by MW3. The historical graph indicates that the salinity is lessening as time goes on and the effects of the spill become either dilute or move past this monitoring point.

Long-term salinity trends have been established which, examined within the context of the radial ground water movement, assist in identifying possible areas or sources of contamination. Wells MW1 and MW2 both exhibit a continuing general (5-year trend) decrease in salinity through 1997. Well MW1 is situated up-gradient of the brine pond area, with respect to ground water movement and well MW2 appears to be immediately downgradient of the brine pond. A potential source of subsurface contamination may be residuals from historical activity that occurred along the northwest corner of the pond. Verification well PW2 encountered this existing affected area and the limited measurements obtained since installation indicate no trends but rather a flat (with time) area of impact which, judging from the flow patterns, is not likely associated with pond operations. Although it has captured the most saline ground water on the site, MW3 is slowly decreasing in salinity over time. The steeply downward sloping salinity 5-year trend observed at MW3 differs from that observed at the other pond wells. This appears to confirm that some other brine source, such as the piping leak found near the low pressure pump pad, is affecting MW3.

Despite frequent fluctuations, there is no well-defined salinity trend observed at well MW4. This well is situated away from and down gradient of the brine pond and the effects observed near higher salinity well MW3. Changes in sampling methodology implemented in 1995 and 1996 may have affected the historical trending at this position but overall a general 5-year decreasing trend is evident with the data.

All of the data taken from the verification wells maintained beyond the original scope, with the exception of PW7, do not reveal any noticeable time trends to date. All data points are essentially the same over the 2 – year period. At PW7, however, an order of magnitude "jump" was noted with the first sampling subsequent to the study which has remained constant since that time through two additional samplings in 1997. This tends to support a conclusion that the original TDS value of 4.7 ppt was somehow "skewed" or affected either by incomplete development or laboratory error. The newer values in the 40 ppt range may represent a local impact associated with previous owner activity or proximity to a historical brine release or spill. Additional temporal data will assist with this determination.

Future ground water data, including that from the newly added wells from the Phase II verification studies and ongoing inspections of the brine pond and site piping will assist in determining if any contamination observed originated from SPR activities.

6.2 BIG HILL

The three major subsurface hydrological formations in the Big Hill area are the Chicot and Evangeline aquifers and the Burkeville aquitard. The major source of fresh water is the Chicot Aquifer which is compressed over the Big Hill salt dome. Fresh water in the upper Chicot Aquifer is limited from near the surface to a depth of -30 m (-98

ft) mean sea level. The town of Winnie uses fresh water from the upper Chicot Aquifer. Beaumont and Port Arthur draw fresh water from the lower Chicot Aquifer.

Sampling of six monitoring wells (wells MW1 to MW6) around the brine disposal pond system (Figure 6-3) began in 1987. Big Hill began sampling these wells by the low-flow method in May 1995. The pond system is composed of three Hypalon-lined ponds, of which two have a protective concrete top coat. All three have an underdrain system contained within a slurry wall keyed to a clay bed. Salinity data collected from the six wells for the past five years indicate a consistency among them. Salinity of ground water from all wells remained at or below the detection limit (1.0 ppt) of the salinity meter used (Figure 6-4). All observed values that are below detection limit were evaluated as one-half the detection limit for statistical calculations. Observed salinity changes are too low to indicate contamination.

Also located on the site are 16 two-inch brine piping leak detection monitoring wells (MW2-1 to MW2-16). These wells were sampled by the traditional pump and purge technique and have been converted for low-flow sampling on a bimonthly schedule. Unlike those around the brine pond, these smaller wells are installed adjacent to buried onsite brine piping to detect brine should a leak occur. In many instances, they are not deep enough to intercept the shallow uppermost aquifer (Figure 6-3). As a result, 7 of these 16 wells were not capable of yielding a sample of ground water for testing in 1997. Since 1996, four of the seven wells have been are damaged and will not be replaced. An additional well was permanently taken from service due to life extension construction in 1997. The other two were found dry during the year.

Of the nine remaining wells, samples were obtained on a very sporadic schedule during CY1997 using a modified low flow sampling method. All measurements made on these wells, with exception of two, were found to be below the method detection limit of 1.0 mg/l. The two

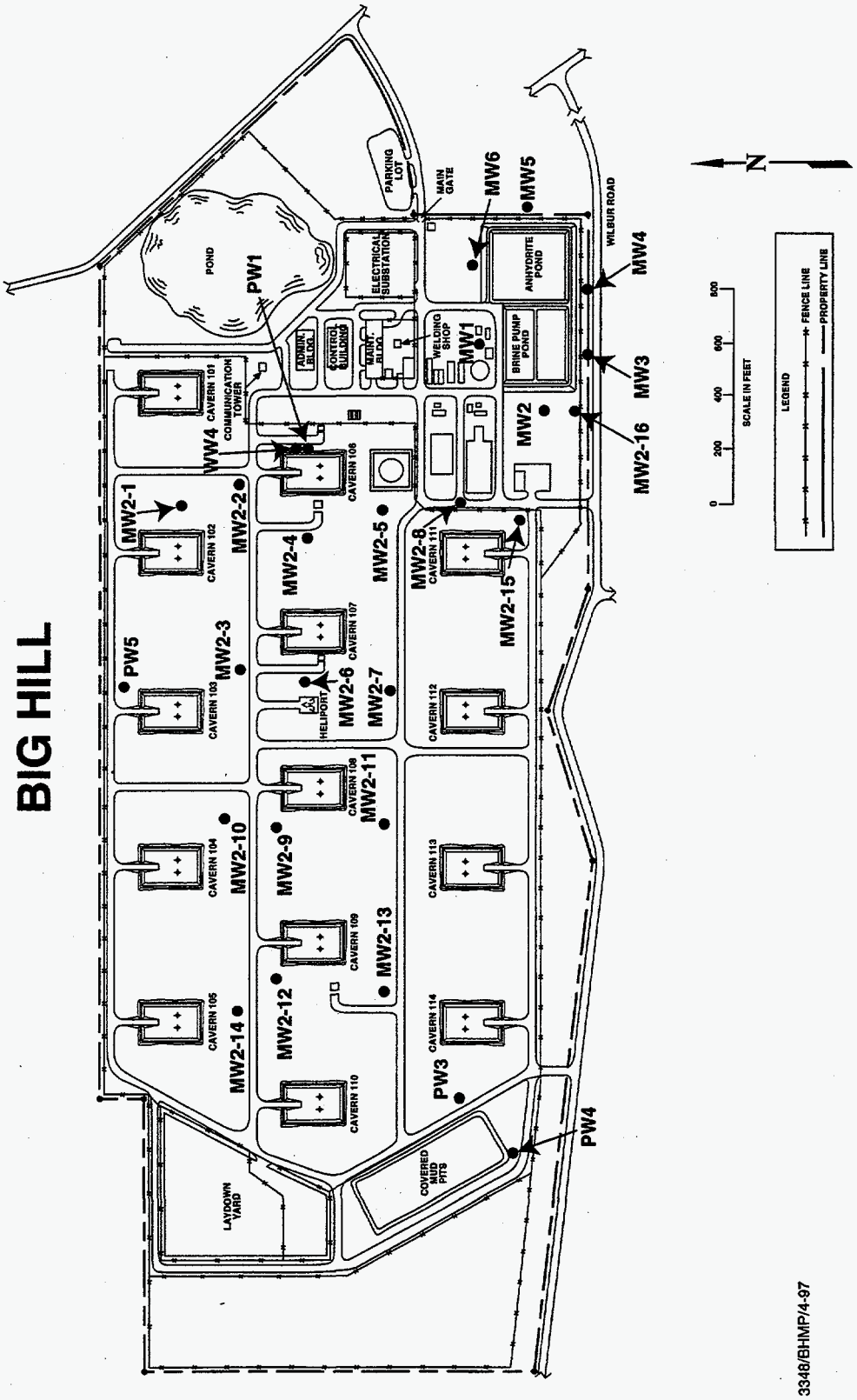


Figure 6-3.
Big Hill Ground Water Monitoring Wells

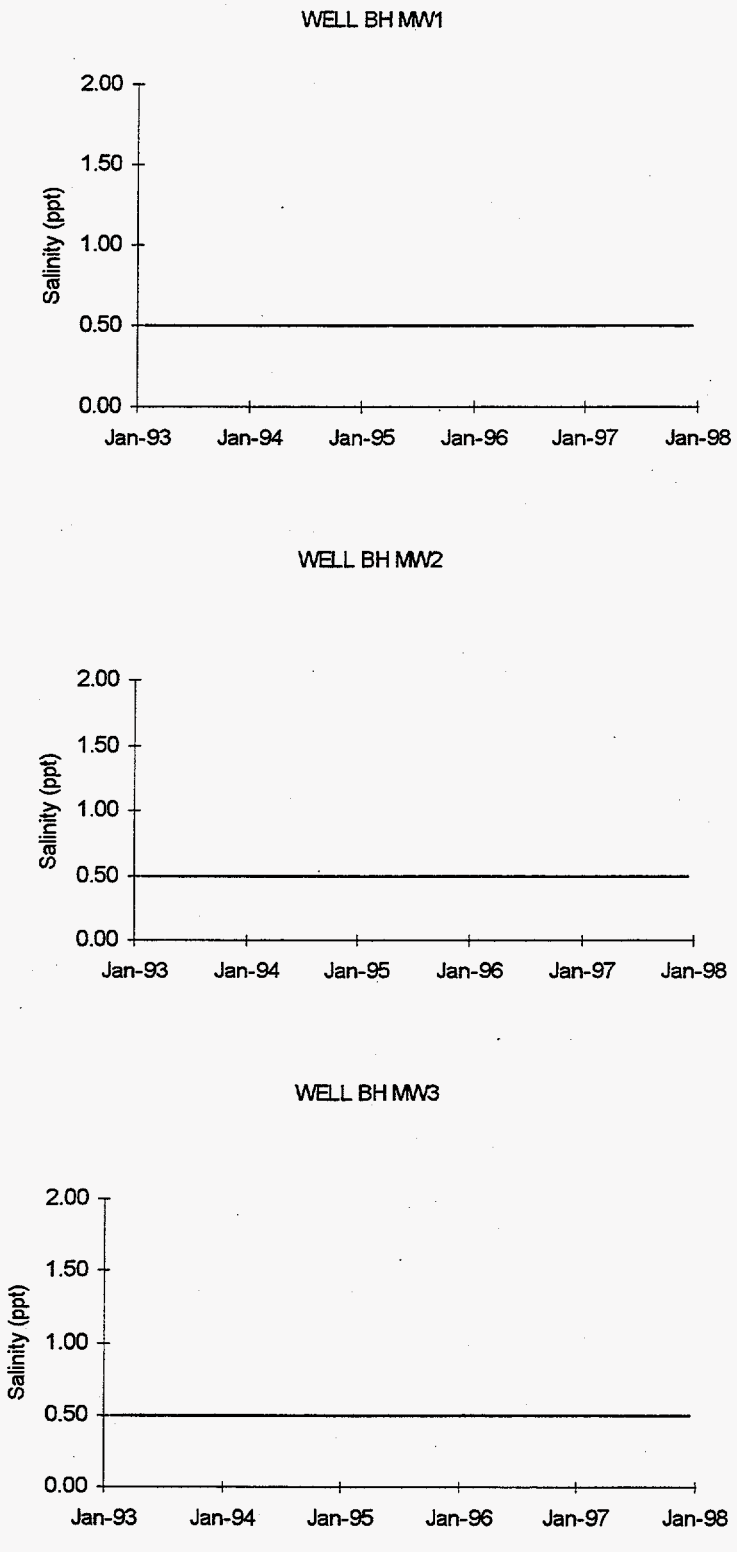
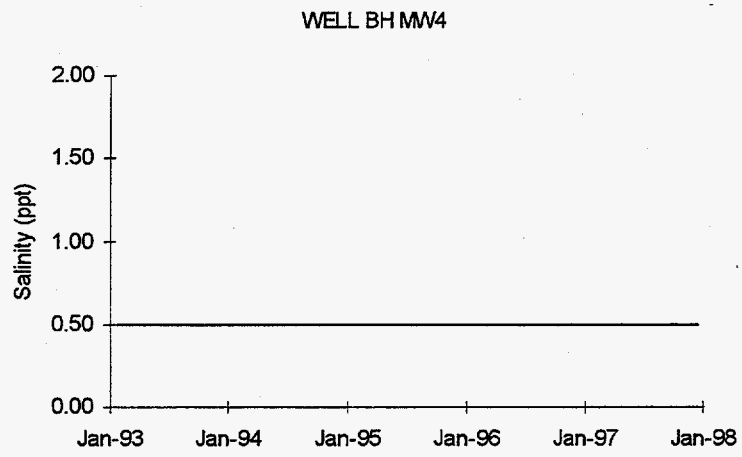
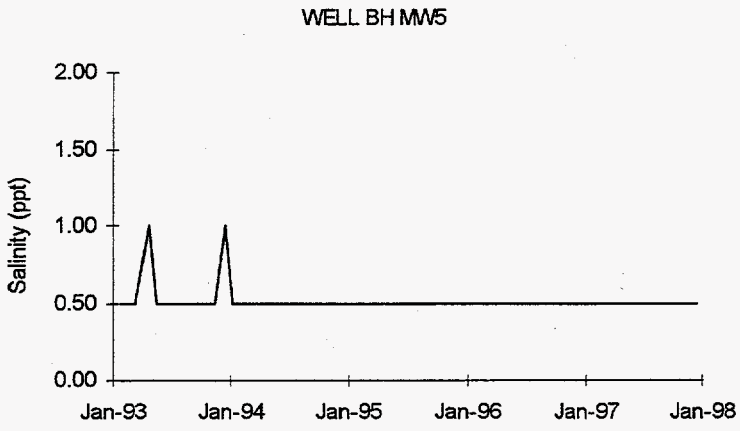


Figure 6-4.
Big Hill Ground Water Monitoring Well Salinities





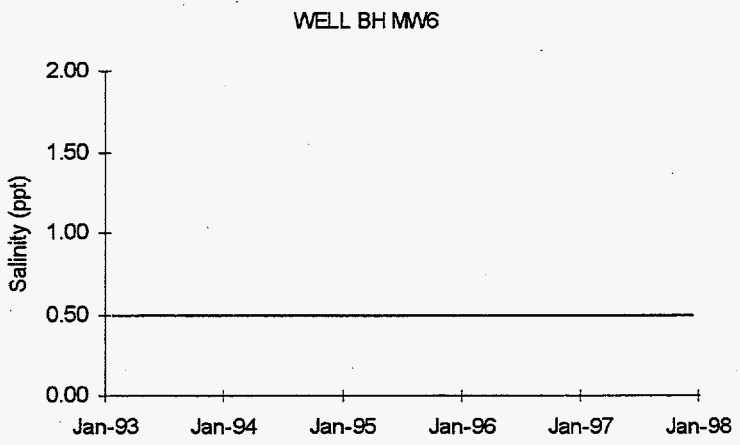


Figure 6-4. (Continued)
Big Hill Ground Water Monitoring Well Salinities

quantifications found above the detectable limit were both below 2.0 mg/l (1.2 at well MW2-8 in April; and, 1.7 at well MW2-11, also in April). All of these wells will be abandoned upon conclusion of the life extension work which moves the underground piping to an aboveground position precluding the need for underground leak detection.

6.3 BRYAN MOUND

Site monitoring wells installed in 20 and 50 foot bls water bearing zones indicate that no fresh water exists over the salt dome. This generalization is confirmed by the additional salinity data from the verification well study (VWS). However, the Chicot and Evangeline Aquifers are fresh to slightly saline in the Bryan Mound area, and fresh water for Brazoria County is obtained from the upper portions of the Chicot up-gradient of the Bryan Mound area.

Fifteen monitoring wells have been drilled at Bryan Mound in four phases between 1981 and 1990 (Figure 6-5). Sampling began shortly after installation. Bryan Mound began using a modified low flow technique for sampling these wells in September 1995. Wells BP1S, BP2S, and PZ2S have been removed from monitoring service due to casing damage. BP1S is discussed further below. Five additional shallow well locations and one additional deep well were installed in 1996 as part of the VWS and all of these have been added to the monitor well net.

A 1991 study determined that site ground water movement in the shallow (20 foot bls) zone was in the northerly direction toward Blue Lake while that of the deep (50 foot bls) zone was in the southeasterly direction toward Mud Lake. Local movement is affected by the domal upthrusting and the data from the VWS wells remaining after the study have provided for a re-evaluation. With these new, more peripheral, well locations it is believed that the shallower zone is influenced more by the topography and appears to be flowing radially (in all directions) off the dome. The flow direction in the lower zone is a bit more easterly. Both of these aquifers exhibit a very low average linear velocity (ranging from 5 to 10 ft/yr) due to the combined effects of the

BRYAN MOUND

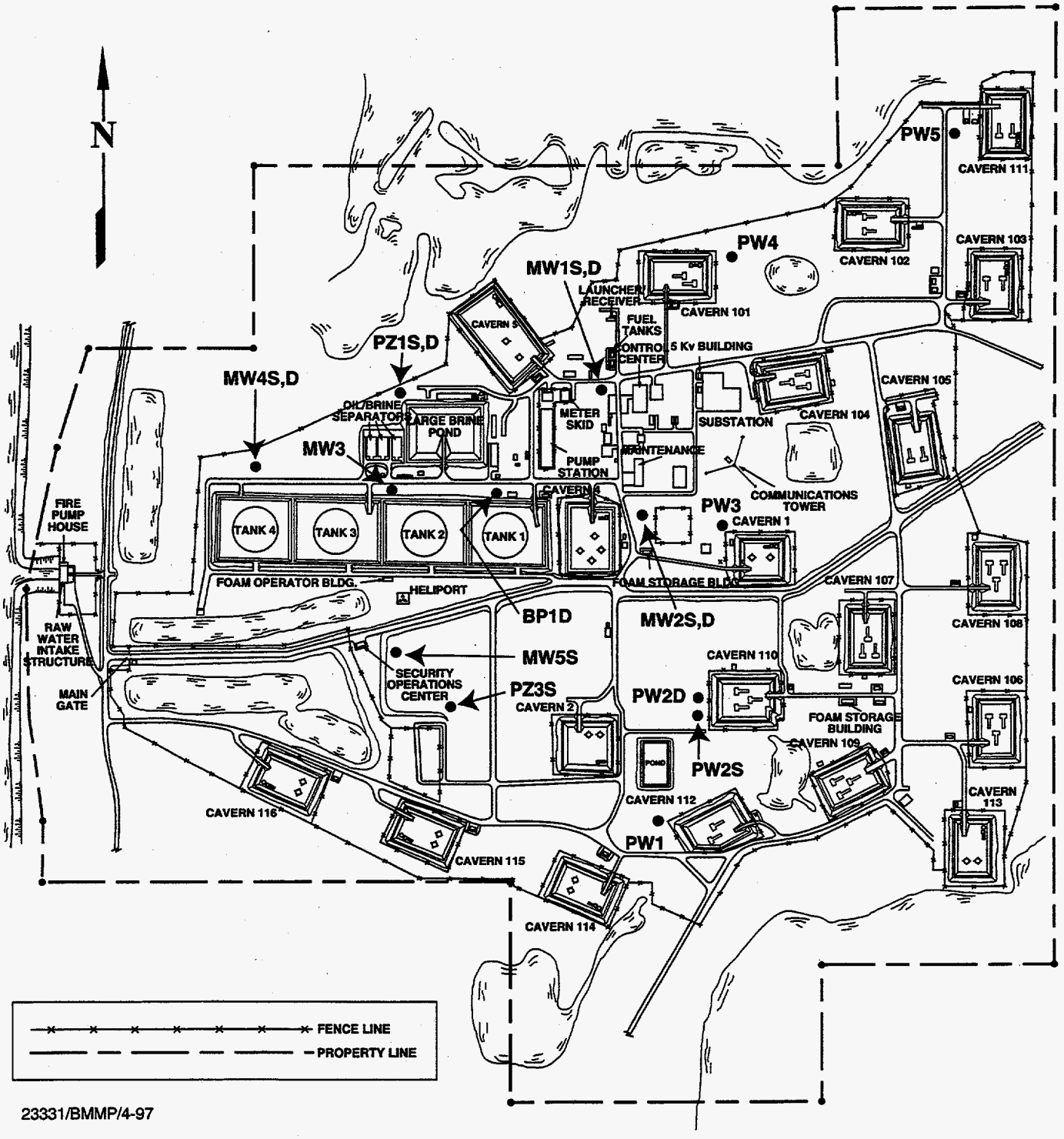
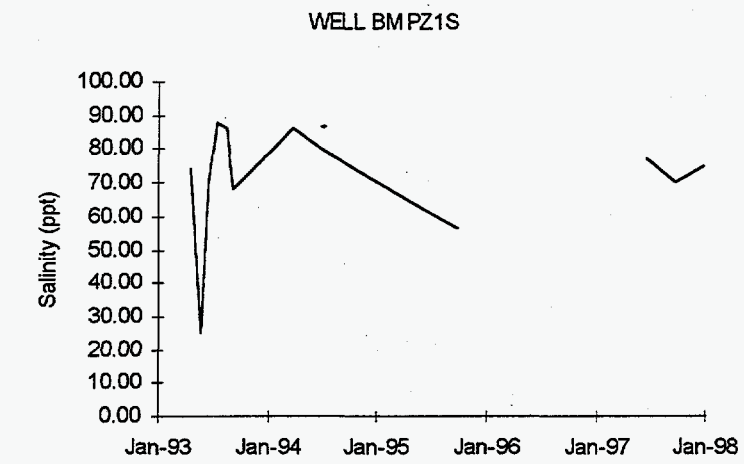
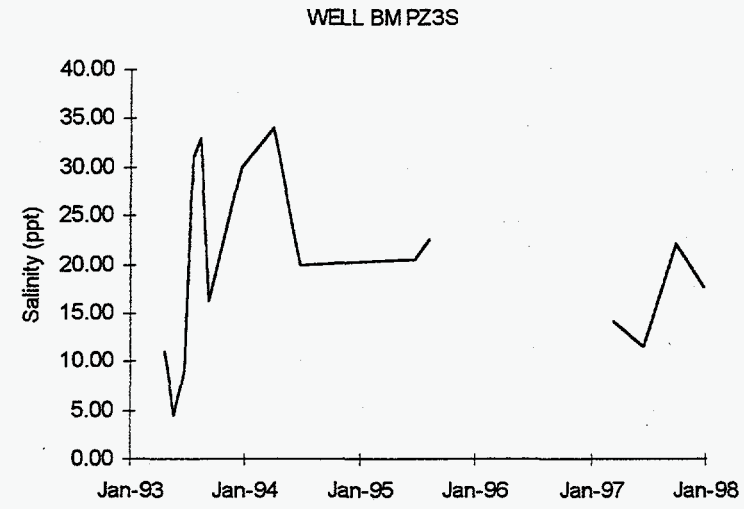


Figure 6-5.
Bryan Mound Ground Water Monitoring Wells





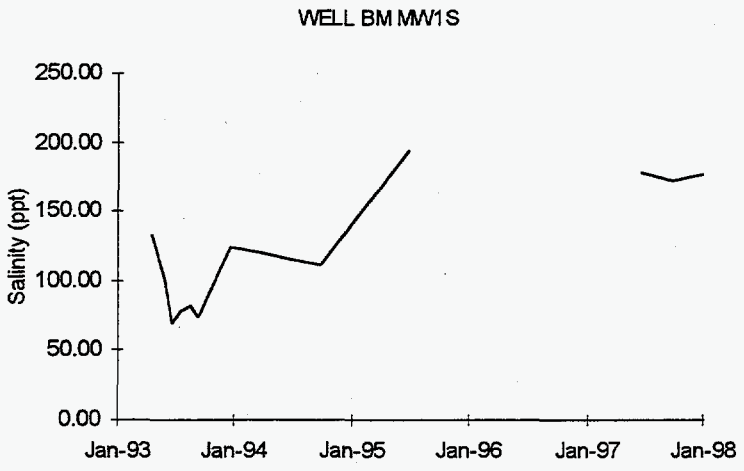
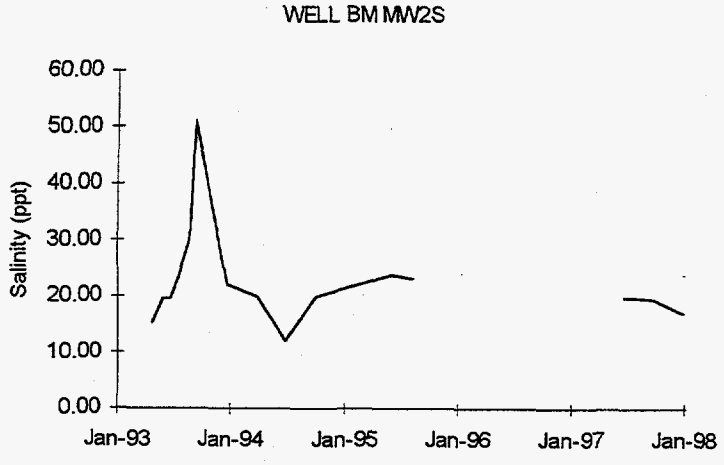
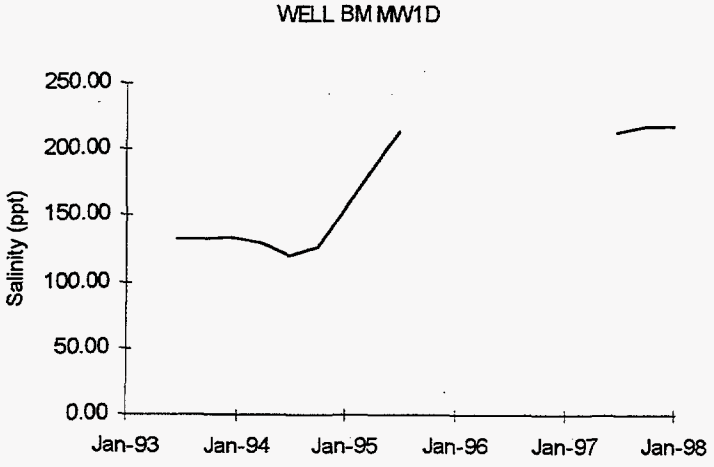


Figure 6-6 (Continued)
Bryan Mound Ground Water Monitoring Well Salinities





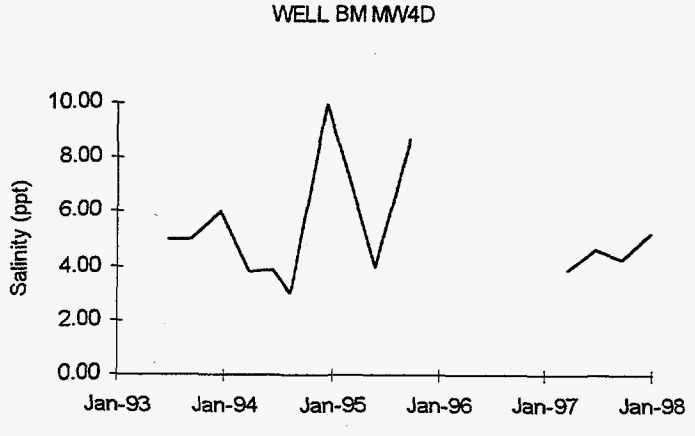
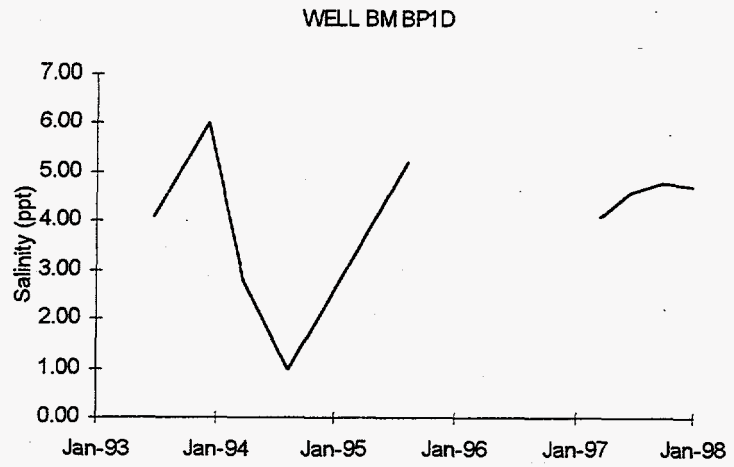
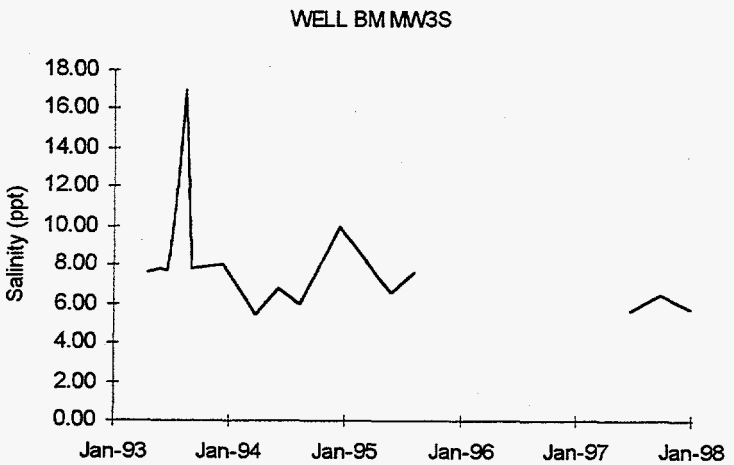


Figure 6-6 (Continued)
Bryan Mound Ground Water Monitoring Well Salinities





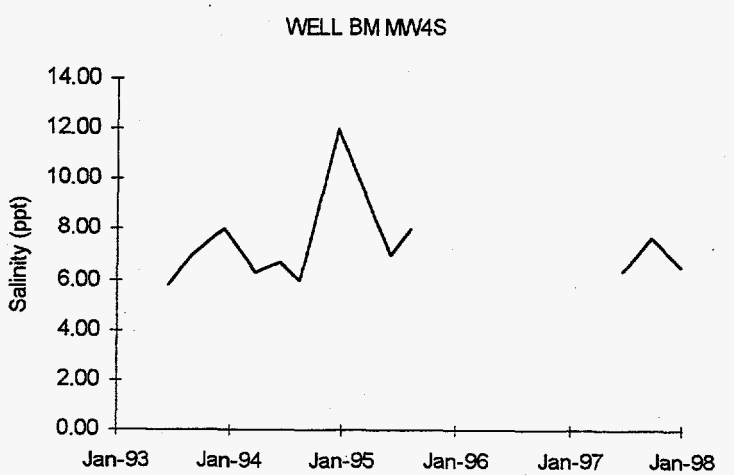


Figure 6-6 (Continued)
Bryan Mound Ground Water Monitoring Well Salinities

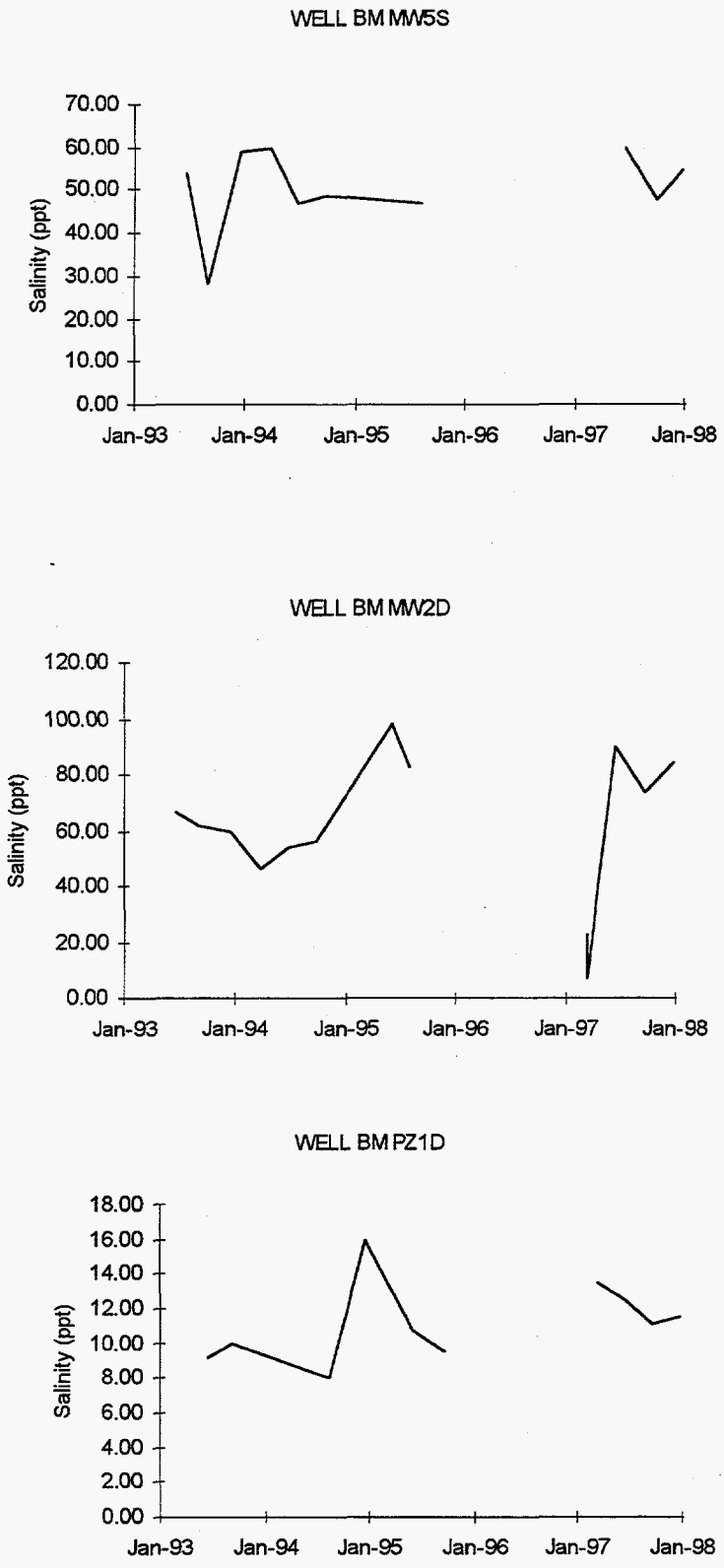


Figure 6-6 (Continued)
Bryan Mound Ground Water Monitoring Well Salinities

clay content of the water bearing strata and very low hydraulic gradients (ranging from 0.002 ft/ft to 0.004 ft/ft). This characteristic reduces the risk of contaminating the potable portions of the aquifers on the salt dome.

Three areas where ground water salinity exceeds ambient (or unaffected) for the Bryan Mound site (greater than 20.0 ppt) have been located. The first area stretches from the brine pond eastward to the brine pump pads and to the vicinity of a brine pond demolished by DOE in 1989. Historical operations (pre-dating DOE ownership) included brine retention in two separate elongated abandoned ponds reclaimed (filled) by DOE in this same area. These historical operations were associated with the brine generation process of a former owner/operator. The second area lies southeast of the security operations center (SOC) adjacent to a closed anhydrite confinement area, and the third lies south of the maintenance building.

Elevated salinity observed at shallow monitor wells since their installation, PZ1S, MW1S, and BP1S, has been speculated as associated with brine pond activity. The large brine pond with a Hypalon (chlorosulfonated polyethylene) membrane was constructed in 1978. The pond was subsequently renovated and enlarged with installation of a new Hypalon liner and a concrete weight coat in 1982. The Bryan Mound brine pond is scheduled for replacement with an aboveground tank in CY 1998. Ground water salinity observed in the pond area and to the northeast and east could be the result of previous or continued seepage from the pond, from adjacent buried piping, or from proximity to former (pre-DOE) operations. Salinity of deep complements to wells PZ1S and BP1S (PZ1D and BP1D) are much lower and considered ambient for the site. They indicate no contamination of the deep zone around the present pond and no apparent direct communication with the shallow zone in this area. Data from the VWS completed in the summer of 1996 indicate that the primary location of shallow zone salinity impact is in the area of well MW1S, which is mirrored by elevated salinity in the underlying deep zone around MW1D. This is the location of former in-ground unlined

brine retention from pre-DOE operations. The high salinity of the deep well may also indicate limited up-gradient communication of the two zones in that area.

The current brine pond was stripped of its pumping capability in the fall of 1997. The pumps were removed and relocated to a position close by the newly converted above ground brine storage tank. The annual structural inspections of the brine pond continue to be made and reported as required to the RCT. These inspections indicate no obvious structural compromises of the pond's integrity as it remains in viable service until the contents are pumped down and the pond is officially closed commencing in the CY1998 time frame.

Southeast of the SOC, in a second area where high salinity ground water is found, an anhydrite disposal area used during early construction and leaching phases of the site may be a source of brine contamination. The contamination is intercepted in the shallow zone by wells MW5S and PZ3S and has been relatively consistent over the long term.

A brine contamination source in a third area of elevated salinity, near the maintenance building, has not been identified or associated with any known historical operations or incidents, and probably pre-dates SPR activity. Salinity measurements exceeding ambient levels are observed in both zones at wells MW2S and MW2D.

Brine contamination is not evident at the northwest corner of the site. Shallow zone monitor wells MW3S and MW4S near the southwest corner and west of the brine pond, respectively, have remained relatively stable in the 5 to 10 ppt range. The ground water salinity at the northwest corner of the site is consistent with salinity observed in Blue Lake, the adjoining surface water feature.

Wide salinity fluctuations observed in Figure 6-6 graphs prior to 1993 are due to changing sampling methodology. Observed salinity was directly related to the degree and consistency of well purging prior to sampling. A consistent purging methodology was instituted in

September 1993, and a modified version of the newer low flow technique sampling technique was instituted in the fall of 1995.

Salinity trends are evident in contaminated and uncontaminated areas. Elevated ground water salinity measurements in both zones in the brine pond and pump pad area have remained relatively constant overall, despite the fluctuations noted which are believed to be an artifact of an inconsistent sampling technique.

An overall step change in salinity is evident for 1995 at both wells MW1S and MW1D which is possibly related to the change to a modified low-flow sampling method.

High salinity measurements observed in the shallow zone near the SOC and in both the shallow and the deep zones near the maintenance building appear to be stable or just slightly increasing over the long term and not indicative of any significant or noteworthy releases or events. Salinity observed in uncontaminated deep and shallow zones at the northwest corner of the site reveal on overall flat or slightly decreasing 5-year trend; each showing minor inconsequential fluctuations for the calendar year 1997.

6.4 ST. JAMES

The Chicot Aquifer is the principal regional aquifer at St. James. The upper strata of the Chicot Aquifer is in direct hydrologic contact with the Mississippi River. Most of the ground water contained in this aquifer is slightly brackish. In the St. James area only the uppermost units contain fresh water.

No ground water monitoring wells have been installed at the St. James site due to the absence of brine and chronic crude oil spills. Underground diesel and gasoline tanks removed in 1995 were found to

have leaked. Resulting contaminated soil was removed and remediated to the satisfaction of the state.

As a result of "due diligence" studies undertaken prior to property transfer to Shell Oil Pipeline, crude oil was located on the shallowest perched water table at two limited areas at St. James. Notification was made to LDEQ in January 1997. Additional remedial investigations and remedial actions were implemented through CY 1997. As a result, one of the areas has been approved as "no further action needed" by the state, and crude oil removal efforts continue into CY1998 on the other.

6.5 WEEKS ISLAND

The Chicot formation is the principal aquifer in the Weeks Island area. The aquifer surface is at approximately sea level near Weeks Island and slopes slightly northwest towards a cone of depression attributed to heavy withdrawals in the Lake Charles area. The fresh water sand layers provide water for the local area.

A sink hole found four years ago on Morton Property which could potentially affect crude oil storage in the underlying mine has prompted further investigation and relocation of the crude oil stores and decommissioning of the Weeks Island site. The sink hole, located east of the mine's crude oil fill hole, continued to grow since 1993 until arrested by construction and maintenance of a freeze wall plug created in the water table around the throat of a suspected crevasse leading down into the top of the salt formation. This plug has effectively abated communication of ground water with the oil storage chamber. Relocation of the bulk of the mine inventory to Bayou Choctaw and Big Hill began in 1995 and was completed in November 1996. Pumps are now being reconfigured for four phases of skimming operations designed to maximize removal of the remaining oil. Five ground water monitoring points outside of the freeze plug have been identified and background or ambient conditions are currently being monitored to assist with post decommissioning long-term monitoring.

The VWS studies were used to further the characterization efforts of the water table aquifer at the Weeks Island site and to install an additional well completing the "net" for the subsequent long-term monitoring proposed. From these long-term monitoring positions, ground water was determined to flow generally toward the northwest at an approximate average linear velocity of around 75 feet per year based upon the gradients observed and the fairly large permeabilities measured.

The Weeks Island long-term monitoring program involves triennial sampling visits made until the mine is deemed closed. Periodic samplings will then be used to compare to the background conditions established prior to closure. The primary compound of concern is crude oil so the parameter total petroleum hydrocarbons (TPH) is used to screen for any crude oils present. The background thus far established indicates no TPH found in any well at the limits of detectability of the method of 5 mg/l.

6.6 WEST HACKBERRY

The Chicot Aquifer, which flows closest to the surface in the Hackberry area, contains predominantly fresh water with salinity increasing with proximity to the Gulf of Mexico. The majority of the ground water pumping from the Chicot Aquifer takes place in the Lake Charles area. Pumping is so great that a cone of depression has been created which has reversed the flow direction to the north. The fresh/saline water interface is approximately 213 m (700 ft) below land surface (bls). Zones contaminated and monitored at West Hackberry are near the surface, the shallow zone at roughly 6 m (20 ft) bls and the deep zone at roughly 15 m (50 ft) bls. Situated directly atop the salt dome and given the long industrialized history of the site and the immediate area, a 10 ppt cut-off for salinity is used in comparisons for determining affected and unaffected waters as ambient conditions have been found highly variable across the site.

The 1991 Contamination Assessment Report and Remedial Alternatives Analysis identified the brine pond as a source of ground water contamination. The brine pond is one of five adjoining ponds

comprising a pond system that contains brine and anhydrite solids pumped from the storage caverns. As an abatement measure, the brine pond was cleaned, and cracks in the walls and floor were grouted to stop leakage. Ground water recovery around the pond was also increased. The West Hackberry brine pond is scheduled for decommissioning in October 1998. Details provided by the VWS in 1996 indicate that the two zones contrast sharply in permeability, and as a result, their estimated linear velocity measurements are quite different. The range of flow rate estimated for the shallow zone is from 50 to 200 feet of movement per year, which results from both variable permeability values and varying gradients across the site. The deep zone exhibits a generalized flow rate estimate of only 7.5 feet per year, which is largely due to the more clayey nature of the sands conveying these waters and the lower gradients evident within the limited well net.

Eleven monitoring wells and 15 recovery wells (Figure 6-7) were installed on the West Hackberry site in five phases. All wells are used to monitor or control brine contamination beneath the brine pond system. West Hackberry began using the low flow technique for sampling these wells in December 1995. Salinity data gathered over the past five years at all wells are depicted in Figure 6-8. Four of the seven wells installed for VWS were retained for additional water level measuring points around the periphery of the main site.

Ground water recovery at the brine pond has improved over the past five years. Gaps in the line graphs in Figure 6-8 denote periods when pumps were inoperable or when wells were dry.

Observed recovery well salinity measurements depict a complex picture of ground water contamination beneath the pond system. Salinity is more elevated and spatially variable in the shallow zone than the deep zone with the exception of the two deep zone wells P1D and P4D on opposing west and east sides of the brine pond, respectively, where salinity inexplicable exceeds that of all other wells.

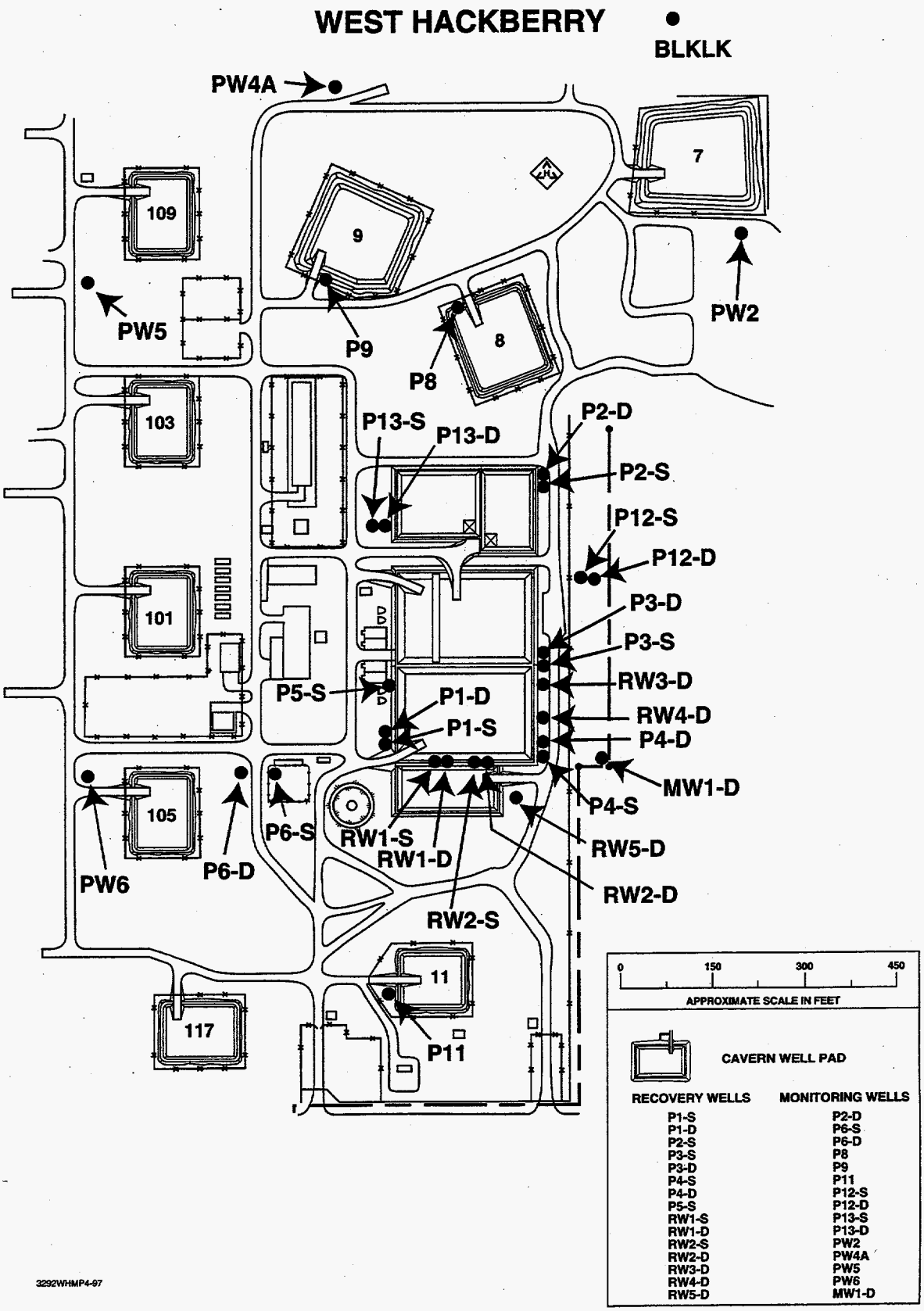


Figure 6-7.
West Hackberry Ground Water Monitoring Wells

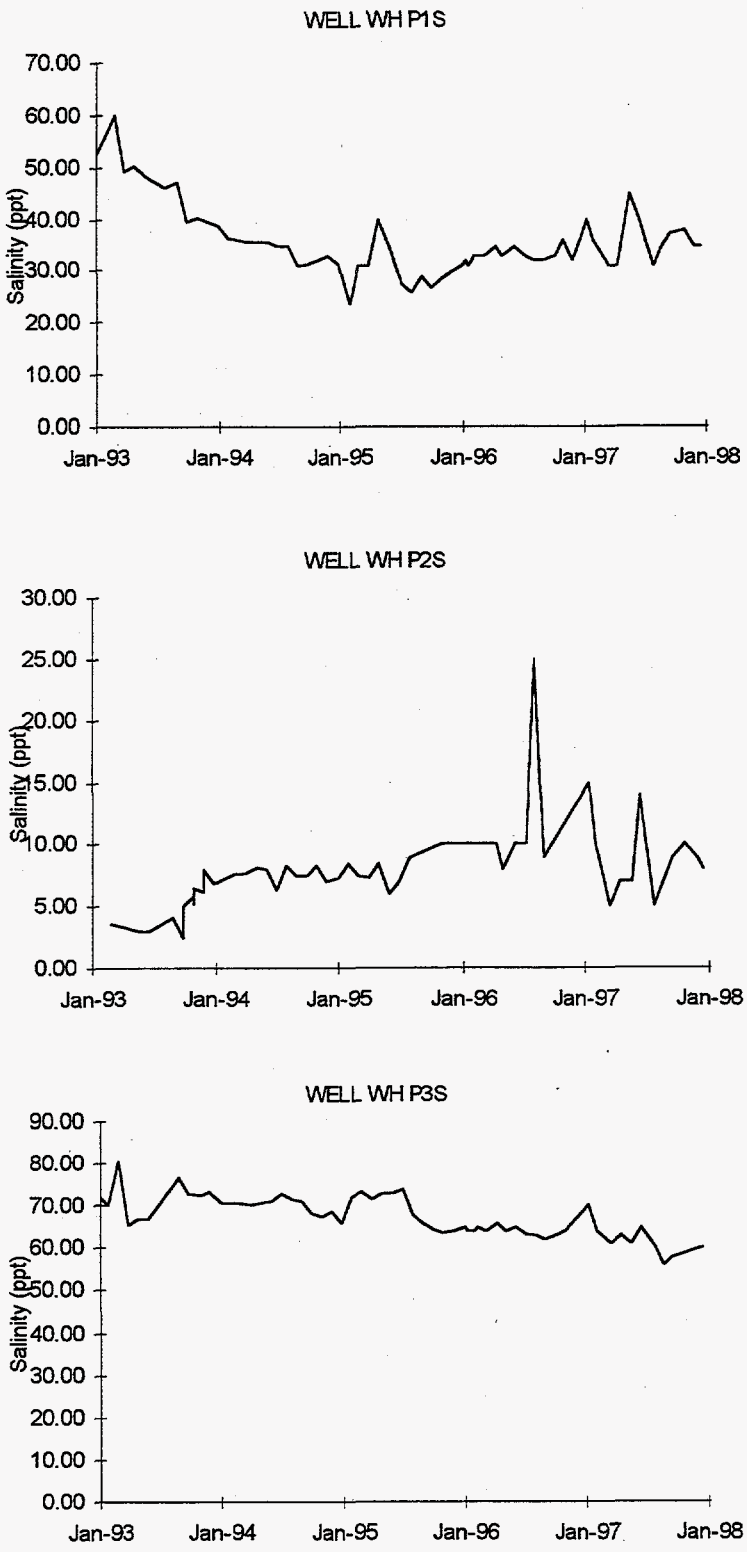


Figure 6-8.
West Hackberry Ground Water Monitoring Well Salinities

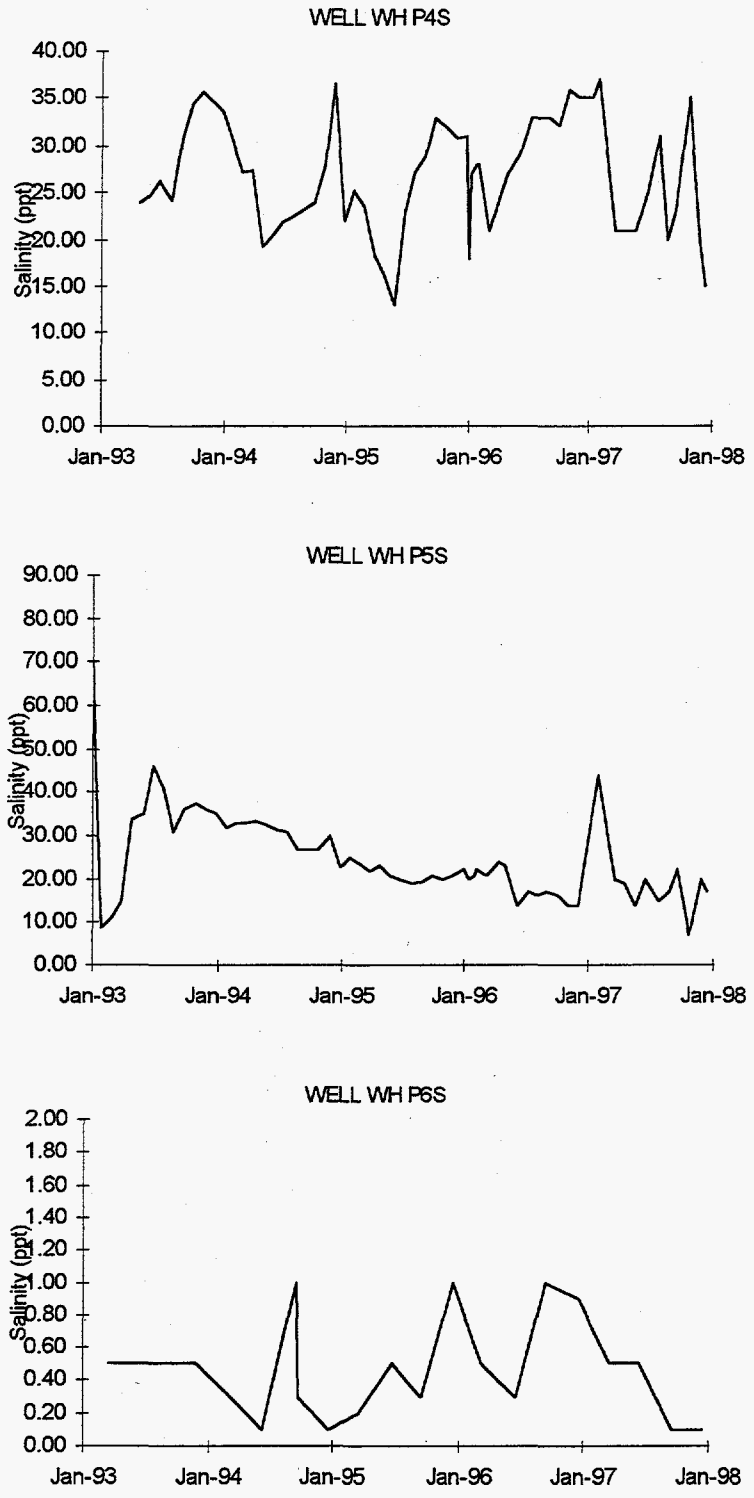


Figure 6-8 (Continued)
West Hackberry Ground Water Well Salinities

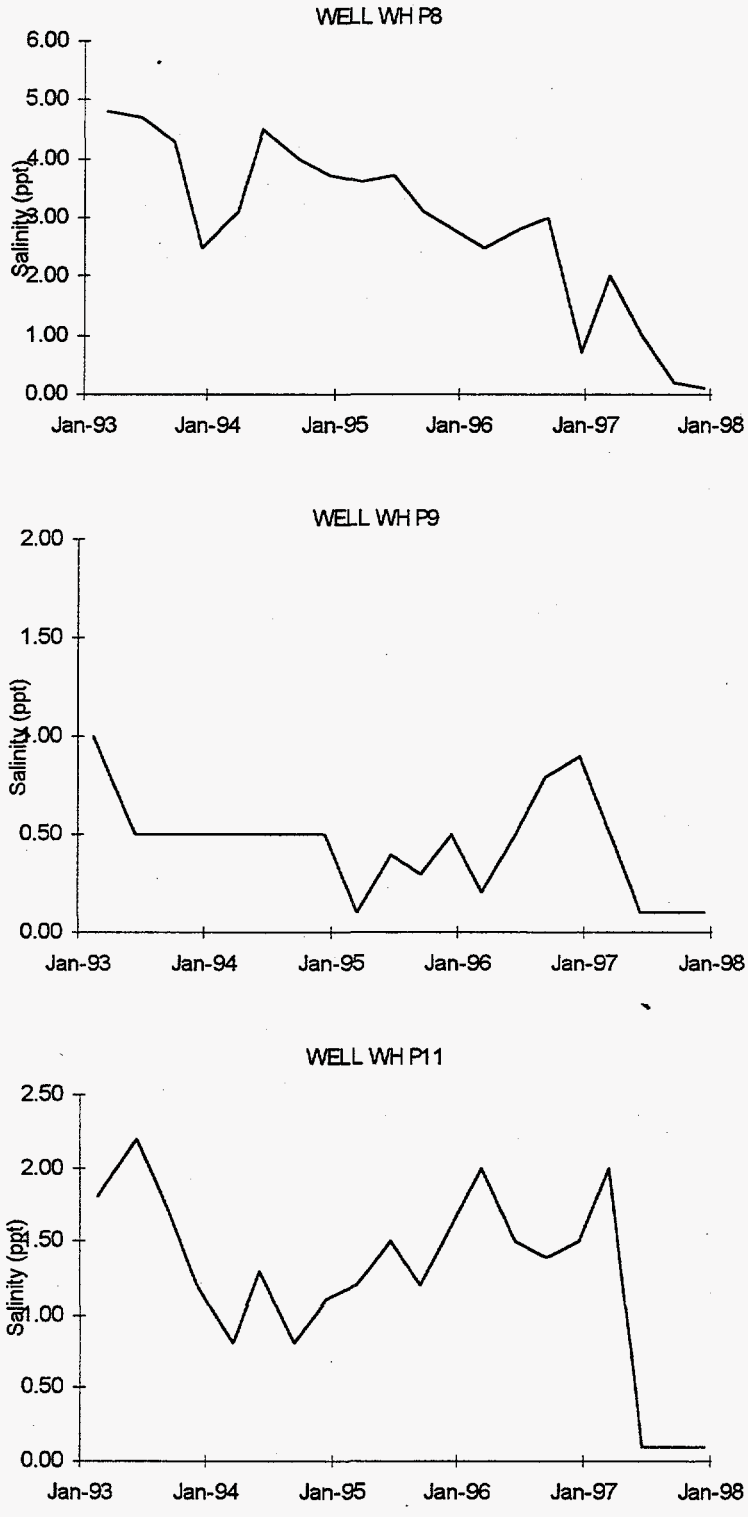


Figure 6-8 (Continued)
West Hackberry Ground Water Well Salinities

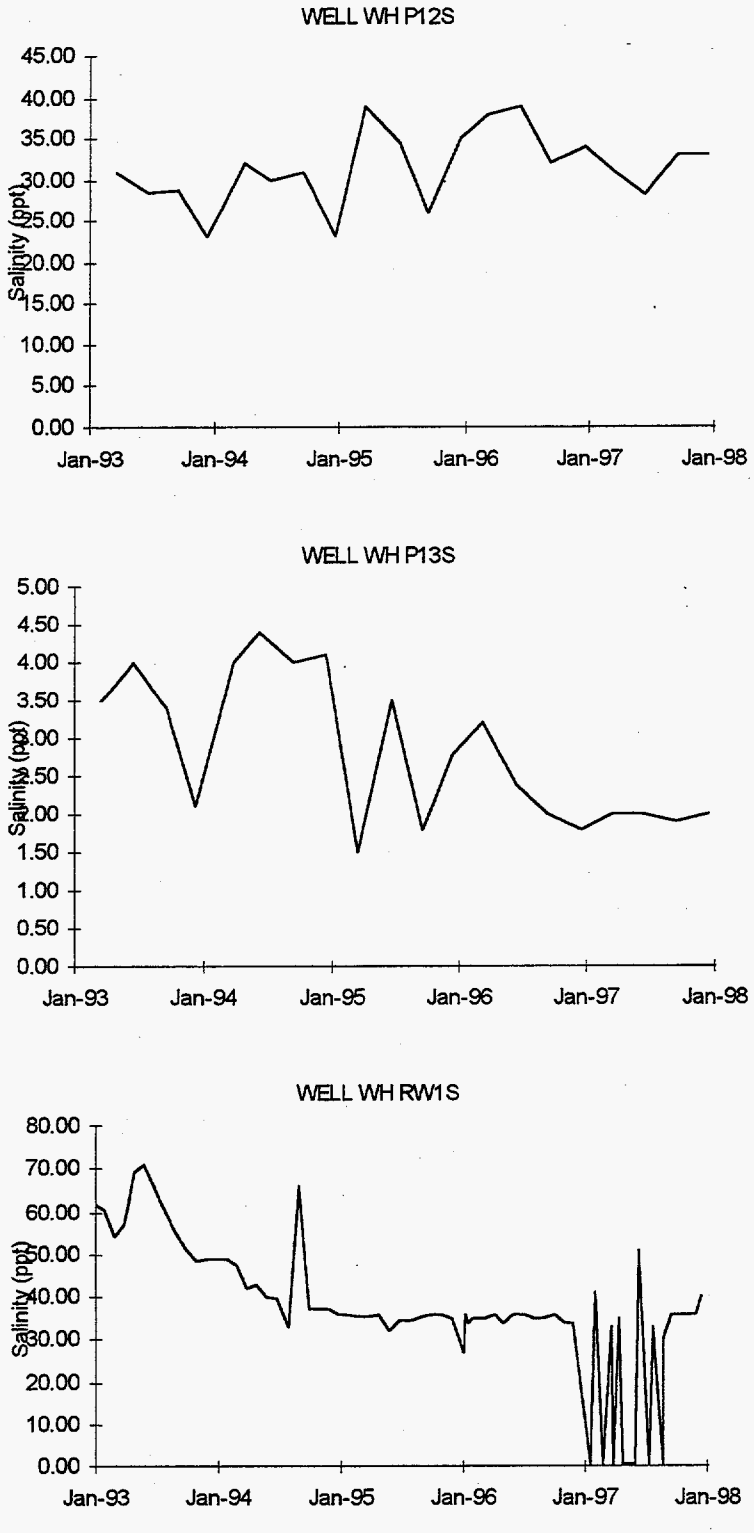


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities

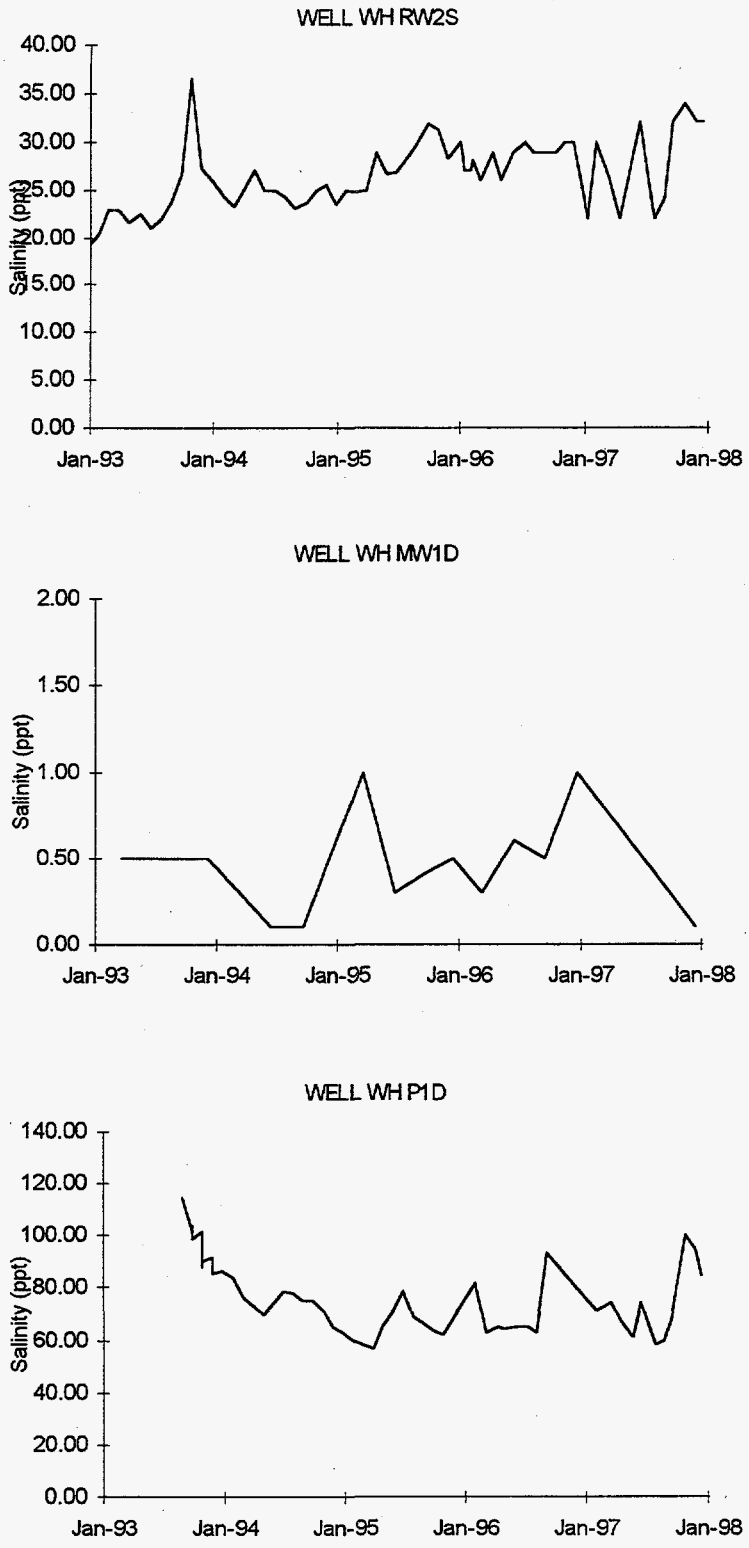


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities

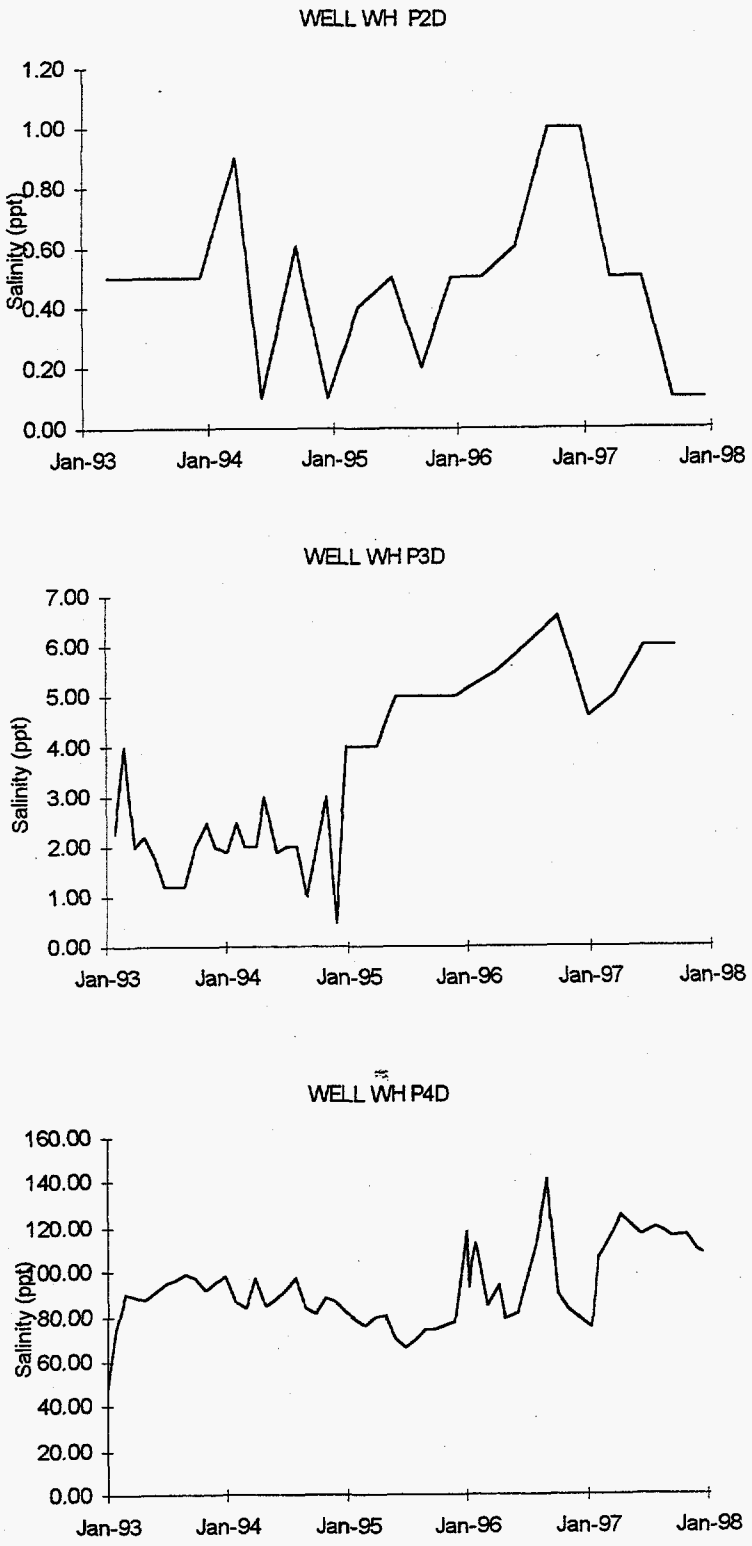
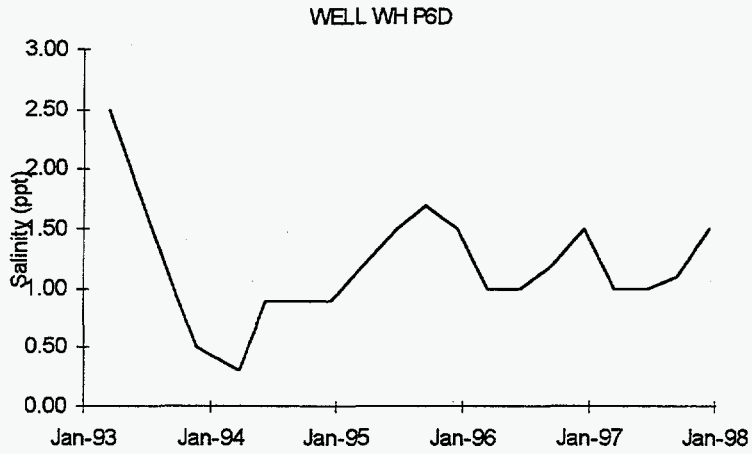
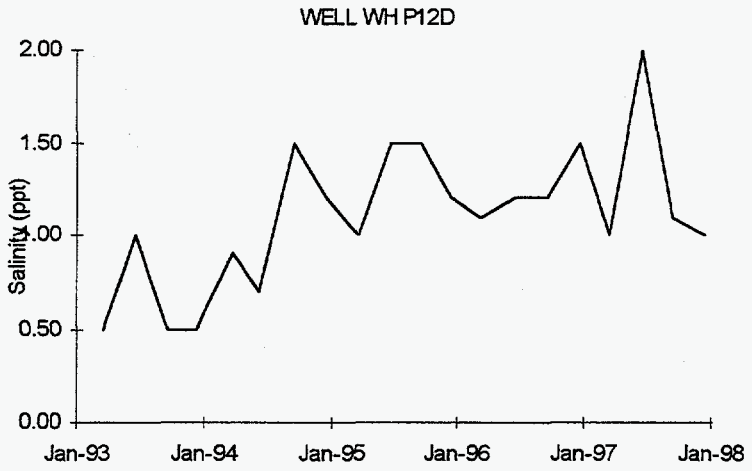


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities





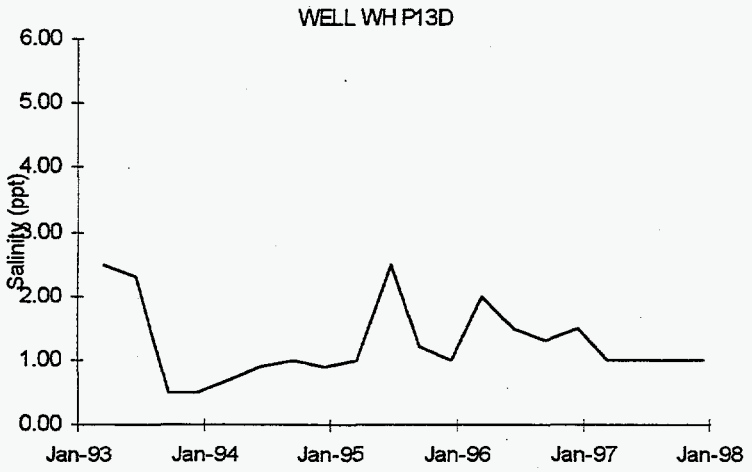


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities

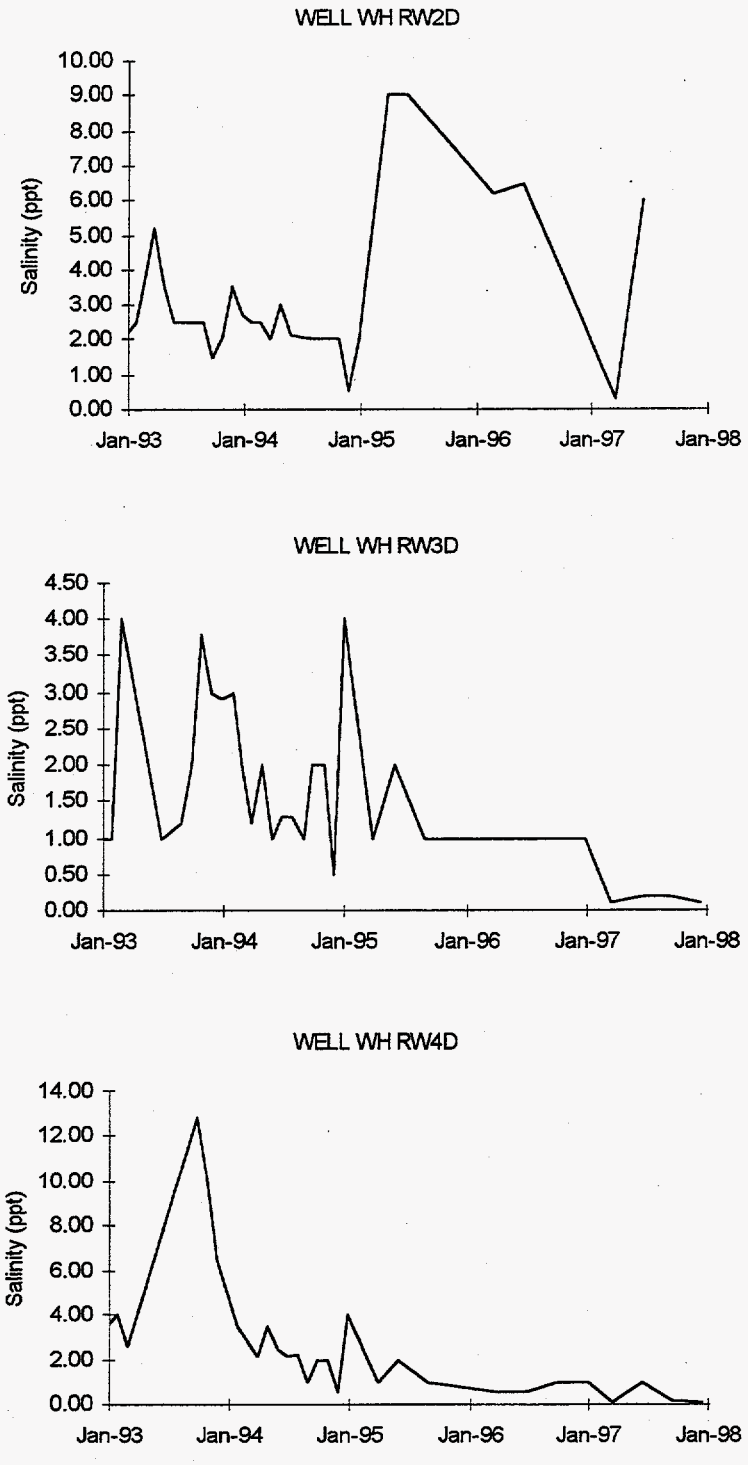


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities

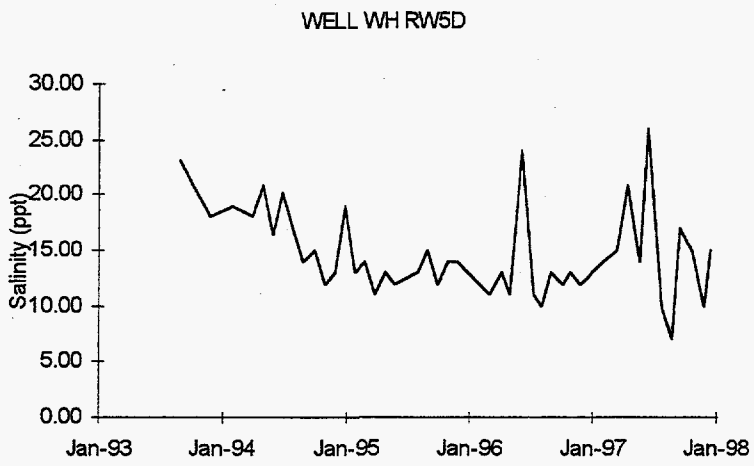


Figure 6-8 (Continued)
West Hackberry Ground Water Monitoring Well Salinities

A brine plume exists in an east-northeastward shaped ellipse beneath the brine pond in the shallow zone from the southwest corner over to Well P3-S. Its saline ground water is captured by six recovery wells. Wells P1S and P5S intercept the plume on the west side of the pond, wells RW1S and RW2S on the south side, and P3S and P4S on the east side. Wide salinity fluctuations of data graphs are attributed to salinity stratification in the wells and oscillating cones of depression. Prior to mid-1993, submersible recovery well pumps ran intermittently and could not maintain a stable cone of depression or resultant stable salinity. A salinity peak exceeding 200 ppt in January 1993 in Well P5S was caused by a brief siphoning of brine from the pond into the well.

A slight decreasing salinity trend is observed at wells P1S, P5S, and RW1S along the west side of the brine pond. A stable to slightly increasing salinity trend is apparent at wells RW2S, P2S, and P3S along the east half of the pond system. With ground water movement to the east, it is expected that wells on the west side of the pond will capture more fresh, uncontaminated ground water from the west as the source of brine contamination decreases. This response may be delayed to the east.

Ground water recovery efforts may be slightly influencing certain areas and wells around the pond in a positive way. For example, the general

declining trend evident with well P3S along the east side of the pond is notable in as much as this well is located directly in the middle of the shallow zone plume and is direct downgradient flow path from the pond.

It appears that elevated deep zone salinity is limited to wells P1D and P4D since no effects have been identified elsewhere in the deep well network. The salinity in deep zone recovery wells RW1D and RW2D near high salinity P1D, and wells P3D, RW3D, and RW4D north of high salinity P4D, remain near ambient although trending slightly downward. The salinity of deep recovery well RW5D south of P4D remains above the unaffected cut-off of 10.0 ppt (16.5 ppt annual average for 1997) and is apparently situated along the edge of the same contaminated area intercepted by P4D.

Shallow monitoring wells P8, P9, and P11 at caverns 8, 9, and 11, respectively, are located away from the brine pond and intercept unaffected waters that are near ambient levels compared to up-gradient well P6S. These wells have exhibited a gradual freshening over the past five years, but wells P8 and P11 have detected slight localized contamination. The source of contamination at P8 was not determined. However, the temporary elevated salinity observed at well P11 resulted from a brackish water leak four years ago from piping of a nearby fire water system. As the graph depicts this area's ground water has returned to background conditions.

Shallow zone monitoring wells P6S, P12S, and P13S, and deep zone monitoring wells P2D, P6D, P12D, P13D, and MW1D are nearer the brine pond than wells at the caverns and, with the exception of well P12S , also intercept ambient ground water. Well P12S is the only down gradient monitoring well that is affected by the shallow zone brine plume extending eastward from the brine pond. Its salinity remains elevated (31.28 ppt annual average in 1997) and has been generally consistent since sampling began in 1992 (range 23 to 39 ppt, Std. D = 4.24 ppt, avg. = 31.51 ppt, n = 23). Prior to 1995, well P13S was trending slightly upward, but it has since exhibited a steady declining trend returning to ambient in the past year or two. The

slightly elevated salinity may have resulted from residual localized contamination from a nearby brine line leak in 1992.

Cones of depression have been sustained in both zones as a result of successful ground water recovery. The differences in shallow and deep zone potentiometric surfaces indicate that the two zones are hydraulically separate; however, the potential is downward and combined with the increased density of saline water, contamination will tend to seek lower elevations through any natural breach or natural connection available between the two zones. The two zones behave as poorly confined units exhibiting static heads considerably above the elevations of an upper confining unit. Recharge would be expected to occur somewhere off site at an up-gradient location; however, local topographic modifications of the surrounding area from the underlying salt piercement have locally modified ground water the regional ground water movement. From the addition of several outlying shallow wells placed for the VWS, we now find that ground water contours indicate a radial flow of water subparalleling surface topography off the dome, placing a recharge potential for the shallow zone directly under the main site in a N-S trending ridge. Insufficient data are available to assess the deeper zone in a similar fashion.

7. QUALITY ASSURANCE

The SPR sites undergo periodic evaluation throughout the year in the form of yearly internal audits as well as inspections by outside federal and state agencies. The structured laboratory quality assurance program has continued through the systematic application of acceptable accuracy and precision criteria at SPR laboratories. Compliance with this and other environmental program requirements was reviewed and evaluated at each site by means of the M&O contractor's Quality Assurance Assessments, Independent Internal Assessments, and program inspections at selected sites by state and federal environmental agencies.

7.1 FIELD QUALITY CONTROL

All field environmental monitoring and surveillance activities are performed in accordance with standard procedures which are maintained in the contractor's Laboratory Programs and Procedures Manual and the Environmental Monitoring Plan. These procedures include maintenance of chain-of-custody, collection of quality control (QC) samples, and field documentation.

7.2 DATA MANAGEMENT

SPR data is generated by SPR and contractor laboratories. All data generated by SPR laboratories is recorded and maintained in bound, numbered, and signed laboratory notebooks. Contractor laboratory data and accompanying QC data is received by the site laboratory or Environmental department and retained on site as part of the original data file.

Water quality data is added to the Water Quality Database for retention, manipulation, and interpretation. This data is compiled and appears in various reports such as the Site Environmental Report, in support of assessments, evaluations, and development of appropriate responses.

7.3 EPA DISCHARGE MONITORING REPORT QUALITY ASSURANCE STUDY

The EPA entered the 17th year of its Discharge Monitoring Report Quality Assurance Laboratory Performance Evaluation program (DMR-QA LPE). Through this program, EPA ensures verifiable and consistent data generation by providing analytical laboratories of major NPDES dischargers blind samples for analysis of permit parameters. The Big Hill, Bryan Mound, and West Hackberry sites, who used to be classified as major dischargers, participated in the study in 1997. Resultant data was provided to EPA, via their contractor, on a standard report form. The results of this study indicated that the SPR laboratories performed acceptably and are approved for continued DMR/NPDES analyses.

7.4 SPR LABORATORY ACCURACY AND PRECISION PROGRAM

The SPR laboratory quality assurance program is based on the *U.S. EPA Handbook for Analytical Quality Control in Water and Wastewater Laboratories.* This program focuses on the use of solvent or standard and method blanks, check standards, and for instrumental methods, final calibration blanks and final calibration verification standards with each analytical batch to verify quality control. Additionally, replicate and spiked samples are analyzed at a 10 percent frequency to determine precision and accuracy, respectively. Analytical methodology is based on the procedures listed in Table 7-1. Several hundred of these quality assurance analyses were performed in 1997 to verify the continuing high quality of SPR laboratory data.

The EPA quality control document advocates use of quality control charts to maintain and evaluate accuracy and precision data. The SPR uses a computer program to allow rapid and exact determinations of

Table 7-1. SPR Wastewater Analytical Methodology

Parameter	Method	Source*	Description
Biochemical Oxygen Demand	5210(B)	APHA	5 Day, 20°C
	405.1	EPA-1	5 Day, 20°C
Chemical Oxygen Demand	D1252-88(B)	ASTM	Micro Spectrophotometric Proc.
	410.4	EPA-1	Colorimetric, Manual
	5220(D)	APHA	Closed Reflux, Colorimetric
Fecal Coliform	Part III-C-2	EPA-2	Direct Membrane Filter Method
	9222(D)	APHA	Membrane Filter Procedure
Residual Chlorine	4500-Cl(G)	APHA	DPD Colorimetric
	330.5	EPA-1	Spectrophotometric, DPD
	8021	Hach	DPD Method
Oil & Grease (Total, Recoverable)	413.1	EPA-1	Gravimetric, Separatory Funnel Extraction
Oil & Grease (Partition, Gravimetric)	5520-(B)	APHA	Gravimetric, Separatory Funnel Extraction
Total Organic Carbon	415.1	EPA-1	Combustion or Oxidation
	D4839-88	ASTM	Persulfate - UV Oxidation, IR
	5310(C)	APHA	
	D2579(A)	ASTM	Combustion - IR
	5310 (B)	APHA	
Dissolved Oxygen	D888-87(D)	ASTM	Membrane Electrode
	360.1	EPA-1	Membrane Electrode
	360.2	EPA-1	Winkler Method with Azide Mod.
	4500-O(C)	APHA	Winkler Method with Azide Mod.
	4500-O(G)	APHA	Membrane Electrode
Hydrogen Ion Conc. (pH)	D1293-84(A&B)	ASTM	Electrometric
	150.1	EPA-1	Electrometric
	4500-H^+(B)	APHA	Electrometric
Total Dissolved Solids (Residual, Filterable)	160.1	EPA-1	Gravimetric, Dried at 180°C
	2540(C)	APHA	Gravimetric, Dried at 180°C
Total Suspended Solids (Residual, Non-Filterable)	160.2	EPA-1	Gravimetric, Dried at 103-105°C
	2540(D)	APHA	Gravimetric, Dried at 103-105°C
Salinity	D4542-85 (Sect. 7)	ASTM	Refractometric
	2520(B) & 2510	APHA	Electrical Conductivity
	210B	APHA (16th Ed.)	Hydrometric
Biomonitoring	1006.0	EPA-3	Menidia beryllina 7 day survival
	1007.0	EPA-3	Mysidopsis bahia 7 day survival
Copper	200.7	EPA-1	Inductively coupled plasma atomic emission spectrometric method for trace element analysis of water and waste

EPA-1 = U.S. Environmental Protection Agency, Methods for Chemical Analysis of Water and Wastes, Document No. EPA-600/4-79-020, March 1983.

APHA = American Public Health Association, et al., Standard Methods for the Examination of Water and Wastewater, 17th Ed., 1989.

EPA-2 = U.S. EPA, Microbiological Methods for Monitoring the Environment: Water and Wastes, Document No. EPA-600/8-78-017, December 1978.

ASTM = American Society for Testing and Materials, Annual Book of Standards, Section 11 - Water, Volumes 11.01 and 11.02, 1990.

Hach = Hach Company, Hach Water Analysis Handbook, 2nd Ed., 1992

EPA-3 = U.S. EPA, Short Term Methods for Estimnating the Chronic Toxicity of Effluents and Receiving Waters to Marine and Estuarine Organisms, Document No. EPA/600/4-87/028.

accuracy and precision without the necessity of manual quality control chart preparation.

7.5 CONTROL OF SUBCONTRACTOR LABORATORY QUALITY ASSURANCE

The M&O Contractor subcontracts some of the required analytical work the SPR laboratories perform. The Laboratories Programs and Procedures Manual contains mandatory guidelines by which such contracts must be prepared. In addition, procurement documents are reviewed by the respective laboratory staff and M&O Contractor Quality Assurance, Operations and Maintenance, and Environmental staff. Subcontractor laboratory service vendors are selected from an approved vendors list maintained by the M&O Contractor Quality Assurance organization. The successful bidder must be on the approved vendors list prior to the start of the laboratory contract. Vendors on the approved list are periodically reassessed by the M&O Contractor Quality Assurance and Operations and Maintenance organizations.

Appendix A
SPR Environmental Standards

This page intentionally blank

Strategic Petroleum Reserve Environmental Standards

STANDARD	AREA	DESCRIPTION
10 CFR 1021	MR	Compliance with the National Environmental Policy Act
10 CFR 1022	MR	Compliance with Flood Plain/Wetlands Environmental Review
10 CFR 835	RP	Occupational Radiation Protection - Applicable and Enforceable Portions
14 CFR 77	IS	(Aviation) Objects Affecting Navigable Airspace
14 CFR 91	IS	(Aviation) General Operating and Flight Rules
14 CFR 121	IS	(Aviation) Operating Requirements: Domestic, Flag, and Supplemental Operations
14 CFR 125	IS	(Aviation) Certifications and Operations
14 CFR 127	IS	(Aviation) Certification and Operations of Scheduled Air Carriers with Helicopters
14 CFR 133	IS	(Aviation) Rotorcraft External Load Operations
14 CFR 135	IS	(Aviation) Operating Requirements: Commuter and On-Demand Operations
14 CFR 137	IS	(Aviation) Agricultural Aircraft Operations
14 CFR 139	IS	(Aviation) Certification and Operation: Land Airport Serving Certain Air Carriers
14 CFR 145	IS	(Aviation) Repair Stations
14 CFR 830	IS	(Aviation) Notification And Reporting - Accidents and Incidents
29 CFR 1903.2	IS	Posting of Notice: Availability of the Act, Regulations, and Applicable Standards
29 CFR 1903.13	IS	Imminent Danger
29 CFR 1904	MO	Recordkeeping and Reporting Occupational Injuries and Illnesses
29 CFR 1910 SUBPART A	IS,FP	General (1910.1 through .7)
29 CFR 1910 SUBPART B	IS	Adoption/Extension of Established Federal Standards (1910.11 through .19)
29 CFR 1910.20 SUBPART C	MO	General Safety and Health Provisions
29 CFR 1910 SUBPART D	IS	Walking-Working Surfaces (1910.21 through .32)
29 CFR 1910 SUBPART E	IS	Means of Egress (1910.35 through .40)
29 CFR 1910 SUBPART F	IS	Powered Platforms/Manlifts/Vehicle Mounted Work Platforms (1910.66 - .70)
29 CFR 1910 SUBPART G	IH	Occupational Health and Environmental Control (1910.94 - .100)
29 CFR 1910 SUBPART H	IS,CS,FP	Hazardous Materials (1910.101 through .120)
29 CFR 1910 SUBPART I	IS	Personal Protective Equipment (1910.132 through .140)
29 CFR 1910 SUBPART J	IS,FP	General Environmental Controls (1910.141 through .150)
29 CFR 1910 SUBPART K	MS	Medical and First Aid (1910.151 through .153)
29 CFR 1910 SUBPART L	IS,FP	Fire Protection (1910.155 through .165)

Strategic Petroleum Reserve Environmental Standards

29 CFR 1910 SUBPART M	IS	Compressed Gas and Compressed Air Equipment (1910.166 through .171)
29 CFR 1910 SUBPART N	IS	Materials Handling and Storage (1910.176 through .190)
29 CFR 1910 SUBPART O	IS	Machinery and Machine Guarding (1910.211 through .223)
29 CFR 1910 SUBPART P	IS	Hand/Portable Powered Tools and Other Hand-Held Equipment (1910.241- .247)
29 CFR 1910 SUBPART Q	IS	Welding, Cutting, and Brazing (1910.251 through .257)
29 CFR 1910 SUBPART R	IS	Special Industries (1910.261 through .275)
29 CFR 1910 SUBPART S	IS	Electrical (1910.301 through .399)
29 CFR 1910 SUBPART T	IS	Commercial Diving Operations (1910.401 through .441)
29 CFR 1910 SUBPART Z	IH	Toxic and Hazardous Substances (1910.1000 through .1500)
29 CFR 1926 APPENDIX A	IS	Designations for General Industry Standards Incorporated Into Body of Construction Standards
29 CFR 1926 SUBPART A	MO	General (1926.1 through .5)
29 CFR 1926 SUBPART B	IS	General Interpretations (1926.10 through .16)
29 CFR 1926 SUBPART C	IS,FP	General Safety and Health Provisions (1926.20 Through .35)
29 CFR 1926 SUBPART D	IS	Occupational Health and Environmental Controls (1926.50 through .66)
29 CFR 1926 SUBPART E	IS,FP	Personal Protection and Life Saving Equipment (1926.95 through .107)
29 CFR 1926 SUBPART F	IS,FP	Fire Protection and Prevention (1926.150 through .159)
29 CFR 1926 SUBPART G	IS	Signs, Signals, and Barricades (1926..200 through .203)
29 CFR 1926 SUBPART H	IS	Materials Handling, Storage, Use, and Disposal (1926.250 through .252)
29 CFR 1926 SUBPART I	IS	Tools - Hand and Power (1926.300 through .307)
29 CFR 1926 SUBPART J	IS	Welding and Cutting (1926.350 through .354)
29 CFR 1926 SUBPART K	IS	Electrical (1926.400 through .449)

Strategic Petroleum Reserve Environmental Standards

29 CFR 1926 SUBPART L	IS	Ladders and Scaffolding (1926.450 through .453)
29 CFR 1926 SUBPART M	IS	Fall Protection (1926.500 through .503)
29 CFR 1926 SUBPART N	IS	Cranes, Derricks, Hoists, Elevators, and Conveyors (1926.550 through .556)
29 CFR 1926 SUBPART O	IS	Motor Vehicles, Mechanized Equipment, and Marine Operations (1926.600 - .606)
29 CFR 1926 SUBPART P	IS	Excavations, Trenching, and Shoring (1926.650 through .653)
29 CFR 1926 SUBPART Q	IS	Concrete, Concrete Forms, and Shoring (1926.700 through .706)
29 CFR 1926 SUBPART R	IS	Steel Erection (1926.750 through .752)
29 CFR 1926 SUBPART S	IS	Tunnels and Shafts, Caissons, Cofferdams, and Compressed Air (1926.800 - .804)
29 CFR 1926 SUBPART T	IS	Demolition (1926.850 through .860)
29 CFR 1926 SUBPART U	IS	Blasting and Use of Explosives (1926.900 through .914)
29 CFR 1926 SUBPART V	IS	Power Transmission and Distribution (1926.950 through .960)
29 CFR 1926 SUBPART W	IS	Rollover Protective Structures; Overhead Protection (1926.1000 -.1003)
29 CFR 1926 SUBPART X	IS	Stairways and Ladders (1926.1050 through .1060)
29 CFR 1926 SUBPART Y	IS	Commercial Diving Operations (1926.1071 through .1092)
29 CFR 1926 SUBPART Z	IH	Toxic and Hazardous Substances (1926.1100 through .1148)
30 CFR 57	IS	(MSHA) Safety and Health Standards - Underground Metal and Nonmetal Mines
33 CFR 64	CW	Markings of Structures, Sunken Vessels and Other Obstructions
33 CFR 67	CW	Aids to Navigation on Artificial Islands and Fixed Structures
33 CFR 68	CW	Private Aid to Navigation
33 CFR 126	CW	Handling Class I (Explosive) Materials or Other Dangerous Cargo
33 CFR 153	CW	Control of Pollution by Oil and Hazardous Substances, Discharged Removed
33 CFR 154	CW	Facilities Transferring Oil or Hazardous Material in Bulk
33 CFR 156	CW	Oil and Hazardous Material Transfer Operations
33 CFR 158	HW	Reception Facilities for Oil, Noxious Liquid Substances, and Garbage (MARPOL)
33 CFR 322	CW	Permits for Structures or Work in or Affecting Navigable Waters of the U.S.
33 CFR 323	CW	Permits for Discharges of Dredged or Fill Material into Waters of the U.S.

Strategic Petroleum Reserve Environmental Standards

33 CFR 325	CW	Process of Department of Army Permits
33 CFR 326	CW	Enforcement
33 CFR 328	CW	Definition of Waters of the United States
33 CFR 329	CW	Definition of Navigable Waters of the United States
33 CFR 330	CW	Nationwide Permits
36 CFR 800	MR	Advisory Council on Historical Preservation
40 CFR 52	CA	Approval & Promulgation of Implementation Plans
40 CFR 53	CA	Ambient Air Monitoring
40 CFR 60	CA	Standards of Performance for New Stationary Sources
40 CFR 60, Appendix A	CA	Determination of Emissions from Volatile Compounds Leaks
40 CFR 61	CA	National Emission Standards for Hazardous Air Pollutants
40 CFR 63	CA	National Emission Standards for Hazardous Air Pollutant for Source Categories
40 CFR 66	CA	Assessment and Collection of Noncompliance Penalties
40 CFR 70	CA	State Operating Permit Programs
40 CFR 80	CA	Regulations of Fuels and Fuel Additives
40 CFR 81	CA	Designation of Areas for Air Quality Planning Purposes
40 CFR 82	CA	Protection of Stratospheric Ozone
40 CFR 109	CW	Criteria for State, Local, and Regional Oil Removal Contingency Plans
40 CFR 110	CW	Discharge of Oil
40 CFR 112	CW	Oil Pollution Prevention
40 CFR 116	CW	Designation of Hazardous Substances
40 CFR 117	CW	Determination of Reportable Quantities for Hazardous Substances
40 CFR 121	CW	State Certification of Activities Requiring a Federal License or Permit
40 CFR 122	CW	EPA Administrated Permit Programs: NPDES
40 CFR 124	CW	Procedures for Decision Making
40 CFR 125	CW	Criteria and Standards for NPDES
40 CFR 129	CW	Toxic Pollutant Effluent Standards
40 CFR 131	CW	Water Quality Planning and Management, Water Quality Standards
40 CFR 133	CW	Secondary Treatment Regulation
40 CFR 136	CW	Guidelines Establishing Test Procedures for the Analysis of Pollutants
40 CFR 141	CW	National Primary Drinking Water Regulations
40 CFR 142	CW	National Primary Drinking Water Implementation Regulations
40 CFR 143	CW	National Secondary Drinking Water Regulations
40 CFR 144	CW	Underground Injection Control Program
40 CFR 146	CW	Underground Injection Control Programs: Criteria and Standards
40 CFR 147	CW	State UIC Programs
40 CFR 149	CW	Sole Source Aquifers
40 CFR 152	CS	Pesticide Registration and Classification Procedures
40 CFR 156	CS	Labeling Requirements for Pesticides and Devices
40 CFR 170	CS	Worker Protection Standards (Pesticides)
40 CFR 171	CS	Certification of Pesticide Applicators
40 CFR 220	CW	General

Strategic Petroleum Reserve Environmental Standards

40 CFR 228	CW	Ocean Dumping
40 CFR 243	HW	Guidelines for Storage and Collection of Residential, Commercial, and Institutional Solid Wastes
40 CFR 247	HW	Comprehensive Procurement Guideline for Products Containing Recovered Materials
40 CFR 260	HW	Hazardous Waste Management System: General
40 CFR 261	HW	Identification and Listing of Hazardous Waste
40 CFR 262	HW	Standards Applicable to Generators of Hazardous Wastes
40 CFR 263	HW	Standards applicable to transporters of hazardous wastes
40 CFR 264	HW	Standards for Owners and Operators of Hazardous Waste, Treatment, Storage, and Disposal Facilities
40 CFR 266	HW	Standards for Management of Specific Hazardous Wastes
40 CFR 268	HW	Land Disposal Restrictions
40 CFR 272	HW	Approved State Hazardous Waste Management Programs
40 CFR 273	HW	Standard for Universal Waste Management
40 CFR 279	HW	Standards for Management of Used Oil
40 CFR 280	HW	Technical Standards and Corrective Action Requirements for Owners and Operators of UST
40 CFR 282	HW	Approved Underground Storage Tank Programs
40 CFR 300	CS	National Oil and Hazardous Substances Pollution Contingency Plans
40 CFR 302	CS	Designation of Reportable Quantities and Notification
40 CFR 355	CS	Emergency Planning and Notification
40 CFR 370	CS	Hazardous Chemical Reporting: Community Right-to-Know
40 CFR 372	CS	Toxic Chemical Release Reporting: Community Right-to-Know
40 CFR 373	CS	Reporting Hazardous Substance Activity When Selling or Transferring Federal Real Property
40 CFR 401	CW	General Provisions
40 CFR 403	CW	General Pretreatment Regulations for Existing and New Sources of Pollution
40 CFR 700	CS	General
40 CFR 761	CS	PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
40 CFR 763	IH,CS	Asbestos
40 CFR 1500	MR	Purpose, Policy and Mandate
40 CFR 1501	MR	NEPA and Agency Planning
40 CFR 1502	MR	Environmental Impact Statement
40 CFR 1503	MR	Commenting
40 CFR 1504	MR	Predecision Referrals to the Council of Proposed Federal Actions Determined to be Environmentally Unsatisfactory
40 CFR 1505	MR	NEPA and Agency Decision Making
40 CFR 1506	MR	Other Requirements of NEPA
40 CFR 1507	MR	Agency Compliance
40 CFR 1508	MR	Terminology and Index
40 CFR 1515	MR	Freedom of Information Act Procedures
40 CFR 1516	MR	Privacy Act Implementation

Strategic Petroleum Reserve Environmental Standards

49 CFR 130	CS	Oil Spill Prevention and Response Plans
49 CFR 171	TS	General Information, Regulations, and Definitions
49 CFR 172	TS	Hazardous Materials Tables and Hazardous Materials Communications Regulations
49 CFR 173	TS	Shippers - General Requirements for Shipments and Packaging
49 CFR 177	TS	Carriage by Public Highway
49 CFR 194	TS	DOT Response Plans for Onshore Pipelines
49 CFR 195	TS	Transportation of Hazardous Liquids by Pipeline
49 CFR 199	TS	Drug Testing
50 CFR 10	MR	General Provisions
50 CFR 17	MR	Endangered and Threatened Wildlife and Plants
EO 11988	CW	Floodplain Management
EO 11990	CW	Protection of Wetlands
EO 11991	MR	Protection/Enhancement of Environmental Quality
EO 12856	PP	Right-to-Know and PPA Compliance
EO 12873	PP	Federal Acquisition, Recycling, and Waste Prevention
EO 12898	MR	Environmental Justice
33:LAC I.3	MR	Adjudications
33:LAC I.15	MR	Permit Review
33:LAC I.39	CW	Notification Regulations and Procedures for Unauthorized Discharge
33:LAC III.1	CA	General Provisions
33:LAC III.2	CA	Rules and Regulations for the Fee System of the Air Quality Control Programs
33:LAC III.5	CA	Permit Procedures
33:LAC III.7	CA	Ambient Air Quality
33:LAC III.9	CA	General Regulations on Control of Emissions and Emission Standards
33:LAC III.11	CA	Control of Emissions of Smoke
33:LAC III.13	CA	Emission Standards for Particulate Matter (including standards for some specific facilities)
33:LAC III.14	CA	Conformity
33:LAC III.15	CA	Emission Standards for Sulphur Dioxide
33:LAC III.17	CA	Control of Emission of Carbon Monoxide (new sources)
33:LAC III.21	CA	Control of Emission of Organic Compounds
33:LAC III.25	CA	Miscellaneous Incineration Rules
33:LAC III.29	CA	Odor Regulations
33:LAC III.31	CA	Standards of Performance for New Stationary Sources
33:LAC III.51	CA	Comprehensive Toxic Air Pollutant Emission Control Program
33:LAC III.53	CA	Minor Sources of Toxic Air Pollutants
33:LAC III.56	CA	Prevention of Air Pollution Emergency Episodes
33:LAC III.60	CA	Division's Source Test Manual
33:LAC V.1	HW	General Provisions and Definitions
33:LAC V.9	HW	Manifest System for TSD Facilities
33:LAC V.11	HW	Generators
33:LAC V.13	HW	Transporters

Strategic Petroleum Reserve Environmental Standards

33:LAC V.15	HW	Treatment, Storage and Disposal Facilities
33:LAC V.18	HW	Containment Buildings
33:LAC V.19	HW	Tanks
33:LAC V.21	HW	Containers
33:LAC V.22	HW	Prohibitions on Land Disposal
33:LAC V.26	HW	Corrective Action Management Units and Temporary Units
33:LAC V.37	HW	Financial Requirements
33:LAC V.39	HW	Small Quantity Generators
33:LAC V.40	PP	Used Oil
33:LAC V.41	PP	Recyclable Materials
33:LAC V.49	HW	Lists of Hazardous Wastes
33:LAC VI.1	HW	General Provisions and Definitions (solid waste regulations)
33:LAC VI.51	HW	Fee Schedules
33:LAC VII.3	HW	Scope and Mandatory Provisions of the Program
33:LAC VII.5	HW	Solid Waste Management System
33:LAC VII.7	HW	Solid Waste Standards
33:LAC VII.9	HW	Enforcement
33:LAC VII.103	PP	Recycling and Waste Reduction Rules
33:LAC VII.105	PP	Waste Tires
33:LAC IX.1	CW	General Provisions
33:LAC IX.3	CW	Permits
33:LAC IX.5	CW	Enforcement
33:LAC IX.7	CW	Effluent Standards
33:LAC IX.9	CW	Spill Prevention and Control
33:LAC IX.11	CW	Surface Water Quality Standards
33:LAC IX.13	CW	Louisiana Water Pollution Control Fee System Regulation
33:LAC IX.15	CW	Water Quality Certification Procedures
33:LAC IX.17	CW	Rules Governing Disposal of Waste Oil, Oil Field Brine, and All Other Materials Resulting From the Drilling for, Production of, or Transportation of Oil, Gas or Sulphur (as amended January 27, 1953)
33:LAC IX.19	CW	State of Louisiana Control Commission
33:LAC IX.23	CW	The LPDES Program Definitions and General Program Requirements
33:LAC XI.1	HW	Program Applicability and Definitions
33:LAC XI.3	HW	Registration Requirements, Standards and Fee Schedule
33:LAC XI.5	HW	Spill and Overfill Control
33:LAC XI.7	HW	Methods Release Detection and Release Reporting, Investigation, Confirmation and Response
33:LAC XI.9	HW	Out of Service UST Systems and Closure
43:LAC I.1	CW	General Rules and Regulations
43:LAC I.5	CW	State Lands
43:LAC I.7	CW	Coastal Management
43:LAC XI.3	TS	Underwater Obstructions

Strategic Petroleum Reserve Environmental Standards

43:LAC XI.5	TS	Pipeline Safety
43:LAC XVII.1	CW	Class I, III, IV, and V Injection Wells (Statewide Order 29-N-1)
43:LAC XVII.3	CW	Hydrocarbon Storage Wells in Salt Dome Cavities (Statewide Order 29-M)
43:LAC XIX.1	CW	General Provisions (Statewide Order 29-B)
43:LAC XIX.2	CW	Fees
48:LAC V.75	CW	Sewerage Program
48:LAC V.77	CW	Drinking Water Program
70:LAC XIII.1	CW	Water Wells
70:LAC XIII.3	CW	Water Well Construction
70:LAC XIII.5	CW	Plugging and Sealing Abandoned Water Wells and Holes
70:LAC XIII.7	CW	Reporting Abandoned Wells and Holes
LAC:XV chpt 1	RP	Radiation Protection - General Provisions
LAC:XV chpt 2	RP	Registration of Radiation Machines and Facilities
LAC:XV chpt 3	RP	Licensing of Radioactive Material
LAC:XV chpt 4	RP	Standards for Protection Against Radiation
LAC:XV chpt 5	RP	Radiation Safety Requirements for Industrial Radiographic Operations
16:TAC I.3	CW	Oil and Gas Division
25:TAC I.301	CW	Wastewater Surveillance and Technology
25:TAC I.325	HW	Solid Waste Management
25:TAC I.337	CW	Water Hygiene
30:TAC I.101	CA	General Provisions
30:TAC I.103	CA	Procedural Rules
30:TAC I.105	CA	Enforcement Rules
30:TAC I.111	CA	Control of Air Pollution from Visible Emissions and Particulate Matter
30:TAC I.112	CA	Sulfur Compounds Control of Sulfur Dioxide
30:TAC I.113	CA	Toxic Materials
30:TAC I.114	CA	Control of Air Pollution from Motor Vehicles
30:TAC I.115	CA	Control of Air Pollution from Volatile Organic Compounds
30:TAC I.116	CA	Control of Air Pollution by Permits for New Construction or Modification
30:TAC I.117	CA	Nitrogen Compounds
30:TAC I.118	CA	Episode Control Procedures
30:TAC I.119	CA	Carbon Monoxide
30:TAC I.122	CA	Federal Operating Permits
30:TAC I.279	CW	Water Quality Certification
30:TAC I.281	CW	Applications Processing
30:TAC I.285	CW	On-site Wastewater Treatment
30:TAC I.290	CW	Water Hygiene
30:TAC I.295	CW	Water Rights, Procedural
30:TAC I.297	CW	Water Rights, Substantive
30:TAC I.307	CW	Surface Water Quality Standards
30:TAC I.312	HW	Sludge Use, Disposal, and Transportation
30:TAC I.325	CW	Certificates of Competency

Strategic Petroleum Reserve Environmental Standards

30:TAC I.327	CW	Spill Prevention and Control
30:TAC I.330	PP	Municipal Solid Waste
30:TAC I.334	HW	Underground and Aboveground Storage Tanks
30:TAC I.335	HW	Industrial Solid Waste and Municipal Hazardous Waste
30:TAC I.337	CW	Enforcement
30:TAC I.338	CW	Water Well Drillers Rules General Provisions
30:TAC I.343	CW	Oil and Hazardous Substances General Provisions
30:TAC 116.211	CA	Standard Exemption List, TNRCC, Jun 1996
31:TAC I.15	CW	Planning Division
31:TAC I.19	CW	Oil Spill Prevention and Response
31:TAC I.20	CW	Natural Resource Damage Assessment
31:TAC I.21	CW	Oil Spill Prevention and Response Hearings Procedures
31:TAC II.57	MR	Fisheries
31:TAC II.65	MR	Wildlife
31:TAC II.67	MR	Resource Protection
31:TAC XVI.503	CW	Coastal Management Program
37:TAC XIII.501	FP	Texas Commission on Fire Protection, Flammable Liquids
No number	CA	Technical Guidance Package for Chemical Sources, Storage Tanks, TNRCC, Feb 1995
No number	CA	Technical Guidance Package for Chemical Sources, Equipment Leak Fugitives, TNRCC, Mar 1995
R.S. 30:2361-2379 SARA Title III	CS	Hazardous Materials Information Development, Preparedness and Response Act
TCRA, 505-507 SARA Title III	CS	Texas Tier Two Reporting Forms and Instructions
TRCR part 11	RP	Texas Regulations for Control of Radiation - General provisions
TRCR part 12	RP	Texas Regulations for Control of Radiation - Fees
TRCR part 13	RP	Texas Regulations for Control of Radiation - Hearing and Enforcement Procedures
TRCR part 21	RP	Standards for Protection Against Radiation - Permissible Doses, Precautionary Procedures, Waste Disposal
TRCR part 22	RP	Notices, Instructions and Reports to Workers; Inspections
TRCR part 31	RP	Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography
TRCR part 41	RP	Licensing of Radioactive Material -Exemptions, Licenses, General Licenses, Specific Licenses, Reciprocity, Transport
ANSI Standards	IS	OSHA Referenced Standards
ASME Standards	IS	OSHA Referenced Standards
EPA 100-K-93-001	PP	Pollution Prevention and Right-to-Know in the Government, Executive Order 12856
EPA 453/R-93-026	CA	Protocol for Equipment Leak Emission Estimates, Jun 1993
EPA 530/R-93-001	CW	RCRA Groundwater Monitoring; Draft Technical Guidance
EPA 600/2-85/105	CW	Practical Guide for Groundwater Sampling
EPA 600/4-78-012	CW	Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms

Strategic Petroleum Reserve Environmental Standards

EPA 600/4-79-019	CW	Handbook for Analytical Quality Control in Water and Wastewater Laboratories
EPA 600/4-79-020	CW	Methods for Chemical Analysis of Water and Wastes
EPA 600/4-82-029	CW	Handbook for Sampling and Sample Preservation of Water and Wastewater
EPA/600/4-83-039	CW	Addendum to Handbook for Sampling and Sample Preservation, EPA 600/4-82-029
EPA/600/8-78-017	CW	Microbiological Methods for Monitoring the Environment, Water and Wastes
EPA/600/R-92/088	PP	Facility Pollution Prevention Guide
EPA 833-R-92-002	PP	Storm Water Management for Industrial Activities
EPA, ISBN:0-86587-279-1	CW	EPA Groundwater Handbook
EPA, ISBN:0-86587-752-1	PP	EPA Waste Minimization Opportunity Assessment Manual
EPA Region IV	MR	Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, 4/1/86
FAA AC 150/5345-27	IS	Specification for 8' and 12' Unlighted and Externally Lighted Wind Cone Assembly
FAA AC 150/5390-2	IS	Heliport Design, January 4, 1988
FAA AC 70/7460-1G	IS	Obstruction Marking and Lighting, October 1985
NFPA	FP	Fire Protection Handbook
NFPA 1	FP	Fire Prevention Code
NFPA 10	FP	Portable Fire Extinguishers
NFPA 11	FP	Low Expansion Foam
NFPA 12	FP	Carbon Dioxide Extinguishing Systems
NFPA 12A	FP	Halon 1301 Fire Extinguishing Systems
NFPA 13	FP	Installation of Sprinkler Systems
NFPA 14	FP	Installation of Standpipe and Hose Systems
NFPA 15	FP	Water Spray Fixed Systems
NFPA 16	FP	Deluge Foam-Water Sprinkler Systems and Foam-Water Spray Systems
NFPA 20	FP	Installation of Centrifugal Fire Pumps
NFPA 24	FP	Installation of Private Fire Service Mains and Theri Appurtenances
NFPA 25	FP	Water-Based Fire Protection Systems
NFPA 30	FP	Flammable and Combustible Liquids Code
NFPA 37	FP	Stationary Combustion Engines and Gas Turbines
NFPA 43D	FP	Storage of Pesticides
NFPA 45	FP	Fire Protection for Laboratories Using Chemicals
NFPA 49	FP	Hazardous Chemical Data
NFPA 51B	FP	Cutting and Welding Processes
NFPA 54	FP	National Fuel Gas Code
NFPA 55	FP	Compressed and Liquefied Gases in Portable Cylinders
NFPA 70	FP, IS	National Electric Code
NFPA 70B	FP	Electrical Equipment Maintenance
NFPA 70E	FP	Electrical Safety Requirements for Employee Workplaces
NFPA 72	FP	National Fire Alarm Code
NFPA 75	FP	Protection of Electronic Computer/Data Processing Equipment

Strategic Petroleum Reserve Environmental Standards

NFPA 77	FP	Static Electricity
NFPA 80	FP	Fire Doors and Fire Windows
NFPA 80A	FP	Exterior Fire Exposures
NFPA 90A	FP	Installation of Air Conditioning and Ventilating Systems
NFPA 92A	FP	Smoke Control Systems
NFPA 101	FP, IS	Safety to Life from Fire in Buildings and Structures
NFPA 101A	FP	Alternative Approaches to Life Safety
NFPA 110	FP	Emergency and Standby Power Systems
NFPA 122	FP	Fire Prevention and Control in Underground Metal and Nonmetal Mines
NFPA 170	FP	Fire Safety Symbols
NFPA 204	FP	Roof Coverings and Roof Deck Constructions
NFPA 220	FP	Types of Building Construction
NFPA 221	FP	Fire Walls and Fire Barrier Walls
NFPA 231	FP	General Storage
NFPA 231C	FP	Rack Storage of Materials
NFPA 232	FP	Protection of Records
NFPA 241	FP	Construction, Alteration, and Demolition Operations
NFPA 253	FP	Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
NFPA 255	FP	Test of Surface Burning Characteristics of Building Materials
NFPA 291	FP	Fire Flow Testing and Marking of Hydrants
NFPA 295	FP	Wildfire Control
NFPA 297	FP	Principles and Practices for Communication Systems
NFPA 302	FP	Pleasure and Commercial Motor Craft
NFPA 306	FP	Control of Gas Hazards on Vessels
NFPA 307	FP	Marine Terminals, Piers, and Wharves
NFPA 321	FP	Basic Classification of Flammable and Combustible Liquids
NFPA 325	FP	Fire Hazard Properties of Flammable Liquids, Gases, and Volatile Solids
NFPA 326	FP	Safe Entry of Underground Storage Tanks
NFPA 327	FP	Cleaning of Safeguarding Small Tanks and Containers Without Entry
NFPA 328	FP	Control of Flammable and Combustible Liquids and Gases in Manholes, Sewers, and Similar Underground Structures
NFPA 329	FP	Handling Underground Releases of Flammable and Combustible Liquids
NFPA 385	FP	Tank Vehicles for Flammable and Combustible Liquids
NFPA 402M	FP	Aircraft Rescue and Fire Fighting Operations
NFPA 418	FP	Heliports
NFPA 430	FP	Liquid and Solid Oxidizers
NFPA 471	FP	Responding to Hazardous Materials Incidents
NFPA 472	FP	Professional Competence of Responders to Hazardous Materials Incidents
NFPA 491M	FP	Hazardous Chemical Reactions
NFPA 497A	FP	Classification of Class I Hazardous Locations for Electrical Installations in Chemical Process Areas

Strategic Petroleum Reserve Environmental Standards

NFPA 505	FP	Powered Industrial Trucks Including Type Designations, Areas of Use, Maintenance and Operations
NFPA 512	FP	Truck Fire Protection
NFPA 550	FP	Fire Safety Concepts Tree
NFPA 600	FP	Industrial Fire Brigades
NFPA 601	FP	Guard Service in Fire Prevention
NFPA 703	FP	Fire Retardant Impregnated Wood and Dire Retardant Coatings for Building Materials
NFPA 704	FP	Identification of the Fire Hazards of Materials
NFPA 780	FP	Installation of Lightning Protection Systems
NFPA 901	FP	Standard Classifications for Incident Reporting and Fire Protection Data
NFPA 902M	FP	Fire Reporting Field Incident Manual
NFPA 903	FP	Fire Reporting Property Survey Guide
NFPA 904	FP	Incident Follow-Up Report Guide
NFPA 906	FP	Fire Incident Field Notes
NFPA 921	FP	Fire and Explosion Investigations, Guide for
NFPA 1000	FP	Fire Service Professional Qualifications Accreditation and Certifications System
NFPA 1021	FP	Fire Officer Professional Qualifications
NFPA 1031	FP	Professional Qualification of Fire Inspector
NFPA 1033	FP	Fire Investigator Professional Qualifications
NFPA 1401	FP	Fire Protection Training Reports and Records
NFPA 1404	FP	Fire Department Self-Contained Breathing Apparatus Program
NFPA 1406	FP	Outside Live Fire Training Evolutions
NFPA 1410	FP	Training for Initial Fire Attack
NFPA 1420	FP	Pre-Incident Planning for Warehouse Occupancies
NFPA 1500	FP	Fire Department Occupational Safety and Health Program
NFPA 1561	FP	Fire Department Incident Management System
NFPA 1582	FP	Medical Requirements for Fire Fighters
NFPA 1901	FP	Pumper Fire Apparatus
NFPA 1902	FP	Initial Attack Fire Apparatus
NFPA 1903	FP	Mobile Water Supply Fire Apparatus
NFPA 1911	FP	Service Tests of Pumps on Fire Department Apparatus
NFPA 1921	FP	Fire Department Portable Pumping Units
NFPA 1922	FP	Fire Service Self-Contained Pumping Units
NFPA 1932	FP	Use, Maintenance and Service Testing of Fire Department Ground Ladders
NFPA 1961	FP	Fire Hose
NFPA 1962	FP	Care, Use, and Service Testing of Fire Hose Including Connections and Nozzles
NFPA 1963	FP	Fire Hose Connections
NFPA 1964	FP	Spray Nozzles (Shutoff and Tip)
NFPA 1971	FP	Protective Clothing for Structural Fire Fighting
NFPA 1972	FP	Helmets for Structural Fire Fighting
NFPA 1973	FP	Gloves for Structural Fire Fighting

Strategic Petroleum Reserve Environmental Standards

NFPA 1974	FP	Protective Footwear for Structural Fire Fighting
NFPA 1976	FP	Protective Clothing for Proximity Fire Fighting
NFPA 1981	FP	Open-Circuit Self-Contained Breathing Apparatus for Fire Fighters
NFPA 1983	FP	Fire Service Life Safety Rope and Systems Components
NFPA 1991	FP	Vapor-Protective Suits for Hazardous Chemical Emergencies
NFPA 1992	FP	Liquid Splash-Protective Suits for Hazardous Chemical Emergencies
NFPA 1993	FP	Support Function Protective Garments for Hazardous Chemical Operations
NFPA 1999	FP	Protective Clothing for Medical Emergency Operations
DOE/EH-0350	CA	Management of Polychlorinated Biphenyls (PCBs)
DOE/EH-0358	MR	Performance Objectives and Criteria for Conducting DOE Environmental Audits
DOE/EM-0276	PP	Annual report on Waste Generation and Waste Minimization Progress 1991 - 1992
DOE/EM-0276	PP	Annual report on Waste Generation and Waste Minimization Progress 1993
DOE/EP-0108	FP	Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems
DOE/FM-0145	PP	Waste Minimization/Pollution Prevention Crosscut Plan 1994
DOE Guideline	PP	DOE Waste Minimization reporting Requirements, Nov. 1994
DOE Handbook	PP	Guidance for the Preparation of the Waste Minimization and Pollution Prevention Awareness Plan, Dec 1993
DOE Handbook	PP	Pollution Prevention Handbook
DOE Handbook	PP	Waste Minimization Reporting System (Wmin) User's Guide
DOE HDBK, 1090-9	IS	Hoisting And Rigging Handbook
DOE Memorandum	PP	EPA's Interim Final Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program
DOE Order 4330.4B	MO,MR	Maintenance Management Plan
DOE Order 5400.1	MR	General Environmental Protection Program
DOE Order 5480.4	MO	Environmental Protection, Safety, and Health Protection Standards
DOE Order 5480.9A	MO	Construction Project Safety and Health Management
DOE Order 5480.19	MO	Conduct of Operations
DOE Order 5480.22	MO	Technical Safety Requirements
DOE Order 5484.1	MO,MR	Environmental Protection, Safety, and Health Protection Information Reporting Requirements
DOE Order 5700.6C	MO,MR	Quality Assurance
DOE Order 6430.1A	MO,MR	General Design Criteria
DOE Order M 231.1-1	MO	Environment, Safety, and Health Reporting Manual
DOE Order M 232.1-1A	MO,MR	Occurrence Reporting and Processing of Operations Information
DOE Order O 151.1	MR	Comprehensive Emergency Management System
DOE Order O 210.1	MO,MR	Performance Indicators and Analysis of Operations Information
DOE CRD 210.1	MO,MR	Contractor Requirements Document - Performance Indicators and Analysis of Operations Information
DOE Order O 225.1	MO	Accident Investigations
DOE Order O 231.1	MO,MR	Environment, Safety and Health Reporting
DOE CRD 231.1	MO,MR	Contractor Requirements Document - ES&H Reporting
DOE Order O 232.1	MO,MR	Occurrence Reporting and Processing of Operations Information

Strategic Petroleum Reserve Environmental Standards

DOE CRD 232.1	MO,MR	Contractor Requirements Document - Occurrence Reporting and Processing of Operations Information
DOE Order O 360.1	MO	Training - Safety Course Development, Requirements and Teaching
DOE Order O 420.1	FP,IS	Facility Safety
DOE Order O 423.1	IS	Technical Safety Requirements DENSITOMETERS?
DOE Order O 430.1	MR	Life-Cycle Asset Management
DOE Order O 430.2	MR	In-House Energy Management
DOE Order O 440.1	FP,IH,IS	Worker Protection Management for DOE Federal and Contractor Employees
DOE CRD 440.1	MO	Contractor Requirements Document - Worker Protection Management for DOE Federal and Contractor Employees
DOE Order O 440.2	IS	Aviation
DOE CRD 440.2	IS	Contractor Requirements Document - Aviation
DOE Order O 441.1	RP	Radiation Protection for the Public and Environment
DOE Order O 451.1A	MR	National Environmental Policy Act Compliance Program
SPRPMO O 451.1A	MR	National Environmental Policy Act Implementation Plan
DOE Order O 460.1	FP,TS	Packaging and Transportation Safety
DOE Order O 460.2	TS	Departmental Materials Transportation and Packaging Management
DOE Order O 473.2	IS	Protective Force Program - Safety Oversight - Firing Range Selection and Training Exercises
DOE Order O 1700.1	MO,MR	Freedom of Information Act
DOE Order P 450.1	MO,MR	Environment, Safety and Health Policy for the DOE Complex
DOE Order P 450.2A	MO,MR	Identification, Implementation, and Compliance with Environment, Safety and Health Requirements
DOE Order P 450.3	MO,MR	Sufficient Process for Standards-based Environment, Safety and Health Management
DOE M 450.3-1	MO, MR	Closure Process for Necessary and Sufficient Sets of Standards
DOE Order P 450.4	MO,MR	Safety Management System Policy
DOE S-0118	PP	Pollution Prevention Program Plan
DOE-STD-1088-95	FP	Fire Protection for Relocatable Structures
DOE Standard Spec. 17900	PP	Paint Repair of Exterior Metal Surfaces
No number	MO,MR	Environmental, Safety, and Health Management Plan (FY 1998 - FY 2002)
SEN-15-90	MR	National Environmental Policy Act
SEN-22-90	HW	DOE Policy on Signatures of RCRA Permit Applications
SEN-37-92	PP	Waste Minimization Crosscut Plan Implementation
AL 5500.11	MO,MR	Drill and Exercise Program Plan
ASE 5400.48	MR	Annual Site Environmental Report
ASI 3400.1	MO, MR	Conduct of Training for the SPR M&O Contractor
ASI 4000.10	FP	Integrated Logistics Support Procedures
ASI 4330.16	FP,IS	Work Order System Procedures
ASI 4400.4	PP	Supply Services Manual
ASI 5400.15	MR	Environmental Instructions Manual

Strategic Petroleum Reserve Environmental Standards

ASI 5480.19	MO,MR	Conduct of Operations at the SPR
ASI 5480.26	IS,FP,CW, HW	ES&H Training Requirements
ASI 5480.22	IS	Accident Prevention Manual
ASI 5600.1	FP	Security Operations Manual
ASI 5700.11	IS	Root Cause Analysis Instruction
ASI 5700.15	MR	Quality Assurance Manual
ASI 6410.2	FP	Construction Management Procedures Manual
ASI 6430.15	MO,MR	Design Review Procedure
ASL 1000.15	MR	Self-Assessment Program Implementation Plan
ASL 4700.1	MO,MR	Configuration Management Plan and Procedures
ASL 5480.18	FP	Fire Protection Manual
ASL 5480.44	IS	Electrical Safety Program Plan
ASL 5499.30	CW	Cavern Inventory & Integrity Control Plan
ASL 5500.1	MO,MR	Emergency Management Plan
ASL 5500.10	MO,MR	Emergency Readiness Assurance Plan
ASL 5500.25	MO,MR	Emergency Response Team Organization and Training Plan
ASL 6400.18	MO,MR	Drawdown Management Plan
ASL 6400.31	MO,MR	Drawdown Readiness Program Plan
ASP 4000.11	FP	Integrated Logistics Support Master Plan
ASP 5000.8	MO,MR	Master Action Tracking Management and Control System
ASP 5400.2	MR	Environmental
ASR 4330.5	FP	Interim Repair/Mitigation Authorization
ASR 5480.49	MO,MR	Environmental, Safety and Health (ES&H) Orientation Video Program
ASR 5700.3	MO,MR	Independent Quality Assurance Assessments
ASR 5700.4	FP	Deviation and Waiver Requests
ASR 7000.1	MO,MR	Readiness Review Board
ASR 7000.2	MO,MR	SPR Crosstalk Information Exchange Program
BCL 5400.16	CW	Bayou Choctaw Spill Prevention, Control, and Countermeasures Plan
BCI 5500.3	EM, FP	Bayou Choctaw Emergency Response Procedures
BHL 5400.21	CW	Big Hill Spill Prevention, Control, and Countermeasures Plan
BHI 5500.4	EM, FP	Big Hill Emergency Response Procedures
BMI 6420.27	FP	Bryan Mound Foam Deluge System Interim Operations Manual
BML 5400.17	CW	Bryan Mound Spill Prevention, Control, and Countermeasures Plan
BMI 5500.5	EM, FP	Bryan Mound Emergency Response Procedures
D506-01162-02	FP	Bryan Mound: Preventive Maintenance Procedures Manual
D506-01163-03	FP	West Hackberry: Preventive Maintenance Procedures Manual
D506-01164-04	FP	Bayou Choctaw: Preventive Maintenance Procedures Manual
D506-01165-05	FP	Weeks Island: Preventive Maintenance Procedures Manual
D506-01167-07	FP	St. James: Preventive Maintenance Procedures Manual
D506-01168-08	FP	Big Hill: Preventive Maintenance Procedures Manual
D506-02569-09	TSM, CS	Hazardous Materials Packaging & Transportation Plan

Strategic Petroleum Reserve Environmental Standards

D506-03287-09	HW,PP,CW	Pollution Prevention Plan
MSL 7000.133	CW, HW	Laboratory Programs & Procedures
NOL 5400.44	CW	New Orleans Warehouse Spill Prevention, Control, and Countermeasures Plan
NOL 5500.6	EM, FP	New Orleans Emergency Response Procedures
No number	CW,PP,CA, HW,CS	Environmental Exhibit 6.6
No number	CW	SPR Groundwater Protection Management Program
No number	PP,HW	SPR Qualified Products List
No number	MO, MR	SPRPMO Environmental, Safety and Health Manual
No number	MO, MR	SPRPMO Level III Design Criteria
WHL 5400.20	CW	West Hackberry Spill Prevention, Control, and Countermeasures Plan
WHI 5500.9	EM,FP	West Hackberry Emergency Response Procedures
WIL 5400.19	CW	Weeks Island Spill Prevention, Control, and Countermeasures Plan
WII 5500.8	EM,FP	Weeks Island Emergency Response Procedures
120 IAC	IS	Boiler And Pressure Vessels - Degas Project Only
055-001-01049-4	CW	Quality Criteria for Water
ACGIH TLV	IH	Threshold Limit Values For Chemical Substances - Current Year & Applicable Substances
ACP USCG	CW	Area Contingency Plan for New Orleans
ACP USCG	CW	Area Contingency Plan for Morgan City
ACP USCG	CW	Area Contingency Plan for Lake Charles
ACP USCG	CW	Area Contingency Plan for Port Arthur
ACP USCG	CW	Area Contingency Plan for Galveston
ACP-EPA	CW	Area Contingency Plan for EPA Region 6
AIHMM	PP	Hazardous Materials Management Education Program Observations and Recommendations: Environmental Mgmt, Hazardous Waste Minimization, and Pollution Prevention for the SPR Operations
American Public Health Assoc.	CW	Standard Methods for the Examination of Water and Wastewater
AP-42	CA	Compilation of Air Pollutant Emission Factors, Mobile Sources
API	MR	Amer. Petroleum Institute - Recommended Practices and Guides
API - Standard	CA	API Standard 653 for Tank Inspection, Repair, Alteration, and Reconstruction
CERI-89-224	CW	Seminar on Site Characterization for Subsurface Remediations
FM	FP	Factory Mutual - Approval Guide and Loss Prevention Data Sheets
ICIMF	IS	Oil Cos. International. Marine Forum - International Oil Tanker and Terminal Safety Guide
IEEE Standards	IS	OSHA Referenced Standards
LP 92-03	PP	Pollution Prevention Assessment Manual for Texas Businesses
MIL-HDBK-1008	FP	Fire Protection for Facilities - Engineering, Design and Construction
MP 94W0000131	CA	SPR Gas and Geothermal Heat Effects on Crude Oil Vapor Pressure, Dec. 1994
NACE	FP, IS	National Association of Corrosion Engineers
NEC	FP, IS	National Electric Safety Code

Strategic Petroleum Reserve Environmental Standards

No number	CW	Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook (LDOTD and LDEQ)
No number	CW	Earth Manual, 2nd Ed.
No number	CW	Engineering Geology Field Manual
No number	CW, CA	Environmental Monitoring Plan
No number	CW	Groundwater Manual
No number	CW	Groundwater Program
No number	CA	Louisiana Air Permit Procedures Manual, Jun 1995
No number	CW	Louisiana's Suggested Chemical Weed Control Guide for 1994 (LA Cooperative Extension Services)
No number	CA	Nonattainment New Source Review Guidance Manual, Oct 1993
No number	CW	The Sterling Brine Handbook (Int'l Salt Co.)
No number	CW	Water Measurement Manual
OSWER-9950.1 (1986)	CW	RCRA Groundwater Technical Enforcement Guidance Document (TEGD)
RBCA (OS21)	CW	Proposed Approach for Implementing a Louisiana Dept. of Env. Quality Risk-Based Corrective Action Program
RG-133	PP	Pollution Prevention Assessment Manual
UFC/UBC	FP	International Conference of Building Officials - Uniform Building Code and Uniform Fire Code
UL	FP	Underwriter's Laboratory - Building Materials, Fire Resistance, Fire Prot. Equip., & Haz. Location Equip. Directories
Water Supply Paper 1473	CW	Study and Interpretation of the Chemical Characteristics of Natural Water (HEM)
Y-87-1	CW	Corps. of Engineers Wetlands Delineation Manual

Strategic Petroleum Reserve Environmental Standards

KEY TO ACRONYMS:

AIHMM	American Institute of Hazardous Materials Mgmt.
API	American Petroleum Institute
CA	Protection of Air Quality
CFR	Code of Federal Regulations
CS	Control of Toxic Substances
CW	Protection of Water Quality
EO	Executive Order
ESH	Environmental, Safety, and Health Directorate
FM	Factory Mutual
FP	Fire Protection
HW	Solid and Hazardous Waste Generation and Control
IH	Industrial Hygiene
IS	Industrial Safety
LAC	Louisiana Administrative Code
M	Manual (DOE)
MO	Management and Oversight
MR	Management, Oversight, and Reporting
MS	Medical Services
NEC	National Electric Code
NFPA	National Fire Protection Association
O	Order (DOE)
P	Policy (DOE)
PP	Pollution Prevention and Waste Minimization
RCRA	Resource Conservation and Recovery Act
RP	Radiation Protection
SEN	Secretary of Energy Notice
TAC	Texas Administrative Code
TRCR	Texas Regulations for the Control of Radiation
TS	Transportation Safety
UBC	Uniform Building Code
UFC	Uniform Fire Code
UL	Underwriter's Laboratory

Appendix B
SPR Environmental Policy Statements

This page intentionally blank

ES&H MANUAL I-9
07/07/97 Rev. 3

ENVIRONMENT, SAFETY, AND HEALTH POLICY STATEMENT FOR THE STRATEGIC PETROLEUM RESERVE PROJECT MANAGEMENT OFFICE

It is the policy and practice of the Strategic Petroleum Reserve Project Management Office (SPRPMO), as an operating unit of the U.S. Department of Energy (DOE), to conduct its operations in a safe and environmentally sound manner. Protection of the environment, workers, and the public are responsibilities of paramount importance to our facilities.

The SPRPMO is firmly committed to ensuring incorporation of all Departmental and national environmental, safety, and health (ES&H) goals in the daily conduct of our business. All employees have an equal commitment to advance the goals of enhancing environmental quality and ensuring public health and safety. It is the SPRPMO's policy and practice to conduct our operations in compliance with applicable Federal, state, and local ES&H statutes, regulations, and standards. In addition, the SPRPMO is committed to good ES&H management of all our programs at our facilities. Our Integrated ES&H Management Systems shall pursue continual improvement in performance by establishing and maintaining documented ES&H objectives and targets that correspond to the mission, vision, and core values subscribed to at the SPRPMO.

Management and Operations contractors also share our responsibilities for good ES&H management. We expect our management and operating contractors to conduct facility operations in a sound manner that limits the risks to the environment and protects the public health. Our contractors must recognize and accept that the Department's criteria for awarding their fees reflects DOE's emphasis of ES&H.
In addition, it is the SPRPMO's policy to undertake appropriate measures to prevent the generation of contaminants, wastes, and other residual materials requiring disposal or release to the environment through source reduction and recycling. Where the generation of such wastes cannot be avoided, the SPRPMO will take actions to reduce their volume and toxicity and ensure proper disposal.

It is the SPRPMO's goal to create a pollution prevention ethic within the work place. Pursuant to DOE policy, a program to develop employee pollution prevention awareness through specific training, special campaigns, and incentive programs will be implemented at each site. As part of this program, employee initiative in the establishment of sound pollution prevention and waste minimization practices will be encouraged by all levels of facility management.

ES&H MANUAL I-10
07/07/97 Rev. 3

We will work cooperatively and openly with the appropriate Federal, state, and local agencies, public stakeholders, and site employees to prevent pollution, achieve environmental compliance, enhance environmental quality, and ensure protection of workers and the public health.

It is our desire to design, develop, construct, operate, and maintain facilities and operations in a manner that shall be resource-efficient and will protect the quality of the environment and ensure protection of workers and the public health consistent with our mission.

//original signed by

_____
William C. Gibson, Jr.
Project Manager
Strategic Petroleum Reserve

POLICY

DynMcDermott Petroleum Operations Company

RESPONSIBLE ORGANIZATION: ENVIRONMENTAL, SAFETY AND HEALTH **SUBJECT CLASSIFICATION:** ENVIRONMENTAL CONTROL **OWNER:** ENVIRONMENTAL MANAGER	**SUPERSEDES:** ASP5400.2B0, "ENVIRONMENTAL POLICY" **APPROVED BY:** **Signature on file in Publication Control** OFFICE OF THE PROJECT MANAGER C.C. JOHNSON, PROJECT MANAGER	**POLICY NO: ASP5400.2C0** **REVISION: C0** **EFFECTIVE DATE: 7/27/98** **PAGE 3 of 7**

THIS IS A CATEGORY C CONTROLLED DOCUMENT AND IS CONTROLLED BY THE PUBLICATION CONTROL DEPARTMENT

TITLE: Environmental Policy

Applicability: All DynMcDermott (DM) Organizations

References:
- **a)** Environmental Standard Set, available through the SPR Environmental Management Information System (SEMIS)
- **b)** DM instruction ASI5400.15, Environmental Instructions Manual
- **c)** DM instruction ASI5400.41, Pollution Prevention Plan
- **d)** International Organization for Standardization, (ISO) 14001, Environmental Management Systems
- **e)** SPRPMO U.S.DOE Environmental Work Authorization Directive to DM M&O Contractor for the U.S. DOE SPR Contract No. DE-AC96-93PO18000
- **f)** U.S DOE P450.4, "Safety Management Systems Policy"

Significant Changes Since the Last Revision: Revised the reference list. Incorporated material to conform to the ISO 14001 standard. Incorporated policy on waste management in section 3. Added project manager responsibilities. Added environmental manager responsibility. Added Human Resources and Development and Information Systems responsibilities. Added responsibilities of managers and employees. Changed paragraphs are marked with a revision bar in the right margin.

1. PURPOSE AND SCOPE

DynMcDermott Petroleum Operations Company (DM) follows regulations, orders, and policies that make up the Department of Energy (DOE)-mandated "environmental standard set," under which the Strategic Petroleum Reserve (SPR) operates. This policy establishes the requirements and responsibilities for DM as a good steward of the environment and a progressive corporate citizen.

2. DEFINITIONS

A. Environmental Instructions Manual - The document that instructs employees on how to comply with environmental requirements in their normal work routine. Along with reference c), it implements the environmental policy statement.

B. Environmental Management Systems – As used in this document, all systems and subsystems thereof used for management of the environmental program, including elements of Integrated Safety Management Systems (ISMS), international environmental management systems, and environmental management principles, as applicable.

C. Environmental Standard Set - The list of regulations, industrial codes, and internal and external supporting documents that define the environmental program and provide the basis on which the SPR operates. The list is located in the SPR Environmental Management Information System (SEMIS).

3. POLICY

3.1 OVERALL ENVIRONMENTAL PROGRAM

DM is committed to continued excellence, leadership, and stewardship in protecting the environment. DM will manage, operate, and maintain the SPR sites with the highest regard for the protection of human health and the environment. Environmental protection is a primary management responsibility, as well as the responsibility of every employee. In keeping with this policy and the nature and scale of SPR activities, DM's objective as a company is to reduce waste and achieve minimal adverse impact on air, water, and land through excellence in environmental management.

3.2 ENVIRONMENTAL GUIDELINES

DM environmental guidelines are as follows:

A. **Employee Responsibility.** Environmental protection is a line responsibility and an important measure of employee performance. In addition, every employee is responsible for environmental protection.

B. **Waste Reduction or Elimination.** Reducing or eliminating the generation of waste has been and continues to be a prime consideration in research, process design, and operations and is viewed by management the same as safety and loss prevention.

C. **Reuse and Recycling.** Source reduction/waste minimization (reuse and recycling) of materials has been and will continue to be given first consideration prior to classification and disposal of waste.

D. **Compliance.** DM will fully comply with federal, state, and local environmental laws, regulations, statutes, and permits, and with other applicable DOE, industry, and internal environmental standards.

E. **Continual Improvement Through Decision-Making and Implementation.** DM will consider pollution prevention, waste minimization, and affirmative procurement in all levels of decision-making and ensure that the environmental management system is implemented.

F. **Meeting Objectives and Targets.** DM will endeavor to meet the objectives and targets described in the Environmental Work Authorization Directive (WAD), which is part of the DOE/DM contract (see reference e)).

4. RESPONSIBILITIES

A. Project Manager

[1] Approve and ensure dissemination of DM's Environmental Policy annually.

[2] Review and approve an environmental management system to support the SPR's mission.

B. ES&H Director

[1] Have the authority and responsibility for developing, implementing, and refining the environmental management system.

a. Provide clear and explicit delegation of authority and responsibility for implementation of all elements of the environmental management system.

b. Ensure, during the budget process, adequate consideration of the referenced environmental protection criteria.

c. Approve annual environmental protection objectives and targets.

C. Environmental Manager

[1] Perform "ownership" functions relating to this policy (pursuant to the authority of the director of the responsible organization):

a. Ensure accuracy of content.

b. Interpret and administer provisions.

c. Obtain concurrence on precedent-setting cases.

d. To the extent an exception is allowed, approve or deny requests for the exception.

e. Initiate revisions when required.

f. Ensure that the environmental policy is appropriate to the nature, scale, and environmental impacts of SPR mission activities.

g. Establish a list of environmental aspects and impacts from which SPR objectives and targets may be developed.

[2] Establish criteria for ensuring environmental protection.

[3] Recommend methods of operation that will reduce adverse environmental impacts.

[4] Support the Operations and Maintenance (O&M) and Engineering and Construction (E&C) directorates in obtaining all necessary environmental permits and authorizations.

[5] Provide support to other directorates as necessary based on environmental laws and regulations, and other regulations.

[6] Provide oversight of environmental activities.

[7] Support O&M in achieving their environmental objectives and targets.

[8] Provide guidance to assist line personnel in carrying out their environmental responsibilities.

D. Procurement

[1] Ensure that all scopes of work are reviewed by Environmental, Safety and Health (ES&H) personnel for environmental program provisions.

[2] Provide support to ES&H and other directorates in conveying the needs of the environmental program to subcontractors and ensure that subcontractors are aware of their contractual responsibilities to comply with environmental laws and regulations.

E. Engineering and Construction

[1] Ensure that the required elements of the environmental management system are included in developing plans and objectives.

[2] Ensure that engineering design principles and decisions eliminate or minimize adverse environmental impacts in all work packages.

[3] Include necessary environmental requirements in all scopes of work and work specifications used in subcontracts.

[4] Ensure that all site construction is covered by applicable environmental permits and assessments.

[5] Transmit all design packages and scopes of work/design specifications to ES&H for review for environmental adequacy prior to their approval.

[6] Ensure that environmental concerns are included in all risk assessments.

F. Operations and Maintenance

[1] Implement the environmental management system in accordance with references b), c), and d).

[2] Ensure that the SPR sites are operated and maintained in compliance with the environmental management system to minimize actual and potential environmental impacts.

[3] Monitor activities to ensure compliance with applicable permits, authorizations, regulations, and laws.

[4] Include necessary environmental requirements in all scopes of work/work specifications used in subcontracts.

[5] Ensure that all site personnel and subcontractor personnel are adequately trained in environmental protection procedures.

[6] Operate and maintain each site in compliance with applicable laws and regulations as well as existing permit provisions and other authorizations.

[7] Ensure that all required reports are prepared and that reporting requirements are implemented as necessary.

[8] Cease site operations or other activities during environmental emergencies or when conditions exist that could imminently cause damage.

[9] Establish site objectives and targets to implement the environmental management system.

[10] Minimize generation of wastes through pollution prevention, especially source reduction.

G. Finance

[1] Provide for environmental management system needs during budget review.

H. Office of General Counsel

[1] Support ES&H in determining the statutory and regulatory requirements of the environmental management system.

[2] Ensure that subcontract provisions require subcontractor compliance with environmental laws and regulations, and appropriate elements of the environmental management system.

I. Quality Assurance

[1] Facilitate independent assessment and self-assessment programs for the Environmental department.

J. Subcontract Manager's Technical Representatives

[1] Ensure that subcontractors comply with the environmental management system provisions of their subcontracts.

[2] Ensure that subcontractors comply with the terms and conditions of all permits and authorizations.

K. Human Resources and Development

[1] Introduce the DM environmental policy to new hires.

[2] Provide a method for evaluating employees' environmental performance.

L. Information Systems

[1] Provide a method for communicating the SPR's environmental policy to the public by means of the DOE Internet home page.

M. DM Managers

[1] Ensure that employees at each level are aware of the potential environmental impacts of their work activities and the potential consequences of departure from specific operating procedures.

[2] Ensure that personnel performing tasks that may cause significant environmental impacts are competent based on appropriate education, training, and/or experience.

N. DM Employees

[1] To the extent of their job scope:

a. Be aware of their responsibilities for conformance with this policy and DM procedures that deal with environmental compliance, including emergency preparedness and response.

b. Be aware of the potential consequences of departure from specific operating procedures.

c. Be qualified to perform the environmental-related activities of their jobs.

References

This page intentionally blank

American Public Health Association, American Water Works Association, and Water Pollution Control Federation. Standard Methods for the Examination of Water and Wastewater. 18 ed. Washington, D.C.: American Public Health Association, 1992.

Faust, Samuel D. and Osman M. Aly. Chemistry of Natural Waters. Ann Arbor: Ann Arbor Science Publishers, 1981.

Geraghty & Miller, Inc. Environmental Services. Contamination Assessment Report and Remedial Alternatives Analysis, Strategic Petroleum Reserve, West Hackberry, Louisiana. April 12, 1991.

Louisiana Office of Water Resources. "State of Louisiana Water Quality Standards." 1984.

Oilfield Testers & Equipment Co., Contract S01M-035687. NORM Survey. March 25, 1991.

Reid, George K. and Richard D. Wood. Ecology of Inland Waters and Estuaries. Second ed. New York: D. Van Nostrand Company, 1976.

Sandia National Laboratories. Strategic Petroleum Reserve (SPR) Geological Site Characterization Report Bryan Mound Salt Dome. SAND80-7111. October 1980; available from National Technical Information Service.

_____. Strategic Petroleum Reserve (SPR) Geological Site Characterization Report Weeks Island Salt Dome. SAND80-1323. October 1980; available from National Technical Information Service.

_____. Strategic Petroleum Reserve (SPR) Geological Site Characterization Report West Hackberry Salt Dome. SAND80-7131. October 1980; available from National Technical Information Service.

_____. Strategic Petroleum Reserve (SPR) Geological Site Characterization Report Bayou Choctaw Salt Dome. SAND80-7140. December 1980; available from National Technical Information Service.

_____. Strategic Petroleum Reserve (SPR) Geological Site Characterization Report Big Hill Salt Dome. SAND81-1045. September 1981; available from National Technical Information Service.

Texas Department of Water Resources. Texas Surface Water Quality Standards. April 1981.

Texas Water Commission. Spill Response Map Series Coastal Region and Support Data, LP90-09, August 1989.

U. S. Deptartment of Energy. Environmental Assessment of Oil Degasification at Four Strategic Petroleum Reserve Facilities in Texas and Louisiana. July, 1994. U.S. Department of Energy.

_____. FY 1997 - FY 2001 Strategic Petroleum Reserve Project Management Office Environmental, Safety and Health Management Plan. May 25, 1995. U. S. Department of Energy

_____. Environmental Assessment on the Leasing of the Strategic Petroleumm Reserve St. James Terminal. January, 1995. U.S. Department of Energy.

_____. Environmental Assessment on the Leasing of the Strategic Petroleumm Reserve Weeks Island Facility. December, 1995. U.S. Department of Energy.

_____. Finding of No Significant Impact for Environmental Assessment of Oil Degasification at Four Strategic Petroleum Reserve Facilities in Texas and Louisiana. September, 1994. U.S. Department of Energy.

_____. Final Environmental Impact Statement, Strategic Petroleum Reserve, Seaway Group Salt Domes. 3 vols. June 1978; available from National Technical Information Service.

_____. Final Environmental Impact Statement, Strategic Petroleum Reserve, Capline Group Salt Domes. 4 vols. July 1978; available from National Technical Information Service.

_____. Final Environmental Impact Statement, Strategic Petroleum Reserve, Texoma Group Salt Domes. 5 vols. November 1978; available from National Technical Information Service.

_____. Final Supplement to Final Environmental Impact Statement, Strategic Petroleum Reserve, Phase III Development, Texoma and Seaway Group Salt Domes. October 1981; available from National Technical Information Service.

_____. Strategic Petroleum Reserve, Environmental Monitoring Plan. October, 1991. U. S. Department of Energy

_____. Strategic Petroleum Reserve, Environmental Protection and Implementation Program Plan. November, 1992. U. S. Department of Energy

_____. Strategic Petroleum Reserve, Ground Water Protection Management Program. May, 1993. U. S. Department of Energy

_____. Strategic Petroleum Reserve, Pollution Prevention Plan. May, 1993. U. S. Department of Energy

U. S. Environmental Protection Agency. Quality Criteria for Water. July 1976; available from U.S. Government Printing Office.

_____. Handbook for Analytical Quality Control in Water and Wastewater Laboratories. EPA-600/4-79-019 September, 1979; Cincinnati, Ohio: Office of Research and Development.

_____. Compilation of Air Pollutant Emission Factors, Supplement No. 12. April 1981; Research Triangle Park, N.C.: Office of Air Quality Planning and Standards.

_____. Methods for Chemical Analysis of Water and Wastes EPA-600/4-79-020. Revised March, 1983; Cincinnati, Ohio: Office of Research and Development.

_____. Air Pollution Engineering Manual. 3rd edition, September, 1985. Method AP-42; Research Triangle Park, N.C.: Office of Air Quality Planning and Standards.

This page intentionally blank