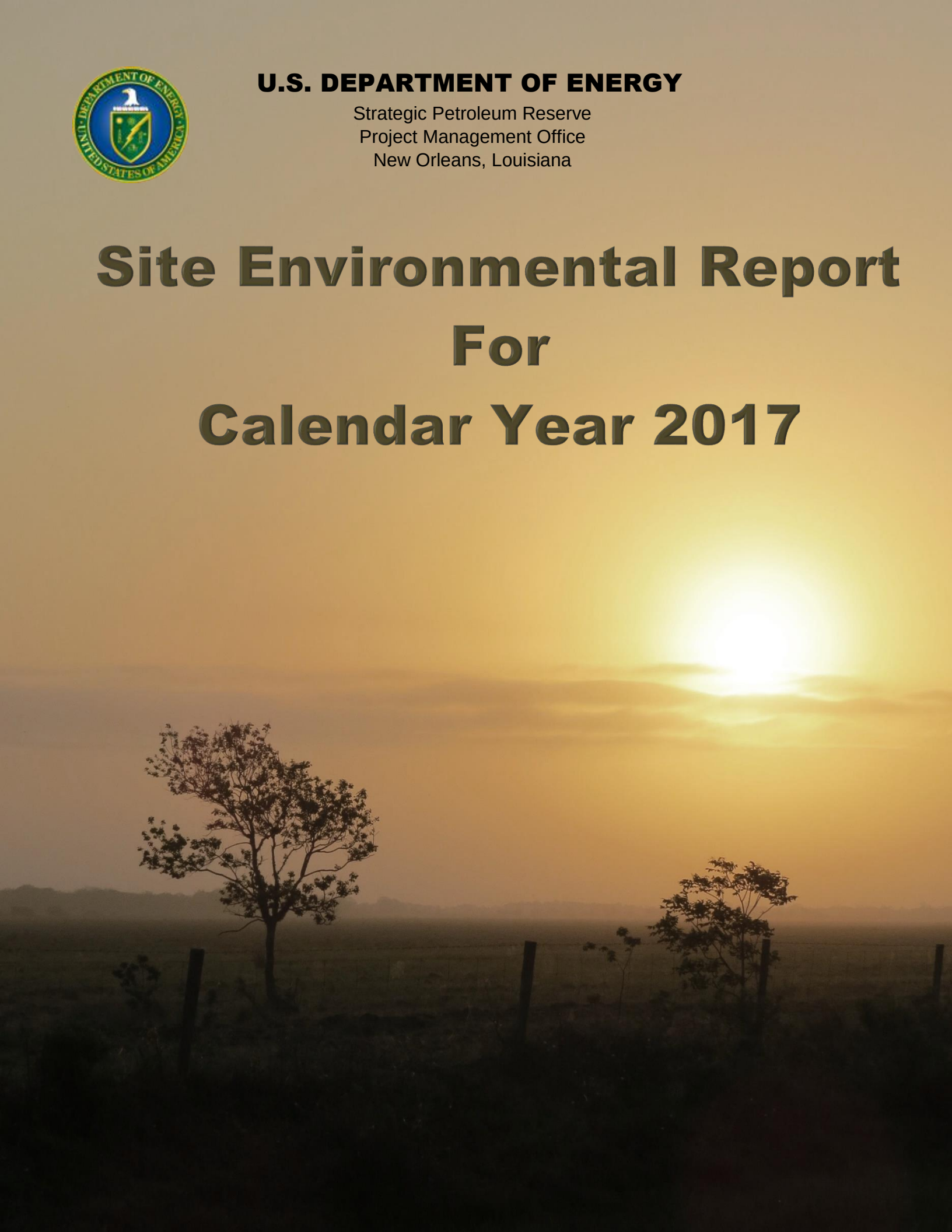

U.S. DEPARTMENT OF ENERGY

Strategic Petroleum Reserve
Project Management Office
New Orleans, Louisiana

Site Environmental Report For Calendar Year 2017

Cover Photo Title: Tuesday Morning at Big Hill

STRATEGIC PETROLEUM RESERVE

SITE ENVIRONMENTAL REPORT

FOR

CALENDAR YEAR 2017

Document No. 0270-2

Prepared for the U. S. Department of Energy
Strategic Petroleum Reserve Project Management Office
under Contract No. DE-FE0011020

FLUOR
FEDERAL PETROLEUM
OPERATIONS

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DOE F 1325.8
(8-89)
EFG (07-90)

United States Government **Department of Energy**

memorandum

DATE: SEP 1 4 2018

REPLY TO ATTN OF: 18-ESH-004
FE-4441 (WWoods)

SUBJECT: SITE ENVIRONMENTAL REPORT FOR CALENDAR YEAR 2017 – STRATEGIC PETROLEUM RESERVE

TO: Douglas MacIntyre, Acting Deputy Assistant Secretary for Petroleum Reserves, FE-40

Attached for your information is a hard copy of the Strategic Petroleum Reserve's Site Environmental Report for Calendar Year 2017. This report will not be distributed until this office receives authorization for release.

After authorization for release is received, an electronic version of the report will be available at:

http://www.spr.doe.gov/esh/default.html

To the best of my knowledge, this report accurately summarizes and discusses the results of the 2017 Environmental Monitoring Program.

Please authorize the release of this report to the attached distribution.

If you have any questions or desire additional information, please contact Anthony Pate of the Strategic Petroleum Reserve Project Management Office, Office of Technical Assurance at (504) 734-4038 or by e-mail at Anthony.Pate@spr.doe.gov.

Paul S. Oosterling
Acting Project Manager
Strategic Petroleum Reserve

Attachment:
As Stated

QUESTIONNAIRE/READER COMMENT FORM

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

Fluor Federal Petroleum Operations, LLC
Environmental Department, EF-20
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)

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(Below for originator's use only)

Subject Matter Expert (SME): _____ Date: _____

SME's Response: _____

_____

_____

_____

Abbreviations and Acronyms	
AFFF	Aqueous Film Forming Foam
ANAB	ANSI-ASQ National Accreditation Board
ANSI	American National Standards Institute
ASER	Annual Site Environmental Report
ASQ	American Society for Quality
bbl	barrel (1 bbl = 42 gallons)
BC	Bayou Choctaw
BDL	Below detection limit
BH	Big Hill
bls	below land surface
BM	Bryan Mound
^{o}C	degrees Celsius
CAA	Clean Air Act
CAP	Corrective action plan
CESQG	Conditionally exempt small quantity generator
CLR	Calculated leak rate
CO	Carbon monoxide

Abbreviations and Acronyms	
COE	United States Army Corps of Engineers
CWA	Clean Water Act
CY	Calendar year
DMR	Discharge Monitoring Report
DO	Dissolved oxygen
DOE	United States Department of Energy
E&P	Exploration and production
EAC	Environmental Advisory Committee
EMP	Environmental monitoring plan
EMS	Environmental management system
EO	Executive order
EPA	Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ES&H	Environmental Safety and Health
FFPO	Fluor Federal Petroleum Operations
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
F&WS	Fish and Wildlife Service
GALCOE	U.S. Army Corps of Engineers, Galveston District
GHG	Greenhouse gas
GIWW	Gulf Coast Intracoastal Waterway
GLO	General Land Office
ISM	Integrated Safety Management system
ISO	International Organization for Standardization
LA	Louisiana
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources
LDWF	Louisiana Department of Wildlife and Fisheries
LPDES	Louisiana Pollutant Discharge Elimination System
MCL	Maximum contaminant levels
MDEQ	Mississippi Department of Environmental Quality
MDLR	Minimum detectable leak rate
mmb	million barrels
M&O	Management and operations
msl	mean sea level
MSGP	Multi-Sector General Permit
MW	Monitoring well
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIMS	National Incident Management System
NO	New Orleans
NODCOE	U.S. Army Corps of Engineers, New Orleans District
NOV	Notice of violation

Abbreviations and Acronyms	
NOx	Nitrogen oxide
NPDES	National Pollutant Discharge Elimination System
OCC	Operations Control Center
OFI	Opportunities for improvement
O&G	Oil and grease
OPA	Oil Pollution Act of 1990
OSPRA	Oil Spill Prevention and Response Act
OVA	Organic vapor analyzer
PCB	Polychlorinated biphenyl
pH	Negative logarithm of the hydrogen ion concentration
PM_{10}	Particulate matter (less than 10 microns)
ppt	parts per thousand
PREP	Preparedness for response exercise program
PW	Periphery well
QA	Quality assurance
QC	Quality control
QPL	Qualified products list
RRC	Railroad Commission of Texas
RWIS	Raw water intake structure
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIP	State implementation plan
SO_2	Sulfur dioxide
SOC	Security Operations Center
SPCC	Spill Prevention Control and Countermeasures
SPR	Strategic Petroleum Reserve
SPRPMO	Strategic Petroleum Reserve Project Management Office
SSP	Site Sustainability Plan
SWPPP	Storm Water Pollution Prevention Plan
TCEQ	Texas Commission on Environmental Quality
TGLO	Texas General Land Office
TOC	Total organic carbon
TPWD	Texas Parks and Wildlife Department
TRI	Toxic Chemical Release Inventory
TSCA	Toxic Substance Control Act
TX	Texas
UIC	Underground injection control
UNO	University of New Orleans
VOC	Volatile organic compound
VSQG	Very small quantity generator
WAD	Work Authorization Directive
WH	West Hackberry

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Executive Summary

The DOE SPR Project Management Office (SPRPMO) Environmental Policy requires the SPR to operate in an environmentally responsible manner while conducting activities to ensure the mission of providing crude oil storage and maintaining readiness to distribute it in the event of a significant disruption of energy supply.

The M&O Contractor is contractually bound to create, execute, and sustain an environmental program that protects the environment and endeavors to meet sustainability goals. The M&O Contractor provides environmental stewardship to foster practices that promote energy and resource conservation, community outreach, pollution prevention, waste minimization, and wildlife habitat preservation.

The purpose of the DOE SPR Annual Site Environmental Report (ASER) is to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts performed by the M&O Contractor, Fluor Federal Petroleum Operations (FFPO). The ASER serves the public by summarizing monitoring data collected to assess SPR impacts to the environment.

The ASER provides a synopsis of non-radiological monitoring and regulatory compliance data. It also affirms that the SPR has been operating within acceptable regulatory limits and illustrates the success of SPR efforts toward continual environmental improvement.

During the calendar year 2017, the M&O Contractor coordinated activities with DOE, contractors, and regulatory agencies to ensure compliance with federal, state, and local requirements along with meeting established environmental and sustainability goals. The narrative of this document illustrates the performance of these achievements.

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

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1 Introduction

This SPR ASER for the calendar year 2017 was prepared to inform the DOE, environmental agencies, and the public about environmental management performance and data gathered at or near SPR sites. It also summarizes compliance with environmental standards and requirements and highlights significant programs and efforts. In April 2014, FFPO became the M&O contractor for the SPR.

1.1 Background Information

The Energy Policy and Conservation Act (EPCA) established the SPR in 1975. The goal of the EPCA is to ensure that the U.S. has sufficient petroleum reserves to mitigate the effects of a significant oil supply interruption. The mission of the SPR is to maintain a constant state of operational readiness to draw down the reserve and supply oil to the country in an emergency as directed by the President of the U.S. The Secretary of Energy also has the authority to acquire oil to fill the reserve or exchange current holdings to alter the mix of oil, to test the SPR's capabilities through test sales or to "loan" oil to refineries when there is a temporary oil supply disruption. Also, starting in 2017, the SPR has been releasing crude oil to the marketplace as required by the Bipartisan Budget Act (Sections 403 and 404) and the 21st Century Cures Act.

SPR MISSION

The mission is to maintain a constant state of operational readiness to draw down the reserve and supply oil to the country in an emergency.

The DOE Office of Deputy Assistant Secretary for the Petroleum Reserves has overall programmatic responsibility for establishing the SPR objectives. The SPRPMO is responsible for implementing these goals and objectives, including articulating an environmental policy (included as Appendix B) that is responsive to DOE requirements. The M&O contractor applies this policy to SPR operations.

The SPR stores emergency crude oil supplies in salt caverns. The caverns were created through the process of solution mining deep within the massive salt deposits that underlie most of the Texas and Louisiana coastline. The utilization of the caverns to store crude oil avoids hazards associated with aboveground storage, offers security, and is an economic means of storage.

The U.S. government selected the Gulf Coast as the location for the SPR due to its large concentration of underground salt domes, and its large number of refineries and crude oil distribution capabilities. These attributes provide the flexibility needed to respond to a wide range of supply disruptions.

1.2 Locations, Facilities, and Operations

The SPR consists of four Gulf Coast underground salt dome oil storage facilities (BM, BH, WH and BC), a project management facility in NO and the Stennis Warehouse facility. Figure 1-1 illustrates the SPR locations. DOE leased the St. James Terminal (located southeast of BC) to Shell Pipeline in January 1997. Although the St. James Terminal is not an active SPR storage facility, it continues as SPR property, and this report contains a descriptive narrative about it where applicable. Table 1-1 summarizes information about the four active storage facilities.

Figure 1-1 SPR Locations

Table 1-1 SPR Storage Facilities*

	City, State	No. of Caverns	Crude Oil Storage Inventory
Bayou Choctaw	Plaquemine, LA	6	74.0 million barrels
Big Hill	Winnie, TX	14	155.6 million barrels
Bryan Mound	Freeport, TX	20	234.9 million barrels
West Hackberry	Hackberry, LA	22	201.1 million barrels

*As of December 31, 2017

1.2.1 Bayou Choctaw (BC)

Iberville Parish, LA serves as the location of the BC site. This storage facility occupies 356 acres above the BC salt dome, including off-site satellite brine disposal wells and associated brine piping.

The U.S. government selected the BC salt dome as a storage site early in the SPR program because of the potential to convert its existing brine caverns to oil storage, and its proximity to commercial marine and pipeline crude oil distribution facilities. Development of the site was initiated in 1977 and completed in 1991. One additional cavern was acquired, modified and completed in 2012.

The area surrounding the site is a freshwater swamp, which includes substantial stands of bottomland hardwoods with interconnecting waterways. Small canals and bayous flow through the site area and join larger bodies of water off-site. The site proper is normally dry and protected from spring flooding by the site's flood control levees and pumps. The forest and swamp provide habitat for a diverse wildlife population, including many kinds of birds, mammals, and reptiles including the American alligator.

1.2.2 Big Hill (BH)

Jefferson County, TX serves as the location of the BH site that covers approximately 270 acres above the BH salt dome. Off-site facilities include an intake structure that provides raw (brackish) water for cavern development and fluid movements, a brine line for brine disposal and a crude oil pipeline for receiving and distributing oil in commerce.

BH is the most recently constructed SPR storage facility and the proximity of it to commercial marine and pipeline crude oil distribution facilities

is advantageous to the function of the SPR mission. Development of the site was initiated in 1982 and completed in 1991.

Most of the site is upland habitat, consisting of tall grass with a few 150-year-old live oak trees. The nearby ponds and marsh provide excellent habitat for a diverse population of wildlife including the American alligator, over-wintering waterfowl, and several species of birds and mammals.

1.2.3 Bryan Mound (BM)

The BM site is in Brazoria County, TX, and occupies 500 acres above the BM salt dome. Off-site facilities include an intake structure that provides raw water for cavern development and fluid movements, brine pipeline for brine disposal and crude oil pipelines for receiving and distributing oil in commerce.

The U.S. government selected BM as a storage site early in the SPR program because of the potential to convert its existing brine caverns to oil storage. Development of the site was initiated in 1977 and completed in 1987.

The marsh and prairie areas surrounding BM are typical of those found throughout this region of the TX Gulf Coast. Brackish marshland dominates the low-lying portions of the site. The coastal prairie has abundant tall grass forming cover and feeding grounds for wildlife. Marshes and tidal pools provide diverse habitats for a variety of birds, aquatic life, and mammals.

1.2.4 West Hackberry (WH)

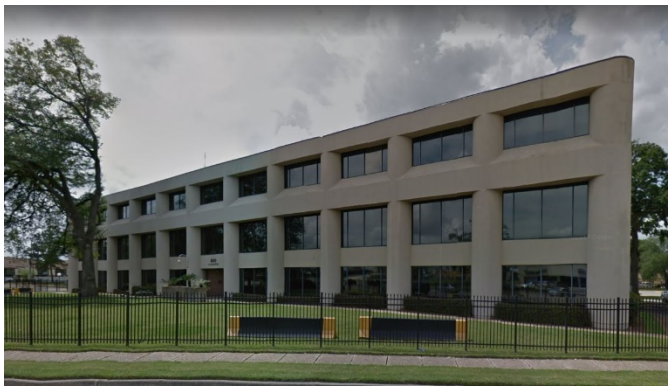
Located in Cameron Parish, LA, the WH site occupies 565 acres over the WH salt dome. Off-site facilities include an intake structure that provides raw (brackish) water for cavern development and fluid movements, brine disposal wells with associated brine piping and crude oil pipelines for receiving and distributing oil in commerce.

The U.S. government selected WH as a storage site due to the potential to readily convert its existing brine caverns to oil storage. Development of the site was initiated in 1977 and completed in 1988.

Numerous canals and natural waterways bisect the area. The surrounding area consists of marshland with natural ridges that support grass, trees and affect water flow through the marshes. These marshlands provide habitat for a variety of wetland and wildlife species.

1.2.5 New Orleans (NO)

The NO, LA metropolitan area is the location for the SPRPMO. Located in Jefferson Parish, the SPRPMO exists in two adjacent leased office buildings with a nearby leased warehouse. This facility functions as the management headquarters of the SPR. Activities conducted at the NO office complex are predominantly administrative.



1.2.6 Stennis

DOE leased the Stennis Warehouse located in Hancock County, MS from the U.S. Army from 2004 to 2011 and since 2011, from the National Aeronautics and Space Administration (NASA). The warehouse and adjacent concrete aprons and parking lot occupy approximately 3.4 acres within the John C. Stennis Space Center. It is used to maintain and store heavy equipment and piping in support of the four storage sites. It also has office space permanently used by its tenants and, if needed, temporarily used by headquarters personnel.

1.2.7 St. James Terminal

The St. James Terminal, located along the MS River in St. James Parish, LA consists of a 173-acre site that includes a central facility and two satellite docks on the west MS River batture. DOE leased this facility to Shell Pipeline in 1997.

2 Compliance Summary

COMPLIANCE DURING 2017

The SPR did not have any:

- ***compliance or cleanup agreements,***
- ***environmental violations cited by regulators,***
- ***notices of violation,***
- ***notices of deficiency,***
- ***notices of intent to sue,***
- ***or other types of enforcement actions issued at any of the sites.***

There were no permit exceedances regarding air, water, and waste.

2.1 Regulatory Compliance Summary

Operational activity at the SPR is subject to numerous federal and state regulations, Executive Orders (EO) and DOE Orders. A list of applicable environmental standards is provided in Appendix A1, and a list of SPRPMO Environmental Safety & Health (ES&H) Directives is included in Appendix A2. By following these regulations, orders, standards, and directives, the SPR successfully operates in an environmentally compliant manner. Table 2-1 summarizes major applicable environmental regulations and orders. It also provides a summary of how compliance requirements were met during 2017, and (where appropriate) references report sections that contain more detailed information.

The principal agencies responsible for enforcing environmental regulations at SPR facilities are:

- Environmental Protection Agency (EPA),
- New Orleans and Galveston Districts of the United States Army Corps of Engineers (NODCOE & GALCOE),
- United States Fish and Wildlife Service (F&WS),
- Louisiana Department of Environmental Quality (LDEQ),
- Louisiana Department of Natural Resources (LDNR),
- Louisiana Department of Wildlife and Fisheries (LDWF),
- Railroad Commission of Texas (RRC),
- Texas Commission on Environmental Quality (TCEQ),
- Texas General Land Office (TGLO),
- Texas Parks and Wildlife Department (TPWD) and
- Mississippi Department of Environmental Quality (MDEQ).

These agencies issue permits, review compliance reports, inspect site operations, and oversee compliance with regulations.

Table 2-1 Environmental Regulations Applicable to the SPR		
Regulation	**Compliance Status**	**Report Section**
National Environmental Policy Act (NEPA)- requires federal agencies to follow a prescribed process to anticipate impacts on the environment of proposed major federal actions and alternatives.	All design reviews, engineering change proposals, deviations, waivers and purchase requisitions were evaluated for NEPA review in 2017. Out of these documents, 30 required NEPA categorical exclusion documentation. None of the projects associated with these documents had potential to adversely affect any environmentally or culturally sensitive resources, such as structures of historical, archeological, or architectural significance or any threatened or endangered species or their habitat. Also, no wetlands were adversely impacted because of these actions. Environmental Assessment, DOE/EA-2039 was prepared in 2016 for the Brine Disposal Pipeline Replacement Project associated with the WH site. The Finding of No Significant Impact and the Final EA were issued by DOE on February 9, 2017. Two projects were reviewed in 2017 and determined to require Environmental Assessments. DOE/EA-2073 was prepared for Life Extension-II Work Packages and DOE/EA-2079 was prepared for raw water channel upgrades at BM, which is also a part of Life Extension-II. Both Environmental Assessments were completed in 2018.	3
EO 11988 "Floodplain Management," **EO 11990** "Protection of Wetlands," NODCOE, GALCOE, LDEQ and RRC	The SPR ensures compliance with EOs 11988 and 11990 by complying with NEPA requirements, identifying potential environmental impacts, and obtaining permits through the COE and state coastal management agencies prior to any construction, maintenance, rehabilitation, or installation of structures and facilities.	3
EO 13693 "Planning for Federal Sustainability in the Next Decade" (issued 3/19/15, in effect through calendar year 2017, revoked 5/17/2018). The goal is to maintain Federal Leadership in sustainability and greenhouse gas emission reductions.	Each year the SPR Sustainability Planning Committee oversees the identification, selection, scheduling, budgeting, and implementation of projects and activities that support the sustainability program. A Site Sustainability Plan is submitted to DOE by every December.	3
Atomic Energy Act of 1954	X-ray and other sealed radioactive sources are used at the SPR to perform analytical, monitoring and scanning activities. Conformance is demonstrated by following state implementing agency radiation control regulations.	4

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Safe Drinking Water Act (SDWA) LA and TX Underground Injection Control (UIC) programs regulate underground hydrocarbon storage, related brine disposal, and oil field wastes. TCEQ enforces the SDWA in Texas by regulating Public Water Systems for health-based violations to ensure potable water provided is safe to drink.	SPR sites comply with the SDWA through permitting under the LA and TX UIC programs. The 2017 Annual Report Form OR-1 for underground injection was completed and submitted on schedule to the LDNR. Local public water systems supply drinking water to all storage sites, NO headquarters, and the NO and Stennis warehouses. Potable water systems at BM and BH are classified by state regulations as "non-transient, non-community" public water distribution systems, and these sites are required to have potable water monitoring programs. WH and BC facilities are not required to have potable water monitoring programs and are recognized as water purchasers only. In 2017, potable water samples were taken monthly at BM and BH for coliform monitoring, and weekly samples were collected and analyzed for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results at both sites did not exceed the regulatory maximum contaminant levels (MCL) for disinfectants. All coliform results were also below the MCL. Potable water is sampled and tested for lead and copper annually at BH and tri-annually at BM. In 2017, testing for disinfection by-products (Trihalomethanes and Haloacetic Acids) was conducted through TCEQ at BM and BH. Test results for DBPs were below the MCL at both sites. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. Samples were collected by a TCEQ contractor and tested for nitrate and nitrite at BH and BM in 2017. All results were below their MCLs. Groundwater monitoring of the uppermost aquifer at the SPR storage sites is mandated via DOE orders for surveillance assessment and is coordinated through the Environmental Monitoring Plan (EMP). Details of groundwater monitoring are presented in Section 6. Historical groundwater evaluations have indicated the presence of shallow groundwater impacts from salt water at the BM and WH sites. As part of the site's overall groundwater surveillance, the post-closure monitoring near the BM brine storage pond is provided through this report to the RRC as requested. The WH site completed the closure of its brine ponds in 1999 under a corrective action plan (CAP) negotiated with LDNR. Remedial recovery pumping was completed in 2001. Post-closure monitoring for 30 years is currently met by quarterly monitoring and annual reporting in the ASER, which is shared with LDNR.	5.1, 6

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Clean Air Act (CAA)- LDEQ and TCEQ regulate the release of air pollutants through permits and air quality limits.	SPR sites comply with provisions of the CAA and State Implementation Plans (SIP) through permitting and following applicable regulations. All SPR facilities operate in accordance with the provisions of the applicable state air permits. In 2017, the BC air permit was renewed and issued by LDEQ. An air permit application to renew the BH air permit was also submitted to TCEQ in 2017. Annual fugitive monitoring of piping components for volatile organic compound (VOC) leaks was performed at the Louisiana SPR sites in 2017. Fugitive monitoring is conducted biennially at the Texas sites and was not required in 2017.	5.2
Clean Water Act (CWA)- EPA Region VI, RRC, LDEQ and MDEQ establish standards and issue permits to improve water quality. LDEQ has primary enforcement responsibility for National Pollutant Discharge Elimination System (NPDES) in LA. EPA and RRC issue NPDES permits in TX.	SPR sites comply with the CWA through permitting under the NPDES program, following SPCC regulations and complying with the wetlands usage program. <u>NPDES</u> In 2017, no modifications, changes or renewals were needed to either the TX state (Rule 8) or federal (NPDES) water discharge permits for the two TX SPR sites. In 2017, no modifications, changes or renewals were needed to water discharge permits (LPDES and Multi-Sector General Permit, MSGP) for the two LA sites. <u>Spill Prevention Control and Countermeasure (SPCC)</u> Each SPR storage site and the Stennis warehouse comply with SPCC regulations by following a plan that addresses prevention and containment of petroleum and hazardous substance spills. SPCC plans are current with Title 40 CFR 112 and corresponding state regulations. <u>Wetlands</u> The SPR sites obtain permits from the COE and Coastal Zone Management representatives of the responsible state agencies whenever projects have fill, discharge, or dredging occurring in a wetland. During 2017, notification was sent to the GALCOE for the construction completion of project BM-MM-1447. This construction project involved the placement of rock and appurtenant materials on the northern bank of the Gulf Coast Intracoastal Waterway (GIWW), approximately 3 miles east of BM in Brazoria County. Additionally, an application to extend the Maintenance Dredging Clause for BM was requested from the GALCOE. A joint permit application was submitted to NOCOE and Louisiana Coastal Management for project WH-MM-826. This project is for the replacement of the WH brine disposal pipeline. There were no wetlands permits issued to the SPR in 2017. There were, however, several maintenance notifications for traveling screen removals for repair and associated replacements at WH and BH.	5.3, 5.4

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Pollution Prevention Act of 1990- LDEQ, RRC and EPA Region VI focus on reducing the amount of pollution through cost-effective changes in production, operation, and raw materials usage.	Each SPR site operates in accordance with a Storm Water Pollution Prevention Plan (SWPPP) prepared in accordance with EPA multi-sector general storm water discharge authority for storm water associated with industrial activity and similar LA and MS state requirements, using Pollution Prevention Program principles as the basis for limiting or precluding storm water contamination.	5.5
Resource Conservation and Recovery Act (RCRA)- LDEQ, EPA and RRC govern the generation, storage, handling and disposal of hazardous wastes.	SPR facilities continued to operate as Very Small Quantity Generators (VSQG) in 2017. Hazardous wastes are not treated, stored, or disposed at any SPR sites. Therefore, the sites are not RCRA-permitted. Each SPR site has an EPA generator number that is used to track the manifesting of hazardous waste for off-site treatment or disposal.	5.5
Toxic Substances Control Act (TSCA)- regulates the manufacture, use, and distribution of all chemicals.	Procedures are in place to prohibit the purchase of equipment containing either friable asbestos or polychlorinated biphenyls (PCBs). Small amounts of non-friable asbestos usually in the form of seals or gaskets are disposed of as they are taken out of service in accordance with applicable solid waste regulations. Non-asbestos replacement components are used. No liquid-filled electrical equipment or hydraulic equipment currently used on the SPR has been identified as containing PCBs.	5.6
Superfund Amendments and Reauthorization Act (SARA)- EPA, LDEQ, LDNR, and TCEQ- SARA Title III specifies many responsibilities and reporting obligations for facilities with hazardous chemicals. **Emergency Planning and Community Right to Know Act** (EPCRA)- establishes requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals.	SARA Title III Tier Two reports, also known as EPCRA Section 312 reports, were prepared and distributed as required by March 1, 2018, to state and local emergency planning committees and local fire departments. The submittal of a TRI Form R (EPCRA Section 313) was required for all sites in 2017 because the SPR introduced crude oil into commerce from Crude Oil Sales and Hurricane Harvey Exchange. The TRI reports were prepared and submitted to EPA as required by July 1, 2018.	5.6

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Endangered Species Act- LDWF and TPWD prohibit activities that would jeopardize the existence of an endangered or threatened species or cause an adverse modification to critical habitat.	The F&WS is consulted about the appropriate actions taken regarding threatened and endangered species. The SPR does not perform activities that would jeopardize the existence of endangered or threatened species. Additionally, there are no critical habitats at any of the SPR sites. Consideration of potential impacts to endangered species at the SPR was included as part of the original conditional coverage through the re-issued MSGP. The MSGP coverage has since been migrated to either the individual or general permits issued to each site.	5.7
EO 13186- "Responsibilities of Federal Agencies to Protect Migratory Birds" & Migratory Bird Act	In a continuing effort to minimize disruption and provide suitable habitat to migratory birds at SPR sites, bird-nesting areas are closed or otherwise protected during critical periods to prevent disturbance because of site operations. SPR storage facilities are located on migratory pathways along the TX and LA Gulf Coast. Many species of waterfowl and song birds use SPR sites for resting and refueling during spring and fall migration. Environmental awareness of migratory bird issues commences at the site level. Selected fields are not mowed from early fall through spring at BC, BM, BH, and WH to provide food and shelter for migrating birds, and nesting and brooding of resident birds. When discovered, nesting areas are flagged (e.g., ground-nesting terns and killdeer); and equipment is designated for limited/restricted use on occasion when they harbor bird nests (e.g. by Northern Mockingbird, Mourning Dove, and Loggerhead Shrike).	5.7
National Historic Preservation Act (NHPA)- identifies, evaluates and protects historic properties eligible for listing in the National Register of Historic Places. NHPA is administered by State Historic Preservation Offices.	No site projects required certified reviews by the State Historical Preservation Offices in 2017.	

Table 2-1 Environmental Regulations Applicable to the SPR

Regulation	Compliance Status	Report Section
Oil Pollution Act (OPA) of 1990- OPA and TGLO improved the nation's ability to prevent and respond to oil spills and provided requirements for contingency planning both by government and industry.	SPR emergency programs, planning, and management are guided by the OPA standards for onshore storage facilities, pipelines, and marine terminal facilities. Facility Response Plans have been combined with site emergency response procedures in accordance with the EPA "One Plan" scheme and meet or exceed the requirements of OPA and related state acts such as the Oil Spill Prevention and Response Act (OSPRA) in TX. The plans are approved by the appropriate federal and state regulatory agencies. The TX sites maintain their individual OSPRA certifications in accordance with state requirements. The SPR conducts emergency drills or hands-on training at its sites quarterly in accordance with the National Preparedness for Response Exercise Program (PREP), along with full equipment deployment of announced/unannounced exercises at each site annually. Emergency management personnel from NO coordinate these drills and include the participation of public and regulatory agencies. The SPR utilizes the National Incident Management System (NIMS), the response management system required by the National Oil and Hazardous Substances Pollution Contingency Plan. SPR site and NO response management personnel have been trained in the unified Incident Command System, and a team of selected NO personnel is available to support extended site emergency operations when needed.	
Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)- LDEQ and TCEQ regulate the manufacture, use, storage and disposal of pesticides and herbicides.	The SPR hires state-certified pesticide applicators to apply pesticides. Also, only chemical products on the SPR Qualified Products List (QPL) are allowed on site. Much of the SPR property is developed with buildings, piping, cable trays, and other structures where pesticide and herbicide use is necessary to control unwanted vegetation and other pests. During 2017, the SPR used pesticide products to control pests in buildings and around work areas, control vegetation throughout site grounds, and security zone areas, and to mitigate the reduction of the number of personnel dedicated to mowing. Although pesticide use is necessary, there is a concerted effort made, through screening of chemicals before purchase, to use products safest for the environment and employees.	

2.2 Preventing and Reporting Releases

The SPR oil storage sites are located adjacent or near marsh, wetlands and water bodies. Protection of the surrounding environment through oil spill prevention and control is a primary commitment. Verbal notification and associated written reports to the appropriate regulatory agencies (e.g., National Response Center) are made if a release meets reportable criteria. Each SPR site has structures in place to contain or divert any harmful release that could impact surrounding waterways or land areas. Onsite spill control equipment, detailed emergency plans, and extensive training are used to ensure that the environment is safeguarded.

Site Emergency Response Procedures address release reporting requirements of the SPR M&O, DOE, and appropriate regulatory agencies. Specific reporting procedures are dependent upon the quantity and type of material released, immediate and potential impacts of the spill, and spill location (e.g., wetland or water body). Spills of hazardous substances are verbally reported to site management and then to NO M&O and DOE management. Releases are documented using the Operations Control Center (OCC) Non-Routine and Occurrence Report form. The form is completed at the site and then forwarded to the NO OCC. Corrective action/cleanup reports are also submitted unless otherwise directed by the DOE or appropriate regulatory agency.

2.2.1 Reportable Releases

Federal and state regulations require notification to authorities in the event of a release of a reportable quantity of designated materials. Historically, most of reportable releases at the SPR have resulted from brine and crude oil operational activities. During calendar year 2017, there were four reportable releases at the SPR. The releases did not cause harmful impacts to the surrounding environment, were cleaned up, and reported to implementing agencies in accordance with regulatory requirements. They are summarized in the following narrative.

Figure 2-1 provides a five-year visual illustration of reportable releases at the SPR. Due to the number of reportable spills that occurred over a two-month span, the M&O Senior Management initiated communication with site management to focus on preventative measures to reduce the likelihood of reportable releases. Because of this focus and support, reportable releases reduced to zero from November 2017 through July 2018.

On September 8, 2017, at BC, a thirty-barrel release of brine resulted from maintenance activities associated with the repair of a leaking raw water pipeline valve. When the pipe system was depressurized for maintenance, liquid from the brine pond siphoned back through it and flowed through the leak onto the ground. M&O personnel completed notification to applicable outside agencies as required and initiated clean up and recovery operations.

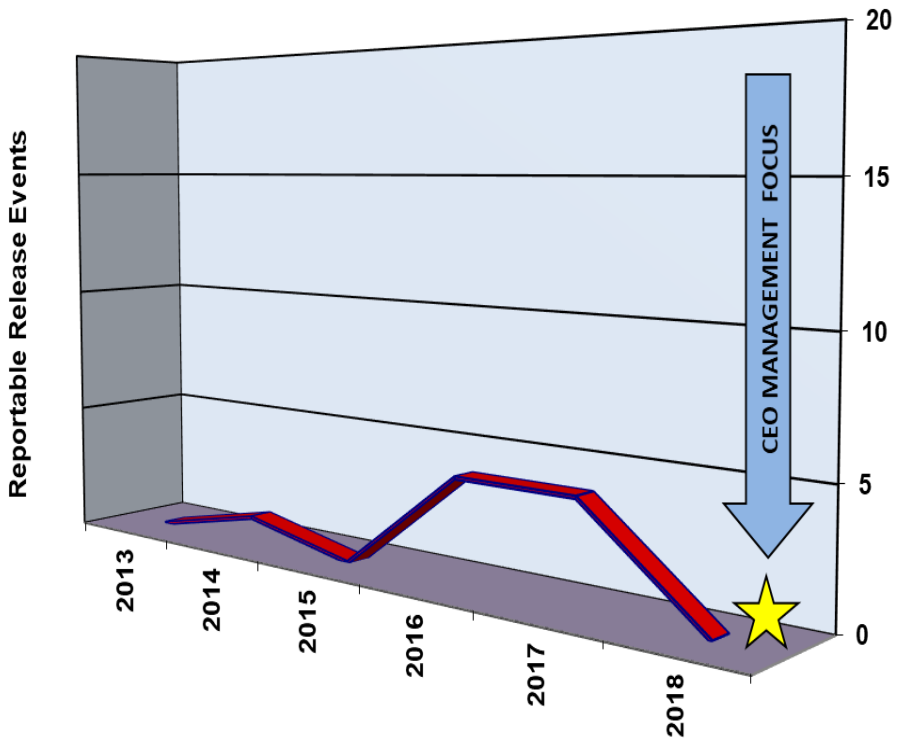
On October 3, 2017, at WH, a ten-barrel release of crude oil occurred within the designated secondary containment area of Cavern 115 as the result of leaking blow out preventers on the work over rig. Wind caused a crude oil mist over a 900-square foot area outside of the secondary containment. Later, rain caused a sheen that originated from the impacted area to form in a drainage area that connects to a navigable water (Black Lake). WH personnel closed the sluice gate upstream of Black Lake and deployed absorbent boom to stop the flow of the sheen and prevent it from reaching Black Lake. M&O personnel completed notification to

applicable outside agencies as required and initiated clean up and recovery operations.

On October 5, 2017, at BC, a four-barrel release of brine to the environment resulted from activities associated with maintenance of the brine disposal wells. The subcontractor performing the task did not utilize secondary containment and during the movement of dewatering tanks, four barrels of brine spilled onto the ground. M&O personnel completed notification to applicable outside agencies as required and initiated clean up and recovery operations.

On October 16, 2017, at BH, an eight-ounce release of diesel fuel to the GIWW resulted from the leaking day tank located on the raw water intake structure (RWIS). Due to the elevated storage of the day tank on the RWIS above the GIWW, windy conditions caused the leaking fuel to become airborne and deposit on the water creating a sheen. M&O personnel completed notification to applicable outside agencies as required and initiated clean up and recovery operations.

Figure 2-1 SPR Reportable Spills for Calendar Years 2013 - 2018



2.3 Major Environmental Issues

2.3.1 Gassy Oil

When retrieving crude oil from salt dome storage, air emissions may be of concern. During retrieval, methane and ethane gases (non-regulated) that have migrated into the salt cavern are released, stripping regulated pollutants (VOCs) from crude oil into the atmosphere. Also, geothermal processes raise the crude oil temperature and vapor pressure. This elevated vapor pressure may exceed regulatory limits for storage in floating roof tanks, potentially affecting some of the SPR sites and the receiving commercial terminals (customers).

This environmental issue has been addressed by performing "degassing" operations. Beginning in 1995, the SPR commenced degassing operations to separate and remove gas from stored oil, as well as employing heat exchangers to cool oil prior to transport offsite. Degassing has since been performed at SPR sites on a continuous alternating schedule. Recent history is as follows:

- BH, early 2004 - October 2006 (Plant was disassembled and moved to BM in 2007.)
- BM, September 2007 - February 2011
- WH, August 2014 - 2018

As of May 2018, degassing continues at WH. It is projected to continue operations through October 2018.

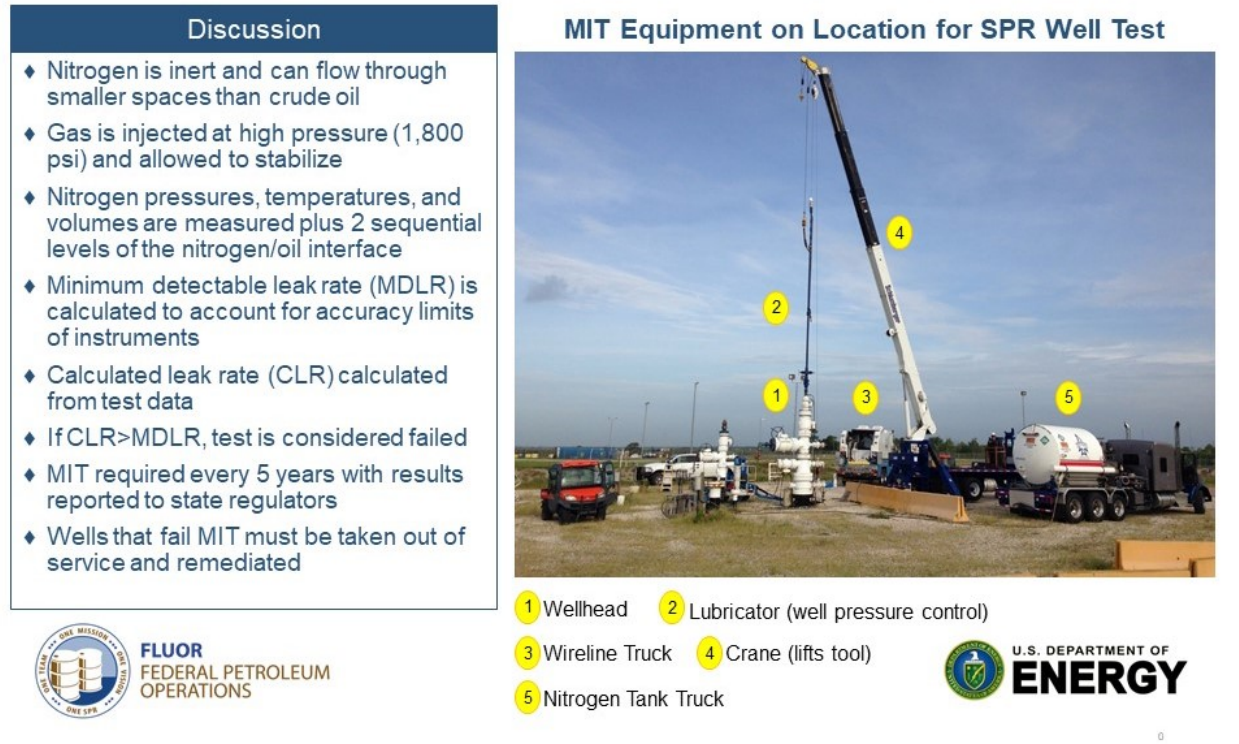
2.3.2 Cavern Integrity

SPR caverns and wells are operated and maintained in accordance with regulatory requirements of the LDNR at LAC Part XVII, Subpart 3, Statewide Order 29-M and the RRC at TAC, Title 16, Part 1, Chapter 3, Rule 3.95, in addition to DOE policies.

To ensure compliance, the SPR conducts a broad monitoring and inspection program, including continuous measurement and recording of fluid pressures in the caverns to keep the caverns within prescribed operating pressure ranges and as a check for the possible loss of containment. Mechanical integrity tests are performed at least once every five years using pressurized nitrogen gas to test fluid containment. A variety of wireline well logging tools, such as multi-arm calipers in the wells and sonars in the caverns, are used to measure subsurface conditions. On the surface, wellheads are inspected periodically for corrosion and loss of integrity and each storage site is surveyed for ground subsidence as an indicator of salt dome movement and possible cavern-scale movement. When necessary, diagnostic workovers are performed to remove brine strings from wells so they can be logged and inspected. Well remediation is performed when a well loses mechanical integrity or shows severe deformation.

During 2017, FFPO completed 14 diagnostic workovers and remediation of two wells (BH Well BH-111B and WH Well WH-115) by operating two workover rigs. The program was successful such that no violations were issued by either LA or TX state regulators.

Figure 2-2 Mechanical Integrity Test (MIT)



2.3.3 Big Hill Brine Pond 9

In November 2006, an inspection revealed significant deterioration of the pond liner and recommended replacement. A method of replacement was submitted to the RRC via permit modification, but denied in July 2013. In December 2013, it was determined that rather than repair the existing liner, the pond would be closed in-situ and capped. In January 2014, a Conceptual Closure Plan was submitted to the RRC. To facilitate closure, sediment samples were collected. Samples indicated chloride concentrations exceeding the regulatory threshold and the presence of hydrocarbons. After consideration of several remedial alternatives, a Closure Plan was developed in May 2015.

In accordance with Phase I of the Closure Plan, a pilot test was performed in early 2016 and completed in July 2016. The pilot test included an in-pond small scale evaluation of a proposed chloride washing technique. The pilot test indicated a reduction of chloride content in anhydrite sediment after washing. Refer to Figure 2-3 for the washing technique. With favorable results, a report of findings was submitted to RRC and permission requested to proceed with Phase II- Full Wash.

The RRC granted permission to proceed with Phase II. A contract was awarded in October 2016 and washing proceeded through 2017. However, by January 2018, it was determined that the washing method was not achieving the remedial goals as quickly as anticipated. Additional sampling and analysis was performed during the Summer 2018 and an updated Closure Plan is to be submitted to RRC in late 2018.

Figure 2-3 BH 10/25/2017 Wellpoint Washing System

View looking west of pond.

2.4 DOE Onsite Appraisals and M&O Organizational Assessments

SPRPMO management appraisal teams and the NO M&O environmental group conduct visits to SPR sites annually to audit compliance with environmental programs and EMS practices. Assessors are independent of the operating sites and are not accountable to those directly responsible for the issues audited. Specific topics are chosen based on current management concerns and the results of previous audits. Issues and programs reviewed in 2017 included chemical and waste management, air and water quality, sustainability, EMS and pollution prevention. In 2017, there was one environmental finding associated with the DOE Onsite Appraisals. The M&O identified three opportunities for improvement (OFI) and one finding during 2017. Corrective action plans were developed and implemented for findings and OFIs. All audit findings are tracked to completion in the SPR's Assessment Tracking System.

2.5 Regulatory and ISO 14001 Registrar Inspections/Visits

There were ten inspections or visits by or on behalf of regulatory agencies and the ISO 14001 certification body to SPR facilities in 2017. These visits are summarized in Table 2-2. The visits are conducted on a routine basis by the regulatory agencies to ensure compliance or to address concerns regarding activities at the SPR facilities. The ISO 14001 registrar's visit was a surveillance audit to validate that the SPR's EMS follows the ISO 14001:2004 standard. There were seven OFIs identified, corrective actions were put into place and all were successfully closed. The M&O maintains ISO14001 registration.

Table 2-2 Summary of Regulatory & Third-Party Inspections/Visits 2017

Site	Organization	Remarks
BH	TGLO	Annual oil spill prevention and response audit - site passed.
	TGLO	Follow-up on reported spill
	TCEQ	Discuss new air permit
	USCG	Follow-up on reported spill
	ISO 14001 CB	Surveillance audit – certification remains in effect.
BM	TGLO	Annual oil spill prevention and response audit - site passed.
NO	ISO 14001 CB	Surveillance audit – certification remains in effect
ST	ISO 14001 CB	Surveillance audit – certification remains in effect
WH	USCG	Follow-up on reported spill
	ISO 14001 CB	Surveillance audit – certification remains in effect

2.6 Community Outreach Programs

SPR sites attempt not only to be good stewards of the environment, but also good neighbors. Community outreach programs have been established to promote healthy public relations and donations have been given to needy SPR site neighbors. Examples are as follows.

BH Celebrates Earth Day 2017

BH celebrated Earth Day 2017 with 3rd grade students at Hamshire Fannett Elementary school. Every year, BH employees travel to Hamshire Fannett Elementary to conduct Earth Day presentations and activities. Flowers are planted and students are provided with coloring books, stickers, animal crackers and water.

Students from Hamshire Fannett Elementary school listen as BH representatives discuss Earth Day.

Science Bowl 2017

SPR employees volunteer for the Louisiana Regional Science Bowl at UNO that is part of the National Science Bowl® competition coordinated by the DOE's Office of Science. Since its inception in 1991, more than 250,000 high school students have participated in this fast-paced question and answer contest. By participating in Science Bowl competitions, students are encouraged to excel in science and math and to pursue careers in those fields. Baton Rouge Magnet advanced to Washington, D.C. from the 2017 DOE Louisiana Regional Science Bowl.

Kids, Grandkids Visit BH and NO Sites

The BH and NO offices welcomed children and grandchildren of SPR employees in 2017 for the annual celebration of Take Our Children to Work Day.

Twenty-four children and grandchildren of BH employees were treated to a full day of fun and educational activities. The DOE Senior Site Representative started things off by welcoming everyone to the site. FFPO employees conducted presentations explaining what the SPR is, how the site moves oil and brine, the importance of recycling and wildlife at the SPR.
The site's young guests also enjoyed a K-9 demonstration conducted by Protection Force officers, a bus tour of the site and interesting hands-on tours of the fire truck, Humvee and night vision goggles.

Morning activities for the 54 young visitors in NO included three Science, Technology, Engineering and Math (STEM) activities — salt water powered monster trucks, growing plants from seeds, Get Slimed! Science Kit — plus the always-popular face painting.

After lunch with their parents/grandparents, the children enjoyed a STEM Engineering Presentation by the Assistant Dean of Engineering at the University of New Orleans (UNO). To close out the day, the kids were treated to snowballs and nachos.

SPR Environmental Advisory Committee (EAC)

The SPR EAC was formed in 1988 as an independent scientific peer review group. The committee consists of eight members that are scientific/technical specialists in the environmental, emergency management, mining, and oil and gas fields, as well as community representatives of the cities near the four SPR sites. The EAC's purpose is to supplement existing environmental and emergency management efforts of the SPR by providing independent assessments, evaluations, advice, and impartial information to management, the public, and media relative to the environment, safety, public perception, programs, and policies of the SPR.

The EAC meets every six months. The January 2017 EAC meeting was held at the BH site. Topics discussed included the status of BH Pond 9, BH wildlife, sustainability, air compliance, and a tour of the site. The September 2017 EAC meeting was held in NO. Topics discussed included cavern integrity, BC wildlife, air compliance, climate change and resilience assessment, reducing potable water use, and an EAC presentation on the Deep-Water Horizon oil spill.

NO Donates Backpacks To Schools, TX Hurricane Victims

NO FFPO employees donated money and school supplies to fill 80 FFPO backpacks, which they delivered to two area schools: Homer A. Plessey Community School and Dr. King Charter School.

NO FFPO also held an additional drive for funds and school supplies to send 100 backpacks and supplies to be distributed to BH and BM area school children affected by Hurricane Harvey.

BC Helps Educate Kids On Safety

Once a year, a miniature city in Iberville Parish welcomes hundreds of local kindergarteners for one valuable purpose: to plant safety seeds in their minds. Community volunteers —such as several representatives from BC — help cultivate the safety messages flooding the streets of Safety Town. Driving big wheel tricycles, the pint-sized visitors tour the tiny town, complete with city buildings, railroad crossings, stop signs and traffic lights. When they demonstrate good safety habits, they are awarded a Safety Town driver's license. If they drive unsafely, they learn what it's like to get a traffic ticket. Volunteers teach the kids what to do when they hear a siren signaling bad weather, how to correctly report an emergency by calling 9-1-1, and important safety principles such as "stop, drop and roll" and why they should not talk to strangers.

BC FFPO managers help guide Safety Town visitors through the make-believe town's traffic signs.

FFPO Makes A Splash Through Community Outreach

FFPO is proud to be a sponsor and supporter of the Solar Splash Team at the UNO. This group of students is a non-profit organization formed to promote engineering education and interest in solar innovation.

Students of the UNO School of Naval Architecture and Marine Engineering have been involved with Solar Splash, the Collegiate World Championship of Solar Boating, since 1996. This intercollegiate competition is designed to foster an environment of learning, camaraderie and innovation.

FFPO's community outreach involvement in this effort includes a cash donation along with mentoring and advising this innovative group of students. FFPO believes science, technology, engineering and math education is a foundation for student success. The company is pleased to invest in inspirational programs like Solar Splash, and is committed to developing the workforce of the future generations.

Angel Tree Program

NO FFPO employees were part of a group of volunteers who delivered toys collected through the annual Angel Tree program, which assists the local Total Community Action Center. Generous employee donors adopted 130 children during the 2017 holiday season.

2.7 Awards

BC Recommended As Voluntary Protection Program (VPP) Star Facility

BC was assessed in 2017 for continued participation in the OSHA VPP. The OSHA audit team was on site for four days and performed a wall-to-wall physical assessment of the site, reviewed policies and procedures, assessed compliance, and looked at process safety management in detail.

A team from multiple NO departments assisted in specific areas of the audit. For example, Configuration Management members responded to specific questions about management of change, and industrial hygienists answered questions related to hazardous chemicals, monitoring,

and ergonomics. Each audit also includes a detailed examination of FFPO's compliance with the process safety management regulation.

Each day, OSHA auditors met with site employees, conducting informal interviews. Following the assessment, the auditors indicated that they would recommend the site as a Star facility, which means the site met or exceeded all requirements.

3 Environmental Management System (EMS) and Sustainability

DOE Order 436.1 requires sites to have an EMS. The EMS must be certified to or in conformance with the ISO 14001 standard. On May 19, 2000, the EMS was first evaluated by an independent certification body accredited by the American National Standards Institute/American Society for Quality (ANSI-ASQ) National Accreditation Board (ANAB) and certified in conformance with the ISO 14001 standard. The EMS was recertified in 2003, 2006, 2009, 2012, and 2015. Between certification and recertification activities, surveillance audits are conducted by the certification body. This certification is valid through May 2, 2018.

The scope of the EMS is the operation and management of the SPR under the M&O and its personnel and on-site subcontractors. The EMS addresses activities conducted at SPR sites by FFPO and its subcontractors. The SPR sites encompass roughly 1700 acres, 160 buildings or structures, and 170 miles of offsite pipeline (crude oil, fresh/brackish water, and brine). Sites are directly supported by approximately 630 M&O contracted and subcontracted full-time personnel. Site personnel receive computer-based ISO 14001 EMS training annually. The training provides an overview of the ISO 14001 standard and the importance of conformity with the SPR's environmental policy and procedures.

DOE delegates responsibility and authority for the environmental component of the Integrated Safety Management system (ISM) to the M&O. The purpose of ISM is to ensure that environmental, safety and health requirements are an integrated but discernible part of the performance of all work, from the initial planning stage through feedback and improvement. The SPR EMS Manual formalizes the environmental portion of ISM and defines the scope of the EMS regarding the elements of the ISO 14001:2004(E) Standard. Although compliance with ISM does not ensure compliance with the ISO 14001:2004(E) Standard, the M&O has tailored the EMS to comply with both standards.

The EMS is implemented to protect the environment and manage SPR environmental obligations in a safe and effective manner. It establishes the necessary organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, and maintaining the "SPR Environmental Policy." Conformance of the EMS to the ISO 14001 standard is illustrated through the SPR EMS Manual. The manual provides descriptions and references to SPR policies, plans, procedures, environmental aspects and impacts and objectives and targets that form the foundation of the EMS. Table 3-1 is a summary of the EMS objectives and targets with progress.

Table **3-1** FY 2017 Institutional Objectives and Targets with Performance			
Aspect	Objective	Status 2017	Performance
1) Continual Improvement	Restructure environmental checklists (EMS & Compliance). Revised checklists will be geared to identify program deficiencies better, and therefore, reduce non-compliance liabilities.	Complete	N/A
2) Continual Improvement	In coordination with Contractor Assurance System, develop strategies to strengthen employee understanding and involvement with implementing the revised ISO 14001 and ISO 9001 standards.	Complete	N/A
3) Continual Improvement	Develop and implement evaluation of compliance database with findings for the past two years. This will provide an all-encompassing location to find succinct information on environmental findings.	Complete	N/A
4) Discharges	Reduce permit exceedances reported on the Discharge Monitoring Reports *Target: ≤8/year*	Zero	Meets Target
5) Spill, Air Emission, Monitoring, Wetlands Disturbance, Drainage, Navigation, Public Exposure	Avoid Clean Water Act, Clean Air Act, and RCRA (waste) enforcement actions (Notices of Violation – NOVs) *Minimum & Target: 0/year*	Zero	Zero Since FY00
6) Spills	Reduce reportable occurrences of releases from operational facilities *Minimum: ≤6/year Target: ≤4/year*	Two	Meets Target
7) Waste	Divert at least 50% Construction & Demolition Debris *Minimum: ≥50% Target: N/A*	62.3%	Above target
8) Waste	Divert at least 50% of Non-Hazardous Solid Waste *Minimum: 50% Target: N/A*	62.3%	Above Target
9) Waste, Spill, Air Emissions Resource Use	Review all P.R.s, designs, SOWs, and other documents submitted for Environmental review. *Minimum: N/A Target: 100%*	100%	100% since 2001
10) Monitoring and Surveillance Results	Submit environmental documents on time to DOE & Regulators (timeliness and quality) *Minimum: N/A Target: 100%*	100%	100% since 2001

Table **3-1** FY 2017 Institutional Objectives and Targets with Performance			
Aspect	Objective	Status 2017	Performance
11) Spill Monitoring & Surveillance	Submit annual Pipeline Integrity Report. *Minimum: N/A Target: On Schedule*	Complete	Completed on Schedule
12) Spill	Ensure key emergency equipment is available. *Minimum: 90% Target: 100%*	100%	>Minimum since 2000
13) Spill Fire	Ensure emergency preparedness and response capabilities through quarterly training of ERT members. *Minimum: 95% ERT trained/site Target: 100% ERT trained/site*	100%	>Minimum since 2000
14) Spill	Complete PREP drills/exercises. *Minimum: N/A Target: 100% PREP objectives tested/site/yr.*	100%	100% for regulatory compliance
15) Spill Air Emissions Waste	Meet weighted average of quality of maintenance, preventive maintenance completion, maintenance support, scheduling effectiveness, productivity, corrective maintenance backlog, and readiness of critical must-operate equipment. *Minimum: 95%/month Target: 98%/month*	Above Target	Generally meeting the target but always exceeding the minimum since FY00

EMS Performance Metrics

The following qualitative discussion describes the status of the EMS performance for 2017. The information provided below is excerpted from the SPR's 2017 EMS Compliance Report that was submitted through Fed Center. The EMS received a "Green" score based on the metrics listed below.

The EMS implementation team annually reviews activities, products, and services. Activities include but are not limited to maintenance, workovers, drawdowns, painting, and pipe integrity. Their associated environmental aspects (i.e., possible air impact, fire results, production of waste, etc.) are evaluated. The severity, frequency (likelihood) and rank are determined using the SPR Risk Coding Matrix. Severity rating descriptions range from negligible, to marginal, moderate, significant and severe. Frequency ratings range from very low to very high. Using severity and frequency ratings, ranks are determined. The Significant Aspect List is provided in Table 3-2. Review results are documented, and changes are made when deemed necessary. The updated list of environmental aspects is published internally and is available outside DOE if requested.

The EMS has established documented, measurable environmental objectives. See Table 3-1 for a list of Objectives and Targets. In 2017, 100% of the objectives were met.

In 2017, operational controls associated with identified significant environmental aspects were established, implemented, controlled and maintained in accordance with operating criteria.

During 2017, an environmental compliance audit program was in place. Audits were completed according to schedule, findings were documented, and corrective and preventive actions were defined/documented and either completed or placed on a schedule for completion. More information about the SPR audit program is in Section 2.4. In 2017, all 10 of the E.O. 13693 "Planning for Federal Sustainability in the Next Decade" sustainability goals were applicable and addressed in the EMS. More information on the sustainability goals is in Table 3-3, 2017 Sustainability Goals, Performance, and Planned Actions.

Table 3-2 Significant Aspect-Impact List*

Aspect	Activity	Impact	Severity Score	Frequency (Likelihood) Score	Rank
Air Emissions	Insufficient maintenance of site structures and equipment	Air Quality	Moderate	Medium	Medium
	Workover-crude movement		Marginal	Medium	Low
	Degas crude		Significant	Medium	Medium
	Drawdown-crude to ships		Moderate	High	Medium
Fire	Inadequate response to upset conditions	Air Quality, Land, Water Quality	Significant	Medium	Medium
Waste	Sample/Test crude (receipt & storage)	Disposal Impact (Haz or Non-Haz)	Marginal	Very High	Medium
	Construction activities		Marginal	Very High	Medium
	Painting		Marginal	Medium	Low
	Sample/Test (degassing crude)		Marginal	Very High	Medium
	Sample/test (workovers and inter-cavern movements)		Marginal	Very High	Medium
	Chemical use-Non-QPL		Marginal	Very High	Medium
	Maintain site structures		Marginal	Very High	Medium
Spills/Releases	Workover-crude/brine movement	Water Quality	Moderate	Very High	High
	Crude storage tanks (before moving to caverns)		Marginal	Very High	Medium
	Respond to upset conditions (emergency)		Severe	Medium	High

Table 3-2 Significant Aspect-Impact List*

Aspect	Activity	Impact	Severity Score	Frequency (Likelihood) Score	Rank
	Inadequate monitoring of onsite piping integrity	Air Quality, Land, Water Quality	Moderate	Very High	High
	Inadequate monitoring of offsite pipeline integrity		Moderate	Very High	High
	Insufficient survey of cathodic protection of crude oil pipelines		Moderate	Medium	Medium
	Drawdown – move crude vial piping		Significant	Very High	High
	Failure to establish/maintain BOAs for spill response/ clean up		Significant	High	High
	Leach caverns with raw water during drawdown	Land and Water Quality	Severe	Medium	High
	Pig pipelines to perform maintenance		Moderate	Very High	High
Natural Resource Preservation	Insufficient maintenance of site structures	Water Quality	Moderate	Very High	High
	Maintain site structures	Wildlife	Moderate	Very High	High
	Work in wildlife habitat areas		Marginal	Very High	Medium
Cavern Integrity	Leach caverns with raw water during drawdown	Cavern Integrity	Severe	Medium	High
	Cavern (drill wells)		Severe	Medium	High
	Store crude in caverns	Environment	Severe	Medium	High
Discharges	Maintain site structures	Water Quality	Moderate	Very High	High
Energy Use	Degas crude oil	Energy/Material Consumption	Moderate	Very High	High

*Severity, frequency, and rank were determined using the SPR Risk Coding Matrix (AAA9020.1057).

EMS & Mission Effectiveness

Since its inception, the EMS has contributed to the effectiveness of the SPR mission. The EMS has reduced risk to the organizational mission, contributed to an improved fiscal efficiency/cost avoidance, provided greater understanding and recognition of environmental issues at all levels and improved community relations. Below are specific examples of how the EMS has contributed to mission effectiveness.

- Allows the SPR to operate more efficiently during routine and drawdown modes due to a strong control of significant environmental aspects.
- Improves SPR's relationship with neighbors and regulators.
- Saves taxpayer money otherwise spent to correct environmental upsets such as crude oil spills and discharges that exceed permit limitations.
- Provides a management system to ensure agreement with compliance obligations.
- Provides a system to reduce environmental liability and risk.
- Formalizes the environmental portion of the ISM.

EMS Best Practices

In 2017, there were several EMS best practices implemented at the SPR. Every year a strategy is developed with recommendations for reaching the sustainability goals of EO 13693. Based on the strategy developed, DOE chooses which objectives to fund. This process is conducted annually to confirm choices for the following year and provide an opportunity to evaluate new strategies or programs. Quarterly sustainability meetings were held to evaluate progress in achieving EO 13693 goals. Progress is discussed at management review team meetings.

Additional 2017 EMS best practices included:

1. Sending out monthly EMS topics to management for discussion at all-hands meetings,
2. Publishing EMS topics in the SPR Newsletter "What's Happening,"
3. Conducting visits to all sites to educate site management on changes to the updated or the new ISO 14001:2015 standard and
4. Conducting a Climate Change Resiliency Assessment for the SPR in conjunction with DOE's National Renewable Energy Laboratory and Southern Climate Impacts Planning Program. The Climate Change Resiliency Assessment presented Senior Management with future resiliency strategies to be selectively implemented in Life Extension 2.

EMS Implementation Challenges

In 2017, there were three EMS implementation challenges identified:

1. Meeting milestones that support E.O. 13693 and meeting other mission and regulatory requirements/responsibilities,
2. Ensuring the management system is adhered to and effective at all operating site locations,
3. Implementing effective training for site personnel.

Plans for resolution are being developed for the identified implementation challenges and will be put in place in 2018.

3.1 Sustainability

The SPR Sustainability Program was initiated in 2007 with the advent of EO 13423, broadened in 2009 with EO 13514, and then revised with EO 13693 in 2015. It focuses on resource conservation and pollution prevention of air, water, waste, and chemicals. The sustainability program is planned, implemented, monitored and measured, evaluated, reported, and improved through the SPR EMS.

Many SPR sustainability goals – identified as "objectives" in the EMS – were created during the initial development of the SPR EMS, after evaluating SPR activities and recognizing the environmental aspects of these activities that must be controlled. These are referred to as SPR-specific "institutional" objectives. Other sustainability goals identified and mandated by the executive orders were included in the EMS in 2007, 2009, and 2015. All goals/objectives and their targets are called "performance measures" and are discussed as follows.
Fifty-two performance measures were tracked by the SPR EMS in FY17 (thirty-two sustainability goals/sub-goals and twenty institutional performance measures). A target is established for each objective/goal. Some objectives have two targets, a "minimum" level that all DOE contractors should meet and a more challenging "stretch" level.

Performance measures are either identified in the M&O contractor's contract Work Authorization Directives (WADs) as contract objectives, or they support the WADs, or they are delineated by the goals of EO 13693.

Performance measures are agreed upon for each fiscal year by DOE and the M&O contractor and tracked for success. Some focus on specific disciplines (such as the Environmental or Emergency Management departments), while others involve all disciplines. All performance measures were related to significant environmental aspects or interests of top management.

Refer to Tables 3-1 and 3-3 for a synopsis in meeting performance measures. Institutional performance measures have been monitored and measured annually for more than 11 years. They are based strictly on SPR-specific environmental aspects.

SPR sustainability goals, performance, and plans are now reported in and tracked by the DOE Sustainability Dashboard (Dashboard). A screenshot of a portion of the Dashboard input window is included as Figure 3-1. Table 3-3 provides a summary of the SPR performance toward meeting the goals. It also provides a summary of planned actions to meet the goals. Sustainability data for the SPR is annually entered into the Dashboard. The Dashboard calculates the SPR performance and displays it in a Comprehensive Scorecard. The Comprehensive Scorecard is used by the Dashboard to populate the table for performance. The Site Sustainability Plan (SSP) is included in the Dashboard. The Dashboard uses the SSP to populate the performance and plans in the table.

Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
Multiple Categories		
50% Scope 1 & 2 Green House Gas (GHG) emissions reduction by FY 2025 from a FY 2008 baseline.	Auto from Comprehensive Scorecard Interim Target: -25% Current Performance: -21.3%	Scope 1: BM continues to minimize frac tank use. Continue to perform fugitive emission monitoring and give priority to leak repairs. Scope 2: GHG emissions will increase due to Congressionally mandated crude oil sales.
25% Scope 3 GHG emissions reduction by FY 2025 from a FY 2008 baseline.	Auto from Comprehensive Scorecard Interim Target: -9% Current Performance: -8.9%	Promote teleconferencing and telecommuting. Encourage carpooling. Assess if vendors can consolidate and reduce trips to sites.
Energy Management		
25% energy intensity (Btu per gross square foot) reduction in goal-subject buildings by FY 2025 from a FY 2015 baseline.	Auto from Comprehensive Scorecard Interim Target: -5% Current Performance: -5.9%	Continue to replace fluorescent and sodium bulbs with LEDs and upgrade HVAC systems as necessary.
EISA Section 432 continuous (4-year cycle) energy and water evaluations.	BC was evaluated in 2017	BM is scheduled for an EISA Section 432 survey in 2018
Meter all individual buildings for electricity, natural gas, steam, and water, where cost-effective and appropriate.	Causes of unreliable power are being investigated. More reliable replacement parts are being used.	Address the cause of unreliable power data. Replace components of the PMCC with more reliable parts, and re-route connections to reduce system downtime.

Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
Water Management		
36% potable water intensity (Gal per gross square foot) reduction by FY 2025 from a FY 2007 baseline.	Auto from Comprehensive Scorecard Interim Target: -20% Current Performance: 81%	Increase in water consumption due to Congressionally mandated crude oil sales. Potable water required by equipment used to move oil. Continue current fixture upgrades. Repair firewater piping.
30% water consumption (Gal) reduction of industrial, landscaping, and agricultural (ILA) water by FY 2025 from a FY 2010 baseline.	Auto from Comprehensive Scorecard Interim Target: -14% Current Performance: 70.1%	Increase in water consumption due to Congressionally mandated crude oil sales. Will assess the feasibility of rainwater harvesting to offset ILA water.
Waste Management		
Divert at least 50% of non-hazardous solid waste, excluding construction and demolition debris.	Auto from Comprehensive Scorecard Interim Target: 50% Current Performance: 62.2%	The SPR will continue to be pro-active in the management of onsite-generated wastes.
Divert at least 50% of construction and demolition materials and debris.	Auto from Comprehensive Scorecard Interim Target: 50% Current Performance: 62.4%	The SPR will continue to be pro-active in the management of onsite-generated wastes.
Fleet Management		
30% reduction in fleet-wide per-mile GHG emissions reduction by FY 2025 from a FY 2014 baseline.	Auto from Comprehensive Scorecard Interim Target: -4% Current Performance: -11.7%	Flex fuel vehicles will be replaced with hybrids and low greenhouse gas vehicles when applicable
20% reduction in annual petroleum consumption by FY 2015 relative to a FY 2005 baseline; maintain 20% reduction after that.	Auto from Comprehensive Scorecard Interim Target: -20% Current Performance: -58.4%	Continued effort to acquire more fuel-efficient vehicles and reduce travel. Enforce employee business carpooling and van pooling in the leased vehicle fleet. Continue annual vehicle fleet optimization exercise. Promote video conferencing.

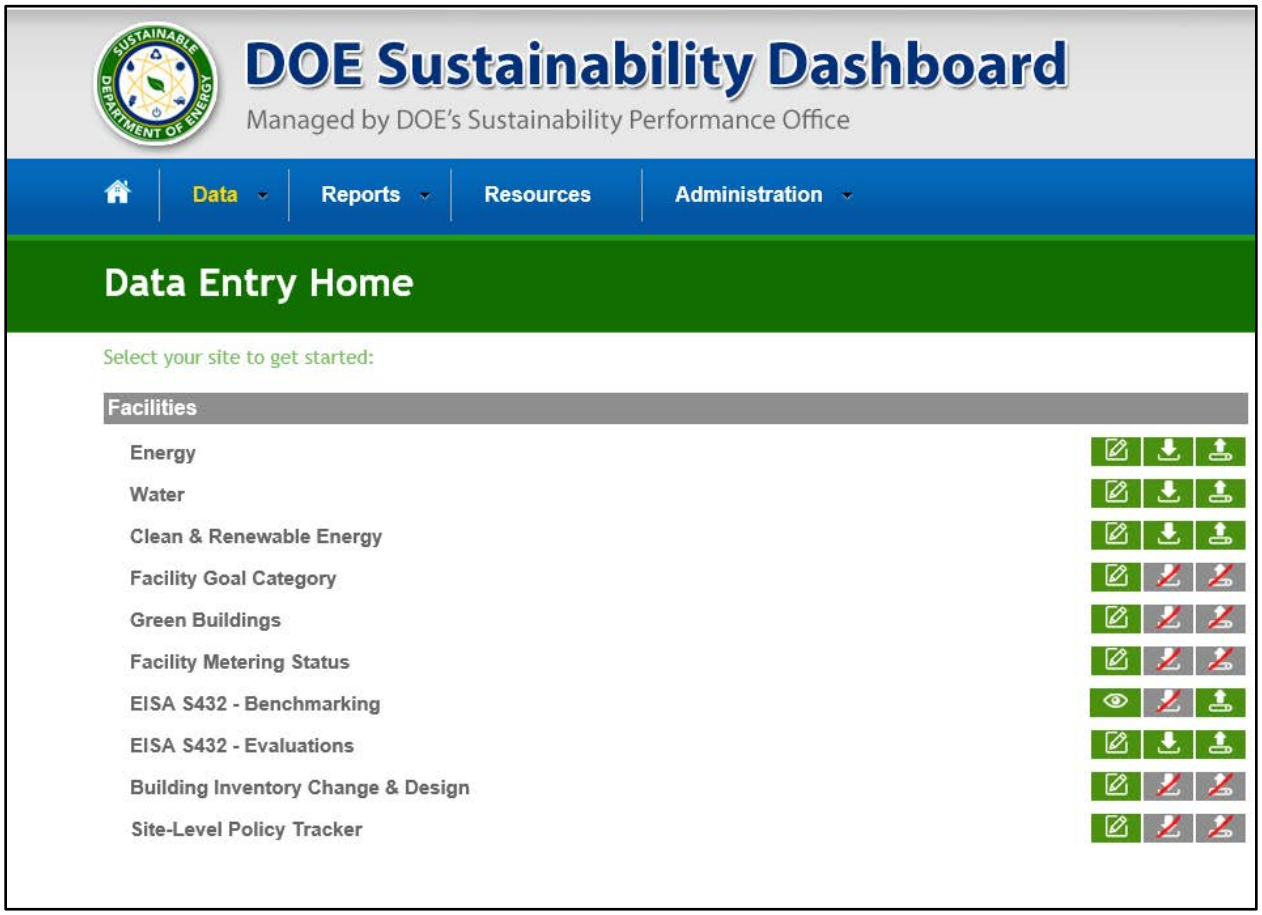
Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
10% increase in annual alternative fuel consumption by FY 2015 relative to a FY 2005 baseline; maintain 10% increase after that.	Auto from Comprehensive Scorecard Interim Target: 10% Current Performance: -99.8%	Submitted an AFV waiver for FY 2017. Continued effort to replace conventional light-duty gasoline vehicles will depend on fueling infrastructure.
75% of light duty vehicle acquisitions must consist of alternative fuel vehicles (AFV).	AFV's were evaluated.	AFV's will be evaluated if light-duty vehicles are purchased. Currently, 65% of the leased fleet is classified as AFV's (E-85 fuel compatible)
50% of passenger vehicle acquisitions consist of zero-emission or plug-in hybrid electric vehicles by FY 2025.	Plug-in hybrid vehicles and zero-emissions vehicles were considered.	When passenger vehicles must be replaced/ purchased, plug-in hybrid vehicles and zero-emissions vehicles will be considered.
Clean & Renewable Energy		
"Clean Energy" requires that the percentage of an agency's total electric and thermal energy accounted for by renewable and alternative energy shall be not less than 25% by FY 2025 and each year after that.	Auto from Comprehensive Scorecard Interim Target: 10% Current Performance: 8%	There are no plans for on-site renewable energy projects. Such technology for future projects will depend on pricing, budget and potential environmental impacts.
"Renewable Electric Energy" requires that renewable electric energy account for not less than 30% of a total agency electric consumption by FY 2025 and each year after that.	Auto from Comprehensive Scorecard Interim Target: 10% Current Performance: 10%	In 2018, the SPR will calculate the RECs needed from fiscal year consumption.

Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
Green Buildings		
At least 17% (by building count) of existing buildings greater than 5,000 gross square feet to be compliant with the revised Guiding Principles for HPSB by FY 2025, with progress to 100% after that.	Auto from Comprehensive Scorecard Interim Target: 15% Current Performance: 0%	Selected buildings will receive upgraded insulation, impact resistant and insulated windows, LED lighting, and cool roofs. Replacement of Bldg. 413 at BC will be constructed to address the revised Guiding Principles.
Net Zero Buildings: 1% of the site's existing buildings above 5,000 gross square feet intended to be energy, waste, or water net-zero buildings by FY 2025.	Opportunities were taken when possible.	The SPR will endeavor to take advantage of all opportunities to get as close as possible to Net-Zero as budget allows and not compromise the SPR Mission.
Net Zero Buildings: All new buildings (>5,000 GSF) entering the planning process designed to achieve energy net-zero beginning in FY 2020.	There are no new buildings > 5,000 GSF.	The SPR will endeavor to take advantage of all opportunities to get as close as possible to Net-Zero as budget allows and not compromise the SPR Mission.
Increase regional and local planning coordination and involvement.	Communication is on-going.	The SPR will continue to participate in local and regional organizations and communicate with the local and regional community its plans as applicable.

Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
Acquisition & Procurement		
Promote sustainable acquisition and procurement to the maximum extent practicable, ensuring bio-preferred and bio-based provisions and clauses are included in 95% of applicable contracts.	Auto from Comprehensive Scorecard Interim Target: 95% Current Performance: 100%	Will continue to strengthen requirements in all purchasing programs.
Measures, Funding, & Training		
Annual targets for performance contracting to be implemented in FY 2017 and annually thereafter as part of the planning of section 14 of E.O. 13693.	On track to meet EISA requirements.	BM is scheduled for an EISA Section 432 survey in 2018
Electronic Stewardship		
Purchases – 95% of eligible acquisitions each year are EPEAT-registered products.	Auto from Comprehensive Scorecard Interim Target: 95% Current Performance: 2.1%	The SPR will continue the current practice of purchasing EPEAT registered products when they meet SPR requirements and specifications.
Power management – 100% of eligible PCs, laptops, and monitors have power management enabled.	Auto from Comprehensive Scorecard Interim Target: 100% Current Performance: 100%	All eligible electronics will continue to have power management enabled.
Automatic duplexing – 100% of eligible computers and imaging equipment have automatic duplexing enabled.	Auto from Comprehensive Scorecard Interim Target: 100%Current Performance: 100%	Automatic duplexing has been enabled on all eligible equipment.

Table 3-3 FY 2017 Sustainability Goals, Performance, and Planned Actions		
DOE Goal	Current Performance Status	Performance & Plans
End of Life – 100% of used electronics are reused or recycled using environmentally sound disposition options each year.	Auto from Comprehensive Scorecard Interim Target: 100% Current Performance: 100%	All electronic equipment is reused, recycled or disposed of in an environmentally sound manner
Data Center Efficiency. Establish a power usage effectiveness target in the range of 1.2-1.4 for new data centers and less than 1.5 for existing data centers.	Determined to be impractical.	Coordinating with the landlord at the NO office to install meters in the Data Center to monitor electrical consumption.
Organizational Resilience		
Discuss overall integration of climate resilience in emergency response, workforce, and operations procedures and protocols.	Incorporated into projects.	Resiliency strategies and projects will be incorporated into the Sustainability Program to the extent practicable. Incorporate natural hazards and resiliency plans into LE2 program planning and design.

Figure 3-1 Dashboard Input Screenshot



4 Environmental Radiological Program Information

Radioactive sources at the SPR consist of electrically-generated X-rays that are used in laboratory and security scanning equipment or other sealed sources brought on site for performing radiography and cavern wire-line type logging operations. Procedures are in place to protect personnel from exposure during these operations. The SPR is subject to inspections by the nuclear regulatory agencies (Nuclear Regulatory Commission and National Nuclear Security Administration) and required notices to employees are posted on each X-ray scanning device and at entry points to rooms containing this equipment.

4.1 Sealed Sources

Sealed sources of radiation are used at the SPR for monitoring activities related to the physical properties of crude oil and brine caverns and pipeline integrity. There were no issues involving sealed sources in 2017.

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5 Environmental Permits and Programs

5.1 Environmental Permits

Environmental permits required to construct, operate, and maintain the four SPR storage sites are discussed in the following subsections.

The SPRPMO negotiated a 20-year long-term leasing arrangement for the use of the St. James site by Shell Pipeline in 1997. Shell Pipeline retains all responsibility for maintaining necessary permits at St. James concurrent with their operations and that lease. A lease extension is to be negotiated in 2018.

There are no permits for the Stennis Warehouse facility. A Certificate of No Exposure, declaring that all activities are conducted in a manner that will not expose potential pollutants to storm water, was approved by the MDEQ instead of operating under a multi-sector general permit. The Certificate of No Exposure to storm water was renewed in June 2014 and is valid for five years. Air emissions from DOE's Stennis Warehouse operations are *de minimus*, requiring no permitting or reporting activity.

5.1.1 BC Permits

BC permits are listed in Table 5-1. Individual work permits are received from the Louisiana Underground Injection Control Division of LDNR for each well work over performed. State inspectors periodically visit the site to observe SPR operations. BC operates under the water and air programs delegated to Louisiana by EPA.

Table 5-1 BC Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BC Air Emissions	LDEQ	1280-00015-03	6/12/17	6/11/27
Water	LPDES Water Discharge	LDEQ	LAG480540	3/28/16	11/30/20
Water	LPDES MSGP Storm Water Discharge	LDEQ	LAR050000	5/9/16	5/8/21
Water	LPDES Hydrostatic Test Water Discharge	LDEQ	LAG679016	2/1/13	2/1/18**
Injection Wells	Letter of financial responsibility to plug and abandon BC injection wells	LDNR	None	1/11/83	Open
Construct & Maintain	Bull Bay 24" brine disposal pipeline	COE	LMNOD-SP (Bull Bay) 3	1/30/79	*

Table 5-1 BC Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	BC brine disposal well pads	COE	LMNOD-SP (Iberville Parish Wetlands) 7	9/26/77	*
Construct & Maintain	BC brine disposal well pads and access roads	COE	LMNOD-SP (Iberville Parish Wetlands) 10	6/12/78	*
Construct & Maintain	Access roads to BC brine disposal well area	COE	LMNOD-SP (Iberville Parish Wetlands) 17	11/6/78	*
Construct & Maintain	Well pad, levees, access road, and equipment - BC Cavern 102	COE	LMNOD-SP (Iberville Parish Wetlands) 31	5/27/80	*
Construct & Maintain	Ring levee, drill site and equipment – BC Cavern 101	COE	LMNOD-SP (Iberville Parish Wetlands) 102	9/26/77	*
Construct & Maintain	36” petroleum products pipeline under and across Bayou Plaquemine	COE	LMNOD-SP (Bayou Plaquemine)	9/26/77	*
Construct & Maintain	Fill with culverts for parking	COE	WN-20-020-0168	4/2/02	*
Construct & Maintain	Culverts and fill for minor roadway crossings	COE	WT-20-020-2654	8/20/02	*
Construct & Maintain	Security fence with a concrete footing and curbing	COE	WT-20-020-3621	9/17/02	*
Construct & Maintain	Replacement N-S bridge at BC	COE	CT-20-030-1379-0	3/12/03	*
Construct & Maintain	Replacement brine disposal access road bridge	COE	CT-20-030-1501-0	3/28/03	*
Construct & Maintain	Bulkhead and fill for bank stabilization in N-S Canal at BC	COE	CT-20-030-3087-0	7/25/03	*
Construct & Maintain	Refurbished Bailey bridge crossing over Wilbert’s Canal	COE	MVN-2004-4453-CT	10/14/04	*
Construct & Maintain	Expanded clear sight security perimeter zone	COE	MVN-2003-2234-CT	2/2/06, 10/4/11	*

* COE permits remain active for the life of the structure. ** Renewed, expires 3/22/2023.

5.1.2 BH Permits

BH permits are listed in Table 5-2. In 2017, the site appropriated 394.5 million m^3 (104.2 billion gallons) of water from the Gulf Coast Intracoastal Waterway (GIWW) exclusive of water for fire protection. This represents 4.0 percent of the annual water usage authorized. The certified annual report of water usage was forwarded to the TCEQ as required in 2017.

The M&O contractor is registered with TCEQ as a Public Water System Operations Company (registration # WC0000183) since BH provides sanitary control of their purchased water distribution system on-site. This three-year registration was successfully renewed in May 2017. The M&O contractor is also registered as a Wastewater Operations Company (registration #OC0000202) which was likewise renewed in May 2017.

Required annual reporting for 2017 involved the performance of a brine line integrity test sent to Region 6 EPA, raw water usage to TCEQ, Water Conservation Plan implementation reporting to the Texas Water Development Board; and crude oil pipeline system operations renewal (T4C) to the RRC.

Table 5-2 BH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BH Air Emissions	TCEQ	9256	1/11/08	1/10/18**
Air	BH Leaching Emissions	TCEQ	PBR 100485	1/24/12	Open
Air	BH Frac Tank Emissions	TCEQ	PBR 107009	2/20/13	Open
Water	NPDES Water Discharge	EPA	TX0092827	11/1/14	10/31/19
Water	Water Discharge	RRC	UHS-006	11/1/14	10/31/19
Water	Water Use	TCEQ	4045A	11/14/83	Open
Caverns	Operate & Construct & Maintain BH caverns	RRC	02939	11/28/83	Open
Construct & Maintain	RWIS, 48” raw water pipeline, 48” brine disposal pipeline, and 36” crude oil pipeline.	COE	SWGCO-RP 16536 (01,02,03,04,05)	1/11/84	Dredging clause to 12/2008 (Renew dredging clause when needed.)
Construct & Maintain	48” brine pipeline	F&WS	P-7	7/31/86	6/30/36

**Renewed, expires 3/19/2028

5.1.3 BM Permits

BM permits are listed in Table 5-3. The BM site has a permit from TCEQ for the appropriation of state waters for the cavern leaching program, site utility, and fire protection systems that are under the jurisdiction of the Brazos River Water Master Program for administration. The permit requires a monthly tally and forecasting communication and annual tally to be provided to the agency to assess management fee. In 2017, the site used a total of 672.6 million m^3 (177.7 billion gallons) of water from the Brazos River Diversion Channel, representing 4.0 percent of the annual water usage authorized.

The M&O contractor is registered with TCEQ as a Public Water System Operations Company (registration # WC0000183) since BM provides sanitary control of their purchased water distribution system on-site. This three-year registration was successfully renewed in May 2017. The M&O contractor is also registered as a Wastewater Operations Company (registration #OC0000202) which was also renewed in May 2017.

Required annual reporting for 2017 included the successful brine line integrity test sent to Region 6 EPA, raw water usage to TCEQ, Water Conservation Plan implementation reporting to the Texas Water Department Board; and crude oil pipeline system operations renewal (T4C) to the RCC. A maintenance dredging clause notification was made to perform routine maintenance dredging of the RWIS in 2017. Notification of project completion (BM SPR Site Erosion Control of 1100 feet of bank of the GIWW near Freeport, Brazoria County, TX) was submitted in 2017.

Table 5-3 BM Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	BM Air Emissions	TCEQ	6176B	5/31/13	5/31/23
Air	BM Frac Tank Emissions	TCEQ	PBR Regulation	5/13/13	Open
Air	BMT-2 Air Emissions	TCEQ	PBR 142987	10/27/16	Open
Water	NPDES Water Discharge	EPA	TX0074012	11/1/14	10/31/19
Water	Water Discharge	RRC	UHS-004	11/1/14	10/31/19
Water	Water Use	TCEQ	5332A	7/20/81	Open
Pipelines	Operate BM Crude Oil Pipelines	RRC	04994	8/1/00	Open
Construct & Maintain	Maintenance dredging of BM Raw Water Intake Structure	COE	SWGCO-RP-12347 (03), SWG-2006-2568	2/22/78	Dredging clause to 12/2017
Construct & Maintain	30” crude oil pipeline to 3 miles SW from Freeport	COE	SWGCO-RP-11666	10/15/77	*
Construct & Maintain	30” crude oil pipeline to 2 miles S from Freeport	COE	SWGCO-RP-12112	7/25/77	*

Table 5-3 BM Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	36" brine disposal pipeline and diffuser	COE	SWGCO-RP-12062 (03)	10/10/78	*
Construct & Maintain	General permit for pipeline crossings by directional drilling in navigable waters	COE	SWGCO-RP-14114 (01)	5/18/85	*
Construct & Maintain	6" PVC potable water line	COE TDH&PT	SWGCO-RP-16177, 82-8475	9/7/82 1/1/83	*
Construct & Maintain	BM cavern pads 101, 102, 103, 111 and 113.	COE	SWGCO-RP-13435 (01)	5/21/79	*

* COE permits remain active for the life of the structure.

5.1.4 WH Permits

WH permits are listed in Table 5-4. A maintenance notification for repair of a traveling screen associated with the RWIS was made per the standing wetlands permit for the structure. Also, the maintenance dredging clause associated with this same structure and permit was renewed. A joint permit application was submitted for WH Project WH-MM-826, brine disposal pipeline replacement.

Table 5-4 WH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Air	WH and Degas Air Emissions	LDEQ	0560-00019-04	2/20/12	8/20/21
Water	LPDES Water Discharge	LDEQ	LA0053031	6/1/16	5/31/21
Water	LPDES MSGP Storm Water Discharge	LDEQ	LAR050000	5/9/16	5/8/21
Water	LPDES Hydrostatic Test Water Discharge	LDEQ	LAG679016	2/1/13	2/1/18**
Injection Wells	Letter of financial responsibility to close all WH injection wells	LDNR	None	1/11/83	Open
Injection Wells	Construct and Operate WH wells 117A and 117B	LDNR	971198-9	9/27/83	Open
Construct & Maintain	RWIS and 42" raw water pipeline	COE	LMNOD-SP (LTCS) 26	2/8/79	*
Construct & Maintain	Maintenance dredging for firewater canal and extended boat slip access	COE	LMNOD-SP (Black Lake) 31	10/26/82	*

Table 5-4 WH Environmental Permits

Permit Type	Permit Description	Issuing Agency	Permit Number	Effective Date	Expiration Date
Construct & Maintain	Erosion control dike and riprap	COE	LMNOD-SP (Black Lake) 43	7/26/84	*
Construct & Maintain	Parallel pipeline. Offshore brine line and diffuser remain inactive.	COE	LMNOD-SP (Gulf of Mexico) 2574	8/11/80	*
Construct & Maintain	36” crude oil pipeline from WH to Texoma/Lake Charles Meter Station	COE	LMNOD-SE (LTCS) 40	5/25/88	*
Construct & Maintain	42” crude oil pipeline	COE	LMNOD-SP (Cameron Parish Wetlands) 162	3/9/78	*
Construct & Maintain	42” crude oil pipeline crossings of waters and waterways in Texas	COE	SWGCO-RP-12342	3/28/78	*
Construct & Maintain	Brine disposal wells, well pads, and brine disposal pipelines (12”, 20” and 24”)	COE	LMNOD-SP (Cameron Parish Wetlands) 152	3/16/78	*
Construct & Maintain	Well pads, levees, and access roads (WH wells 110, 111, 112, 113, 114 and 115)	COE	LMNOD-SP (Cameron Parish Wetlands) 276	2/11/80	*
Construct & Maintain	Repair of exposed 42” crude oil pipeline	COE	WN20-000-3972-0	8/31/00	*
Construct & Maintain	Restored riprap along north perimeter dike adjacent to WH Cavern 6 and Black Lake	COE	WO-20-020-1136	1/25/02, 2/19/02	*
Construct & Maintain	Deposited fill in fire ditch	COE	WO-20-020-3607	10/23/02	*
Construct & Maintain	Boat ramp modifications and erosion control breakwater in Black Lake along the north side of WH.	COE	WW-20-030-3748	10/22/03	*
Construct & Maintain	Maintenance dredging of WH RWIS	COE	MVN-1997-00068-WW	4/29/09	*

* COE permits remain active for the life of the structure.
** Renewed, expires 3/22/2023

5.2 Air Quality Program

Air quality is maintained at the SPR via compliance with applicable provisions of the Clean Air Act and State Implementation Plans. The SPR sites operate in accordance with the provisions of the applicable state air permits.

The SPR sites are permitted by the LDEQ and TCEQ as minor sources for the following criteria pollutants: non-methane/non-ethane volatile organic compounds (VOC), nitrogen oxides (NOx), sulfur dioxides (SO_2), carbon monoxide (CO), and particulate matter less than 10 microns (PM_{10}). The Bayou Choctaw and West Hackberry air permits also include emission rates for the following hazardous air pollutants: benzene, ethylbenzene, n-hexane, toluene, and xylene.

The SPR sites are in attainment areas for all National Ambient Air Quality Standards, except for ozone. The BC and BM sites are in ozone non-attainment areas. The BH and WH sites are in ozone attainment areas.

During 2017, the BC air permit was renewed and issued by LDEQ. An application to renew the BH air permit was also submitted to TCEQ in 2017.

The SPR ensures compliance with air permit limits by monitoring usage of emergency generators and pumps, volumes of crude oil, brine, diesel, and gasoline through tanks, and volume of paint used.

Piping components (valves and pump seals) are inspected for VOC leaks (annually in LA and biennially in TX) using an organic vapor analyzer (OVA). Flanges are also inspected weekly in TX using visual, audible or olfactory methods to identify possible leaks.

The BH and BM external floating roof tanks require inspection of the primary seal (every five years) and the secondary seal (semi-annually) for visible tears, holes, or cumulative gaps exceeding regulatory limits.

Annual air emissions were reported to TCEQ by BM and BH in 2017. The BC and WH sites did not require reporting because they were below the required emission limit for reporting in LA.

Table 5-5 is a summary of the SPR Site Air Emissions in Tons/Year (Metric Tons/Year) from 2012-2017. SPR emissions complied with permit limits for all six years, except for the 2015 BM VOC emissions due to the roof failure of the BMT-4 crude oil tank.

Table 5-5 SPR Site Air Emissions in Tons/Year (Metric Tons/Year)

BC SPR Site	Volatile Organic Compounds	Nitrogen Oxides	Carbon Monoxide	Sulfur Dioxide	Particulates (less than 10 microns)
2012	0.64 (0.58)	0.54 (0.49)	0.12 (0.11)	0.00 (0.00)	0.02 (0.02)
2013	1.03 (0.93)	1.94 (1.76)	0.45 (0.41)	0.00 (0.00)	0.06 (0.05)
2014	0.54 (0.49)	0.47 (0.43)	0.10 (0.09)	0.00 (0.00)	0.03 (0.03)
2015	0.37 (0.34)	0.91 (0.83)	0.21 (0.19)	0.00 (0.00)	0.03 (0.03)
2016	0.65 (0.59)	0.21 (0.19)	0.05 (0.05)	0.00 (0.00)	0.01 (0.01)
2017	2.51 (2.28)	0.72 (0.65)	0.16 (0.15)	0.00 (0.00)	0.03 (0.03)
BH SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2012	(1) 16.00 (14.52)	2.31 (2.10)	0.53 (0.48)	0.02 (0.02)	0.08 (0.07)
2013	(1) 11.22 (10.18)	(2) 7.62 (6.91)	(2) 1.74 (1.58)	0.05 (0.05)	0.25 (0.23)
2014	2.57 (2.33)	0.22 (0.20)	0.05 (0.05)	0.01 (0.01)	0.01 (0.01)
2015	2.56 (2.32)	1.85 (1.68)	0.41 (0.37)	0.06 (0.05)	0.09 (0.08)
2016	2.77 (2.51)	0.42 (0.38)	0.09 (0.08)	0.02 (0.02)	0.02 (0.02)
2017	1.36 (1.23)	1.32 (1.20)	0.30 (0.27)	0.02 (0.02)	0.05 (0.05)
BM SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2012	12.16 (11.03)	2.28 (2.07)	0.52 (0.47)	0.00 (0.00)	0.09 (0.08)
2013	4.66 (4.23)	0.93 (0.84)	0.21 (0.19)	0.02 (0.02)	0.04 (0.04)
2014	4.55 (4.13)	9.56 (8.67)	2.19 (1.99)	0.03 (0.03)	0.29 (0.26)
2015	(3) 54.97 (49.87)	4.00 (3.63)	0.95 (0.86)	0.03 (0.03)	0.13 (0.12)
2016	(4) 15.90 (14.42)	15.94 (14.46)	3.65 (3.31)	0.04 (0.04)	0.48 (0.44)
2017	(4) 16.77 (15.21)	0.63 (0.57)	0.14 (0.13)	0.01 (0.01)	0.03 (0.03)
WH SPR Site	**Volatile Organic Compounds**	**Nitrogen Oxides**	**Carbon Monoxide**	**Sulfur Dioxide**	**Particulates (less than 10 microns)**
2012	22.77 (20.66)	0.29 (0.26)	0.07 (0.06)	0.00 (0.00)	0.01 (0.01)
2013	15.43 (14.00)	2.92 (2.65)	0.66 (0.60)	0.00 (0.00)	0.08 (0.07)
2014	6.52 (5.91)	2.01 (1.82)	1.93 (1.75)	0.03 (0.03)	0.12 (0.11)
2015	8.69 (7.88)	5.13 (4.65)	5.00 (4.54)	0.02 (0.02)	0.36 (0.33)
2016	7.90 (7.17)	5.96 (5.41)	5.85 (5.31)	0.03 (0.03)	0.42 (0.38)
2017	11.35 (10.30)	5.05 (4.58)	6.08 (5.52)	0.02 (0.02)	0.42 (0.38)

(1) Includes cavern leaching emissions
(2) Includes emergency generator emissions from major maintenance project
(3) Includes BMT-4 tank failure emissions and BMT-3 landing losses
(4) Includes BMT-3 landing losses

5.3 Water Discharge Effluent Monitoring Program

The water discharge permit-monitoring program fulfills the requirements of the EPA NPDES, and corresponding RRC Rule 8 and Louisiana LPDES programs. All SPR point source discharges are conducted in compliance with these federal and state programs.

COMPLIANCE DURING 2017

The SPR had <u>zero</u> non-compliances from analyzed discharges. All sites were 100% compliant.

SPR personnel regularly conducted point source discharges from the four storage sites: BC, BH, BM and WH during 2017. These discharges are grouped as follows:

a. brine discharged to the Gulf of Mexico (from BH and BM sites);
b. storm water runoff from tank, well, and pump pads;
c. rinse water from vehicles to permitted outfalls;
d. effluent from packaged sewage treatment plants; and
e. hydrostatic test water from piping and/or tanks.

The SPR disposed of 1240 million m^3 of brine during 2017. Approximately 86% of the brine was disposed into the Gulf of Mexico via the BH (32% of the total) and BM (54% of the total) brine disposal pipelines. The remaining 14% was disposed in saline aquifers via injection wells at WH (6% of the total) and BC (8% of the total).

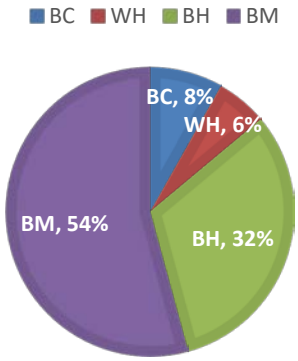


Figure 5-1 - SPR Brine Disposal 2017

Parameters monitored varied by site and point source discharge. Measurements and compliance rates observed during 2017 specific to each of the storage sites are discussed in the following subsections.

Discharge monitoring reports (DMRs) were prepared and submitted in accordance with site-specific permit requirements. All discharge permits issued to the SPR require quarterly reporting to the appropriate agency(s) (LDEQ, RRC and EPA). Should a non-compliance or reportable bypass occur during the reporting period, an explanation of the cause and actions taken to correct the event are included in the corresponding quarterly report.

As a testament to safe operations and commitment to protecting the environment, during 2017, the SPR had zero non-compliances from analyzed discharges. All sites were 100% compliant.

5.3.1 BC

Table 5-6 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the BC outfalls. There were **zero** permit non-compliances during 2017. The site was 100 percent compliant. There have been five permit non-compliances in the previous five years: 2 in 2015 and 3 in 2012.

Monitoring is related to water discharges regulated under the LDEQ Office of Water Resources LPDES permit. Discharges are from two packaged sewage treatment plants, a vehicle/equipment rinsing station and storm water runoff from well pads, pump pads, and containment areas. The LPDES MSGP provides storm water runoff limitations and monitoring requirements. A LPDES permit also exists for the discharge of hydrostatic test water. There were, however, no hydrostatic test water discharges during 2017.

Table 5-6 BC Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
LAG480540	01A 01B Treated sanitary wastewater	Flow BOD_5 TSS pH Fecal Coliform	0	24	24	100%	N/A	N/A
	002 Exterior vehicle and equipment wash water	Flow COD TSS O&G pH	0	20	20	100%	N/A	N/A
	009 Storm water runoff	Systematic Visual Observation	N/A	N/A	N/A	100%	N/A	N/A
LAG679016	001 Hydrostatic test water	Flow TSS TSS-Net O&G TOC Benzene Total BTEX Lead, Total pH	N/A	0	N/A	100%	N/A	N/A

5.3.2 BH

Table 5-7 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the BH outfalls. There were **zero** permit non-compliances during 2017. The site was 100 percent compliant. There have been ten permit non-compliances in the previous five years: 1 in 2015, 2 in 2014, 1 in 2013 and 6 in 2012.

Table 5-7 BH Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
TX0092827	001 Brine to the Gulf of Mexico	Flow Exit Velocity Density O&G TDS TSS pH Biomonitoring Integrity Tests	0	122	122	100%	N/A	N/A
	002 Hydroclone Blowdown	Flow pH TSS	N/A	0	N/A	100%	N/A	N/A
	Storm water: 003- 14 cavern pads 005- electrical substation pump 006- Surge Tank area 007- Meter prover & crude oil meter skids 008-RWIS	pH Salinity O&G TOC	0	86	86	100%	N/A	N/A
	004 Treated sanitary wastewater	Flow TSS BOD_5 pH	0	48	48	100%	N/A	N/A
	009 Recirc. water at RWIS	Flow pH	0	24	24	100%	N/A	N/A

Monitoring is related to water discharges regulated under the EPA NPDES permit program and the similar RRC discharge permit program (Rule 8). Discharges are brine to the Gulf of Mexico, hydroclone blow down into the ICW, storm water from well pads and pump pads, effluent from the sewage treatment plant, and recirculated raw water at the RWIS. There were no discharges during 2017 from the hydroclone blow down system.

5.3.3 BM

Table 5-9 includes permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the BM outfalls. There were **zero** permit non-compliances during 2017. The site was 100 percent compliant. There have been five permit non-compliances in the previous five years: 1 in 2016, and 4 in 2014.

Monitoring is related to water discharges regulated under the EPA NPDES permit program and the similar RRC discharge permit program (Rule 8). Discharges are brine to the Gulf of Mexico, storm water from well pads and pump pads, effluent from the sewage treatment plant, and recirculated raw water at the RWIS.

Table 5-8 BM Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
TX0074012	001 Brine to the Gulf of Mexico	Flow Exit Velocity Density O&G TDS TSS pH Biomonitoring Integrity Tests	0	165	165	100%	N/A	N/A
	002 Treated sanitary wastewater	Flow pH TSS BOD_5	0	48	48	100%	N/A	N/A
	Storm water: 003-20 cavern pads & other 004-HPPP 005-Tank farm	pH Salinity O&G TOC	0	24	24	100%	N/A	N/A
	006 Recirculated water at RWIS	Flow pH	0	24	24	100%	N/A	N/A

5.3.4 WH

Table 5-9 provides permitted outfalls, required monitoring parameters, number of permit exceedances, samples collected, compliant samples, and percent of samples in compliance for the WH outfalls. There were **zero** permit non-compliances during 2017. The site was 100 percent compliant. There have been zero permit non-compliances in the previous five years.

Monitoring is related to water discharges regulated under the LDEQ Office of Water Resources LPDES permit. Discharges are from a packaged sewage treatment plant, a vehicle/equipment rinsing station, non-contact cooling tower blowdown and storm water runoff from the degasification plant. Although not listed as an outfall, storm water runoff from well pads, pump pads, and containment areas are visually inspected quarterly. The LPDES MSGP provides storm water runoff limitations and monitoring requirements. A LPDES permit also exists for the discharge of hydrostatic test water. There were, however, no hydrostatic test water discharges during 2017. There were no discharges during 2017 from the hydroclone blow down system.

Table 5-9 WH Outfall Sampling Parameters

Permit	Outfall	Parameters	# of Permit Exceed-ances	# of Samples Taken	# of Compliant Samples	Permit Com-pliance	Date(s) Exceeded	Description/ Solution
LA0053031	002 Treated sanitary wastewater	Flow BOD_5 TSS pH Fecal Coliform	0	20	20	100%	N/A	N/A
	003 Exterior vehicle and equipment wash water	Flow COD TSS O&G pH	0	10	10	100%	N/A	N/A
	004 Non-contact cooling tower	Flow TOC pH Temperature	N/A	0	N/A	100%	N/A	N/A
	005 Storm water runoff from the degasser unit	Flow TOC O&G pH	0	8	8	100%	N/A	N/A
LAG679016	001 Hydrostatic test water	Flow TSS TSS-Net O&G TOC Benzene Total BTEX Lead, Total pH	N/A	0	N/A	100%	N/A	N/A

5.4 Surface Water Quality Surveillance Monitoring Program

Surface waters at the BC, BH, BM, and WH SPR sites were sampled monthly in 2017 for general water quality according to the SPR EMP. Water quality monitoring is conducted to provide early detection of potential surface water quality degradation possibly resulting from SPR operations. It is separate from, and in addition to, the water discharge permit monitoring program.

The parameters monitored are pH, salinity, total organic carbon (TOC), dissolved oxygen (DO), oil and grease (O&G), and temperature.

- DO refers to microscopic bubbles of gaseous oxygen (O_2) that are mixed in water and available to aquatic organisms for respiration. DO can be affected by natural influences such as temperature and salinity. DO concentration decreases as water temperature increases. DO concentration decreases as salinity increases. Thus, salinity and temperature are monitored to correlate with DO results.
- pH is a measure of the acidity/alkalinity of water. It ranges from 0 to 14, with 7 being neutral. Excessively high and low pH can be detrimental to water usage.
- Total organic carbon (TOC) is a measure of the total amount of carbon in organic compounds in water and can be an indication of contamination.
- Oil and grease can interfere with biological life in surface waters and create unsightly films.

Maps with locations of the surface water monitoring stations at each site are included in Appendix D, Figures D-1 through D-4. The number of surface water monitoring stations varies at each site:

- Bayou Choctaw-7
- Big Hill-5
- Bryan Mound-10
- West Hackberry -6.

Note, Station A at Big Hill is no longer sampled because it does not hold water and has been backfilled with vegetation over the years.

Data from 2017 from each site is presented in Appendix D, Tables D-1 through D-4. Surface water at all sites exhibited neutral pH, and O&G readings were below the detectable limit of 5 mg/l. This indicates no oil impacts from SPR activities during any of the 2017 sampling episodes.

Annual averages of parameters measured in the last 6 years at each site are included in Tables D-5 through D-8. Graphical representation of the data is included in Figures D-5 through D-8. The parameter results have not fluctuated significantly within the last 6 years at each site.

The small fluctuations in the data are likely due to non-standardized time of sampling, differing meteorological conditions, and varying seasonal and environmental factors. The overall surface water data at the SPR sites has remained consistent indicating no evident surface water quality impacts from SPR operations.

5.5 Waste Management and Pollution Prevention Programs

The Waste Management Program is responsible for managing hazardous and non-hazardous waste generated by SPR operations. Site personnel and waste management personnel collaborate to ensure all waste generated at the SPR is accumulated, characterized and disposed or recycled in accordance with federal, state, and local regulations.

SPR operations, maintenance, and construction activities generate a variety of waste streams. Common wastes and recyclable materials generated at the SPR include:

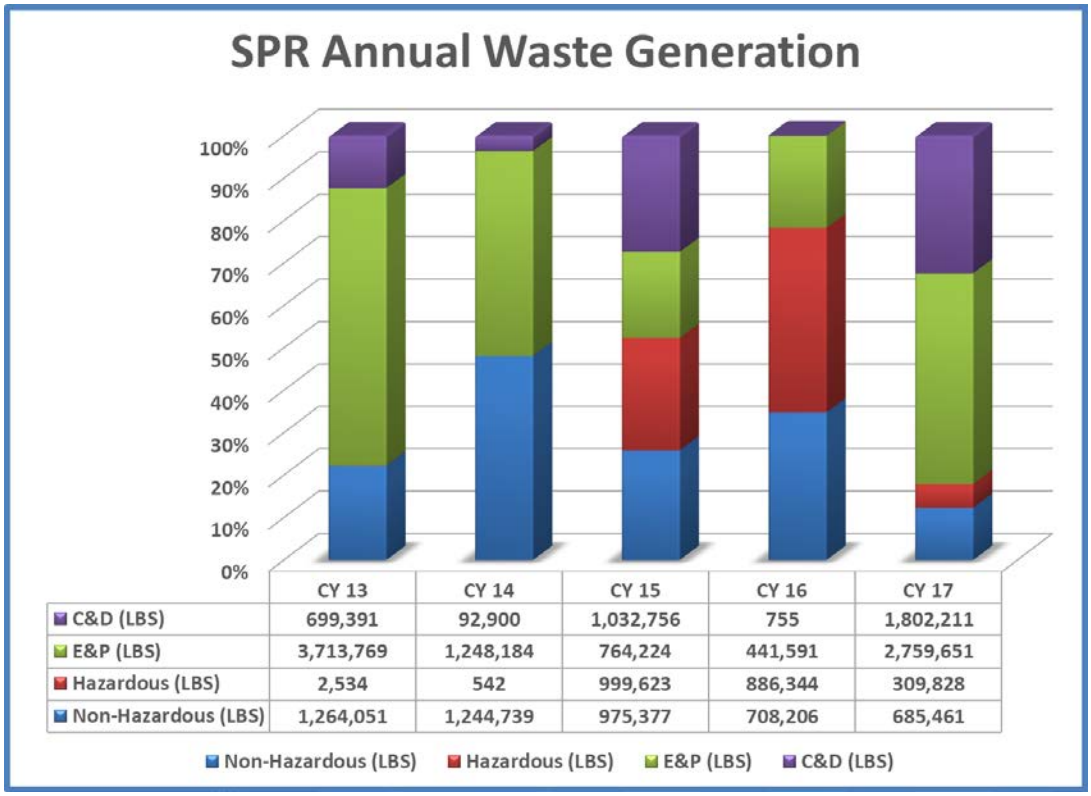
1. Hazardous waste such as lab waste and crude oil contaminated material with a hazardous characteristic,
2. Non-hazardous waste such as office trash and industrial waste without a hazardous waste characteristic or code,
3. Recyclable materials such as paper, plastic, batteries, and used oil,
4. Construction and demolition (C&D) waste such as scrap metal and concrete, and
5. Exploration and production (E&P) waste such as brine or crude oil contaminated products without a hazardous waste characteristic.

The SPR characterizes all E&P wastes to determine if they exhibit hazardous characteristics. Wastes that exhibit a hazardous characteristic are managed and disposed of as hazardous waste. Non-hazardous wastes generated by the E&P process are disposed at state-approved E&P disposal facilities.

Quantities of waste generated for each waste category over the past five years at the SPR are provided in the bottom portion of Figure 5-2, and their percentages charted in the top portion of the figure. The SPR generated a significant amount of C&D and E&P waste in 2017 as compared to previous years. The increase in E&P waste for 2017 is attributed to significant well workover events at the Big Hill and West Hackberry sites. The increase in C&D waste for 2017 is attributed to the demolition of a 220,000-barrel crude oil storage tank located at the Bryan Mound site (BMT-2). The increase in hazardous waste for 2015 and 2016 is attributed to the generation of crude and refined petroleum tank bottoms from cleaning out a separate 220,000-barrel crude oil storage tank located at the Bryan Mound site (BMT-4).

MEETING GOALS

The SPR exceeded the DOE departmental goals to divert (recycle) 50% of non-hazardous waste and 50% of Construction & Demolition waste, and the SPR goal of 20% of hazardous waste over the past five years.



	CY 13	CY 14	CY 15	CY 16	CY 17
C&D (LBS)	699,391	92,900	1,032,756	755	1,802,211
E&P (LBS)	3,713,769	1,248,184	764,224	441,591	2,759,651
Hazardous (LBS)	2,534	542	999,623	886,344	309,828
Non-Hazardous (LBS)	1,264,051	1,244,739	975,377	708,206	685,461

Figure 5-2 SPR Annual Waste Generation

Some of the activities that SPR waste management personnel conducted or supported in 2017 include:

- Coordinated with construction and engineering personnel to recycle or dispose of material generated from the demolition of BMT-2.
- Coordinated with cavern integrity personnel to dispose of E&P waste generated from well workover activities at the West Hackberry (1.1 million lbs.) and Big Hill (363,224 lbs.) sites.
- Coordinated with Lab Chemists to manage hazardous waste generated from crude oil testing associated with transporting 35.13 million barrels (MMbbl) of crude oil for Hurricane Harvey and oil sales.
- Coordinated the disposal of 287,100 lbs. of material generated from cleaning out brine disposal wells located at the Bayou Choctaw site.
- Coordinated the disposal of material generated from pigging the raw water pipeline at the West Hackberry site.
- Coordinated the reclamation of material generated from pigging crude oil transmissions lines from the West Hackberry site.
- Coordinated with construction and emergency preparedness personnel to donate aqueous film forming foam (AFFF) from multiple SPR sites to local emergency response training centers.

- Coordinated with cavern integrity personnel to reclaim crude oil contaminated solids generated at the West Hackberry (158,800 lbs.) and Big Hill (149,820 lbs.) sites.

The SPR places a high priority on protecting the environment. Since its creation in 1997, the SPR's Pollution Prevention Program has worked to minimize risks to the environment while supporting the SPR's mission. Waste minimization is a key component of the Pollution Prevention program. Waste minimization is considered in all levels of decision making at the SPR and is the responsibility of all employees. Planned activities to minimize waste generation include:

- Eliminate product need.
- Reduce the amount of product needed, and procure only enough to complete the task.
- Select appropriate package sizes to prevent excess.
- Reuse products until they are completely spent.

The SPR exceeded the DOE departmental goals to divert (recycle) 50% of non-hazardous waste and 50% of C&D waste, and the SPR goal of 20% of hazardous waste over the past five years. A combination of SPR employees following the waste minimization planned activities and managing a rigorous recycling program contributed to the SPR exceeding the waste diversion goals. Figure 5-3 shows the percentage of non-hazardous, hazardous, and C&D waste that was recycled from FY 2013 through FY 2017.

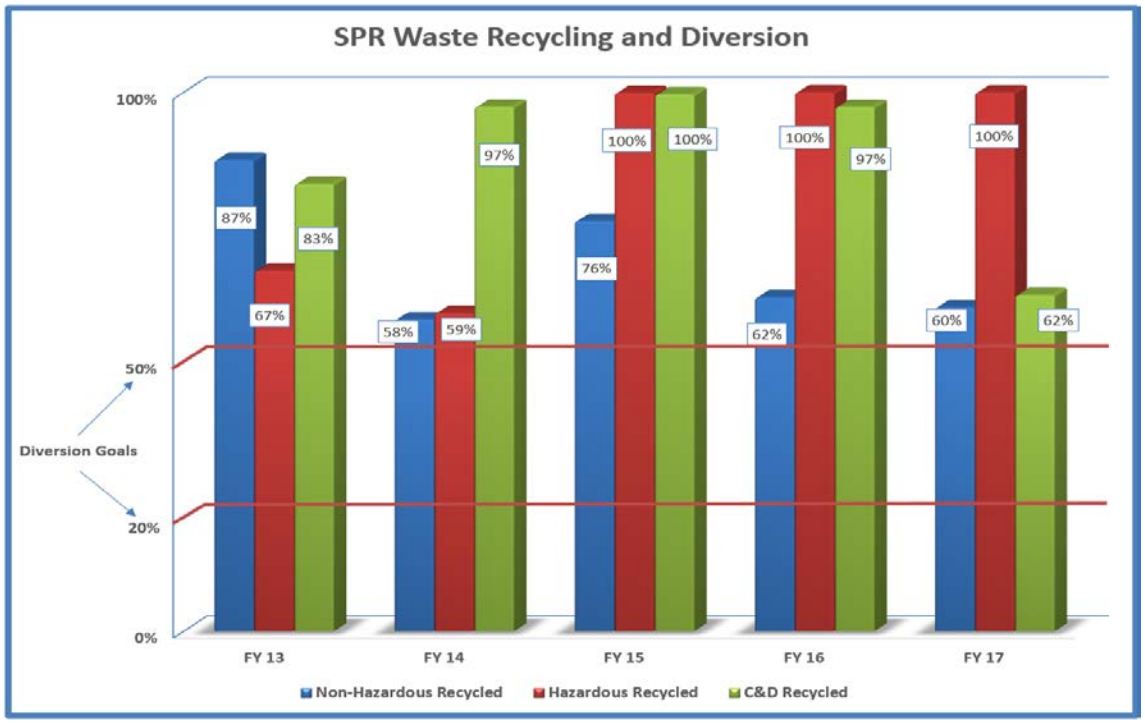


Figure 5-3 SPR Waste Recycling and Diversion

Significant SPR projects that contributed a substantial amount of recyclable material in 2017 included the demolition of BMT-2; replacement of AFFF at the Bayou Choctaw, Bryan Mound, and West Hackberry sites; and well workover activities at the Big Hill and West Hackberry sites.

Materials recycled in 2017 are summarized in Table 5-10.

Table 5-10 SPR Recycled Materials

Category	Recycled (lbs.)	Recycled (kg.)
AFFF	25,545	11,587
Aluminum-Plastic Comingled	1,308	593
Antifreeze	122	55
Ballasts	62	28
Brine and/or Crude Oil Contaminated Wash Solution (Hazardous)	308,620	139,988
Capacitors	22	10
Cardboard	19,542	8,864
Concrete (C&D)	610	277
Crude Oil Contaminated Pigging Solids (Hazardous)	950	431
Electronics	1,735	787
Fuel Filters	18	8
Lamps (Non-Hazardous)	1,017	461
Oil Filters	1,277	479
Office Paper	154,531	70,094
Plastic	1,035	469
Scrap Metal	123,159	55,864
Scrap Metal (C&D)	1,118,040	507,134
Toner Cartridges	1,909	866
Used Oil	3,972	1,802

While waste minimization and recycling is a key aspect of the SPR's Pollution Prevention program, there are several other elements that are critical to the success of the program. The other elements include:

- Toxic substance reduction/substitution
- Resource conservation (water, energy)
- Sustainable acquisition, i.e., affirmative procurement, bio-based products, environmentally preferable products, and energy and water efficient products
- Greenhouse gas reduction

These elements, except for sustainable acquisition, are discussed in other sections of this report as they pertain to either Sustainability (Section 3) or Chemical Management (Section 5.6).

The SPR achieved the 100% affirmative procurement target for FY17. All purchases qualified as recycled products or justified products. There were no purchases of virgin products in 2017.

Pollution Prevention announcements and suggestions are communicated to SPR personnel through the SPR's newsletter "What's Happening," and routine email distributions including pertinent local information and useful web links. These communications are published on the M&O Contractor Environmental webpage, which is available to all SPR employees.

5.6 Chemical Management Program

5.6.1 Qualified Products List and SARA Title III Tier Two Reports

Chemical containing products used at the SPR must be included on the Qualified Products List (QPL). The QPL is used to control and limit the quantity of toxic constituents found in chemical products and minimize hazardous waste generated.

Chemicals requested for QPL inclusion are reviewed for potential impacts to the environment, generation of wastes, adherence to the SPR building specifications and green requirements for paints, adhesives and sealants; recycled content in materials; and exclusion of constituents that contain EPA's 17 High Priority Toxic Chemicals.

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 1, 2018, to state and local emergency planning committees and local fire departments. Table 5-11 contains a summary of the inventory information that was submitted for 2017.

Table 5-11 2017 SARA Title III Tier Two Summary for the SPR

SPR Site	Chemical Name (Category)	*Max Daily Amount (lbs.)	Location on Site
BC	Chemguard 3% MS-AFFF C-301	5,000 – 9,999	OPS., Foam Deluge Building
	Crude Oil Petroleum	> 1 Billion	Flammable Storage Building, Site Tanks, Piping, Underground Caverns
	Diesel Fuel	10,000 – 24,999	Emergency Generator Fuel Tank
	Diesel Fuel #2	5,000 – 9,999	Property Tank #2
	Gasoline, Including Casing Head	5,000 – 9,999	Property Tank 1
	Hydrochloric Acid	0 – 99	Environmental Laboratory
	KAM Generator Solution A	0 – 99	Environmental Laboratory
	Nitric Acid	0 – 99	Environmental Laboratory
	Nitrogen Balance Gas	0 – 99	Control Building
	Sulfur in Petroleum Crude Oil	0 - 99	Environmental Laboratory
	Xylene	0 – 99	Envir Flam. Cabinet
BH	Asphalt	10,000 – 24,999	Laydown Yard
	Chemguard 3% MS AFFF C301	100,000 – 499,999	Operations Buildings 16, 805 and 834
	Crude Oil Petroleum	> 1 Billion	Flammable Storage Building, Site Tanks, Piping, Underground Caverns
	Diesel Fuel	25,000 – 49.999	Operations, BHT-4, 11, and 50, BHSE-196 Trailer, Bldg 805and Property Annex BHT-51
	Gasoline	10,000 – 24,999	Bldg. 805 and BHT-52
	GMA Garnet	10,000 – 24,999	Maintenance Laydown Yard
	Hydrochloric Acid	0 – 99	Environmental Laboratory
	Hydrogen Sulfide	0 – 99	I&C Office
	Nitric Acid	0 – 99	Environmental Laboratory
	Non-Flammable Gas Mixture	0 – 99	I&C Office

Table 5-11 2017 SARA Title III Tier Two Summary for the SPR

SPR Site	Chemical Name (Category)	*Max Daily Amount (lbs.)	Location on Site
	Sulfuric Acid	0 – 99	Environmental Laboratory
	Xylene	0 – 99	Crude Oil Storage Bldg.
BM	1-125 PPM Vol. Hydrogen Sulfide Balance Nitrogen – Cal. Gas	0 – 99	Property Building 202
	Chemguard 3% MS AFFF C301	75,000– 99,999	Operations Buildings 242 and 206
	Crude Oil Petroleum	1 Billion	Flammable Storage Building, Site Tanks, Piping, Underground Caverns
	Diesel	25,000 – 49,999	Fuel Tank, BMT-20, BMP- 29 and 217, Bldg 242, RWIS, Brine Pump, and Workover Rig
	Gasoline	10,000 – 24,999	Operations Building 242
	Hydrogen Sulfide	100 – 499	Buildings 244 and 201
	Non-Flammable Gas Mixture 4-1 F/Calibration Gas	0 – 99	Buildings 244 and 201
	Non-Flammable Gas Mixture – 25PPM H2S (58)	0 - 99	Warehouse
	Sealed Lead Acid Battery	500 – 999	Warehouse
Stennis	CAT ELC Extended Life Coolant	10,000 – 24,999	West Wall
Offsite Pipelines	Crude Oil, Petroleum	50,000,000 – 99,999,999	Pipelines in Calcasieu Parish, La (West Hackberry)
	Crude Oil, Petroleum	10,000,000 – 49,999,999	Pipelines in Cameron Parish, La (West Hackberry)
NO	Diesel Fuel	100 – 999	Tank, Building 850
	Diesel Fuel	1,000 – 4,999	Tank, Building 900
WH	Amercoat 68 HS Powder	100 – 999	Flammable Storage Building
	Ansulite 3% AFFF (AFC-3MS-C)	5,000 – 9,999	
	Crude Oil Petroleum	> 1 Billion	LCMS Piping, Site Tanks, Piping, Underground Caverns, Warehouse E
	Diesel Fuel	5,000 – 9,999	MTC, Fuel Pump Tank
	Diesel Fuel #2	1,000 – 4,999	Workover Rig
	FC-203CF Lightwater Brand AFFF	5,000 – 9,999	Operations Foam Storage Building
	Gasoline, Including Casing Head	10,000 – 99,999	Fuel Pump Tank, Laydown Yard and HPPP Flammable Cabinet
	GMA Garnet	1,000 – 9,999	MTC, Paint Laydown Yard
	Hydrochloric Acid	0 – 99	Environmental Laboratory
	Mobil DTE Oil BB	1,000 – 4,999	Degas General
	Mobil DTE Oil Heavy	5,000 – 9,999	Degas General
	Mobil Pegasus 505	1,000 – 4,999	Degas General
	Nitrogen	5,000 – 9,999	MTC Laydown Yard
	Sulfur in Petroleum Crude Oil	0 - 99	Environmental Lab
	Sulfuric Acid	0 – 99	Environmental Lab

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

5.6.2 Toxic Chemical Release Inventory (TRI) Form R

SPR sites are required to report under EPCRA Section 313, by submitting the Toxic Chemical Release Inventory (TRI) Form R when reporting thresholds, from crude oil placed in commerce, are exceeded. Specifically, when crude oil is placed in commerce, it is repackaging of hazardous substances and must be reported. This form must be submitted by July 1 for the reporting thresholds exceeded during the preceding calendar year. The submittal of a TRI Form R was required for all SPR sites in 2017 because the SPR introduced crude oil into commerce from the 2017 Crude Oil Sales and the Hurricane Harvey Exchange.

5.7 Wildlife Program

The four SPR storage sites are located on the Central and Mississippi Flyways. The coastal locations of BC, BH, BM, and WH make them the last resting and feeding stop for migrating birds before they make the arduous trip across the Gulf of Mexico to the wintering areas in Central and South America, and the first stopover when they migrate back to North America in the spring. Without places along the way that provide an adequate food supply for the replenishment of fat reserves, water, and shelter from predators, these birds most likely will not survive.

Selected habitat at BC, BH, BM and WH are not mowed from early fall through spring to provide food, shelter and nesting areas for migrating and resident birds. WH and BH have Purple Martin houses to attract the mosquito-eating birds, and Eastern Bluebird nest boxes and Wood Duck nest boxes are installed at BC. At all sites when ground nests for terns, Black-necked Stilts, Killdeer and Common Nighthawk are discovered, they are flagged until the chicks have fledged. Equipment harboring active bird nests are designated for limited/restricted use.

BC, BH, and BM also conduct periodic avian inventories per the Memorandum of Understanding between F&WS and DOE. Inventories are uploaded to the Cornell University Ornithology Laboratory database and are used to assess the health and populations of migratory birds. The SPR has an active dialog with Cornell University ornithologists regarding unusual observations and absence or abundance of species found at the sites.

The SPR's management of habitat for migrating and resident birds is good for the environment and indirectly contributes to the economy of Texas and Louisiana. Hunting and birding activities have a positive economic impact on state economies.

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6 Site Hydrology, Ground Water Monitoring and Public Drinking Water Protection

Ground water monitoring is performed at the four SPR storage sites to ensure the protection of water quality and comply with related state and federal regulations and orders. Specifically, DOE Order 5400.1 requires a ground water surveillance system/program for each SPR site. Ground water that is or could be impacted by DOE activities is monitored to determine and document the effects of operations on ground water quality.

Monitoring has been performed at all four sites since the 1980's. Through the years of operation, both before and during SPR usage, there have been spills/leaks that have or could have impacted the shallow ground water at each site. Monitoring results have confirmed or disproved impacts and have been included in the ASER.

Significant historical investigations performed include:

- 1991- *Contamination Assessment Report and Corrective Action Plan for Bryan Mound*- no recovery action was advised for brine contamination due to soil characteristics.
- 1991- *Contamination Assessment Report and Remedial Alternatives Analysis for West Hackberry*- additional recovery wells and brine pond repair or replacement were advised.
- 1992- Phase I of II, non-invasive survey, *Final Report on Baseline Hydrogeological Screening Surveys, SPR Sites, Louisiana and Texas*.
- 1996- Phase II of II, *Multi-Site Hydrogeological Investigation, SPR Sites, Louisiana and Texas.* (Also referred to as the Verification Well Study in which periphery wells were installed.) A surveillance monitoring system was established after this study and includes a network of wells that encompasses brine pond/storage area and periphery areas.

Monitoring wells are present at each site and shallow ground water is analyzed to determine the presence of contaminants that could be indicative of site operations. The first and second (when present) encountered water-bearing strata are monitored at each site. Monitored ground water is not used for drinking water purposes. All sites purchase potable water.

Salinity is measured as an indicator of brine and the potential presence of hydrocarbons is screened using the TOC test. Other parameters such as pH and temperature are also recorded. Depth to ground water is collected to determine ground water flow direction.

Monitoring is required at WH in accordance with a monitoring plan agreed to by DOE and LDNR. As agreed, monitoring data is included in each ASER and will be submitted to LDNR. Monitoring is also required at BM in accordance with closure of a brine pond, under the direction of the RRC. Monitoring data is included in each ASER and submitted to the RRC. Wells surrounding the operating brine storage and disposal pond systems at BH monitor ground water as part of permit required leak detection.

Available ground water salinity data collected at each site for the past five years are included and presented graphically in Appendix C. These data are discussed within each site-specific section.

6.1 BC

The Plaquemine Aquifer is the main source of fresh water for the site and surrounding communities. The aquifer occurs at depths of 60 to 600 ft. bls. Atchafalaya Clay is present from near ground surface to just above the aquifer. BC purchases its potable water from the Iberville Hwy. 1148 Water District. LA regulations do not require a potable water monitoring program and BC is recognized as a water purchaser only.

Four monitoring wells (BC MW1 through BC MW4) were installed in 1989/1990 near the brine storage pond (Figure C-1). These wells were drilled to approximately 30 ft. bls at three of the corners of the pond. One well was drilled farther southeast to monitor potential impact from the brine storage pond and any other potential nearby shallow contamination sources.

Periphery wells (BC PW1, BCPW2, and BC PW4 through BC PW8) (Figure C-1) were installed in areas identified as possibly being impacted based on results of the 1991 Phase I non-intrusive survey. They are screened to capture the first encountered ground water and are monitored to enhance evaluation of ground water flow direction and outlying salinity movements and variation.

Monitoring activities in 1996 provided evidence that the water in the shallow zone moves in a generally radial direction off the main site and underlying dome, loosely mimicking the topography. Water levels collected in June 2017 also indicate radial ground water movement from a high point on the dome of Cavern 15 (Figure C-2).

Ground water salinity results from samples collected during 2017 at all wells are below detection limit (BDL) (Figure C-3). Brine impacts are not evident.

For perspective, the average five-year salinity values for the BC wells are as follows:

Table 6-1
5-Year Salinity Values in BC Wells

BC Well	Salinity (ppt)
BC MW1	1.8
BC MW2	1.7
BC MW3	4.3
BC MW4	6.6
BC PW1	17.8
BC PW2	21.3
BC PW4	1.7
BC PW5	17.6
BC PW6	3.1
BC PW7	18.5
BC PW8	10.4

BC MW3, at the south-east downgradient corner of the brine pond, historically captured the most saline site ground water. It now exhibits an essentially stable and decreasing trend. Impacts from a historical 1991 brine piping leak appear to have completely passed this well in an easterly

downgradient direction.

BC PW2 is near an area with impacted ground water from historically impacted surface soil. The salinity values at BC PW2 have shown a steady decrease of salinity to ambient values. All site PW wells indicate decreasing or flat five-year salinity trends.

6.2 BH

The Evangeline and Chicot aquifers provide potable water to the BH area. Near the BH salt dome, the base of the Chicot aquifer is approximately 1,200 feet below msl. However, fresh water is reported to occur in the upper 100 feet of the Chicot aquifer on top of the dome. The town of Winnie, west of BH, uses fresh water from the upper Chicot Aquifer. Beaumont and Port Arthur, north and northeast of the site, (as well as most of Jefferson County) draw fresh water from the lower Chicot Aquifer.

BH purchases its potable water from the Trinity Bay Conservation District. It is classified by TX regulations as a "non-transient, non-community" public water distribution system and is required to have a potable monitoring program. In 2017, potable water samples were collected monthly for coliform monitoring, and weekly for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results did not exceed the regulatory MCLs for disinfectants. Coliform results were also below their MCL.

Potable water is also sampled and tested for lead and copper annually at BH. In 2017, testing for disinfection byproducts (trihalomethanes and haloacetic acids) was conducted through TCEQ. Results were below their MCLs. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. A TCEQ contractor tested for nitrate and nitrite in 2017. Results were below their MCLs.

Six monitoring wells (BH MW-1 through BH MW-6) were installed in 1987 around the brine disposal pond (Figure C-4). These wells were screened in the first water-bearing zone, approximately 15 to 20 ft. bls, consisting of silty sands and fine sands. Overlying this zone are near-surface organic silts, clays and sandy clays. The zone is underlain by silty organic clays.

Periphery wells (BH PW1, and BH PW3 through BH PW6) were installed in areas identified as possibly being impacted via results of the 1991 Phase I non-intrusive survey. They are screened to capture the first encountered ground water (Figure C-4).

Monitoring activities in 1996 provided evidence that the water in the shallow zone on the east side of the site flows to the southeast and on the west side flow to the southwest. Water levels collected in July 2017 indicate the same flow directions. The flow directions are generally consistent with surface topography at the BH site (Figure C-5).

Ground water salinity results from samples collected during 2017 at all wells are BDL (Figure C-6). One half of the detection limit is recorded as results in Figure C-6. Brine impacts are not evident.

For perspective, the average five-year salinity values for the BH wells are as follows:

Table 6-2
5-Year Salinity Values in BH Wells

BH Well	Salinity (ppt)
BH MW1	0.5
BH MW2	0.5
BH MW3	0.5
BH MW4	0.5
BH MW5	1.0
BH MW6	0.5
BH PW1	0.5
BH PW3	0.5
BH PW4	0.5
BH PW5	0.5

Salinity data collected from wells surrounding the ponds and the verification wells have indicated complete and consistent results indicating no ground water effects associated with pond operation.

6.3 BM

The Evangeline and Chicot aquifers provide potable water to the BM area and are fresh to slightly saline in the BM area. Fresh water for Brazoria County is obtained from the upper portions of the Chicot aquifer upgradient of the BM salt dome.

BM purchases its potable water from Freeport Water Utilities. It is classified by TX regulations as a “non-transient, non-community” public water distribution system and is required to have a potable monitoring program. In 2017, potable water samples were collected monthly for coliform monitoring, and weekly for residual chloramine (disinfectant). Average disinfectant levels were reported to TCEQ on a Disinfectant Level Quarterly Operating Report. Calculated results did not exceed the regulatory MCLs for disinfectants. Coliform results were also below their MCL.

Potable water is also sampled and tested for lead and copper tri-annually at BM. In 2017, testing for disinfection byproducts (trihalomethanes and haloacetic acids) was conducted through TCEQ. Results were below their MCLs. Other potable water parameters monitored for compliance include asbestos, nitrite, and nitrate with varied monitoring schedules. A TCEQ contractor tested for nitrate and nitrite in 2017. Results were below their MCLs.

The BM site is underlain by two water-bearing zones. The shallow zone occurs at depths of 8 – 12 ft. bls and extends to 25- 30 ft. bls and averages 15 ft. in thickness. The deep zone occurs at depths of 40-50 ft. bls and averages 10 ft. in thickness. The water-bearing zones consist of fine and silty sands and clayey silts. A clay layer approximately 10 to 20 feet thick separates the two zones. No usable quantities of fresh water exist in these zones.

Fifteen monitoring wells were installed between 1981 and 1990 in both the shallow (denoted as "S") and deep (denoted as "D") encountered water-bearing zones (Figure C-7). Three wells (BM BP1S, BM BP2S, and BM PZ2S) were removed from service due to casing damage. Five additional shallow wells and one additional deep well (BM PW1 through BM PW5 and BM PW2D) were installed during the 1996 Verification Well Study, and were incorporated into the site monitoring network.

Water level data collected in September 2017 indicate the ground water flow direction for the shallow zone in the northern portion of the site is to the north-northwest and north-northeast. Ground water flow for the shallow zone in the southern portion of the site exhibits predominately two radial flows, one from BM MW5-S and another from BM PW2-S (Figure C-8). The direction of the ground-water flow in the deep zone is primarily to the north toward Blue Lake (Figure C-9).

Salinity values for 2017 and previous years from the 18 monitored wells (12 shallow zone and 6 deep zone) and are included in Figure C-10.

Elevated salinity measured in shallow monitor wells since their installation (BM PZ1S, BM MW1S, and former BM BP1S), has speculatively been associated with the large SPR brine storage pond. The large brine pond (with a Hypalon® (chlorosulfonated polyethylene) membrane) was originally constructed in 1978 and subsequently enlarged (height added) with installation of a new Hypalon® liner and a concrete weight coat in 1982. It was removed from service in September 1998 and closed in early Spring 1999. The salinity measurements observed to the northeast (BM PW4) and east (BM MW1S and D of the closed pond area) could be the result of seepage occurring from before the 1982 renovations of the pond and/or its subsequent closure, or also from operations preceding SPR ownership.

Brine effects are not evident in the northwest and southern portions of the site. Shallow zone wells BM MW3 and BM MW4S, and deep well BM MW4D (west of the former brine pond), have historically remained stable in the unaffected 5 to 10 ppt range. Wells in the southern portion of the site are consistently below 50 ppt.

For perspective, the average five-year for salinity for the BM wells are depicted in the table below:

Table 6-3
5-Year Salinity Values in BM Wells

BM Well	Salinity (ppt)
BM BP1D	6.2
BM MW1D	150.4
BM MW1S	83.4
BM MW2D	56.6
BM MW2S	11.9
BM MW3	7.2
BM MW4D	4.7

BM MW4S	9.7
BM MW5	40.8
BM PW1	26.8
BM PW2D	22.2
BM PW2S	10.2
BM PW3	53* samples not taken in 2015 and 2016
BM PW4	112.5* samples not taken in 2014, 15 and 16
BM PW5	Samples not taken since 2014
BM PZ1D	24.17
BM PZ1S	47
BM PZ3	22 * samples not taken in 2015 and 2016

6.4 WH

The Chicot Aquifer provides potable water to the WH area. Much 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 regional southerly flow direction towards the north near the coast, south of Lake Charles. The fresh/saline water interface is approximately 700 ft. bls. WH purchases its potable water from the Cameron Parish Waterworks. LA regulations do not require a potable water monitoring program and WH is recognized as a water purchaser only.

The WH site is underlain by two water-bearing zones. The shallow zone occurs at depths of 6-13 ft. bls, is 3- 12 ft. thick, and consists of fine and silty sands. The deep zone occurs at depths of 40-50 ft. bls, averages 10 ft. thick, and consists of silty sand with increasing amounts of fines (silt and clay) to the west and north of the former brine pond area. A clay layer approximately 10 to 20 feet separates the two zones.

The 1991 *Contamination Assessment Report and Remedial Alternatives Analysis* identified the former brine pond as a source of ground water contamination. The decommissioned brine pond was one of five adjoining ponds comprising a pond system and solids management system that handled brine and anhydrite solids pumped from the construction of storage caverns. Brine pond construction activity implemented per the state approved brine pond-decommissioning plan was concluded in November 1999.

Eleven monitoring wells and 15 former recovery wells have been installed on the WH site in five phases from 1988-1990. They were used to either monitor or control brine movement beneath the brine pond system. The 1996 Verification Well Study added 7 periphery wells (PW) screened in the shallow zone. The surveillance monitoring network is shown on Figure C-11. It consists of wells screened in the shallow zone (denoted as “S”) and deep zone (denoted as “D”).

Water level data collected during June 2017 were used to determine ground water flow directions in the shallow and deep water-bearing zones. Results are shown on Figures C-12 and C-13, respectively. Water in the shallow zone flows in a radial direction from a site high at WH PW6 (near Cavern 105 in the southwestern portion of the site). Water in the deep zone exhibits radial

flow from most monitored wells, with the northwest portion monitored flowing toward the northwest (to Black Lake) and the southern portion flowing to the southeast.

Salinity data gathered over the past five years at all wells is depicted in Figure C-14. Four of the seven wells originally installed for 1996 Verification Well Study were retained for additional water level measurement around the periphery of the main site.

Certain wells are analyzed for salinity only once per year per the 2002 site-wide monitoring proposal approved by LDNR in early 2004, with the remainder analyzed quarterly.

The five-year salinity average for the WH wells are depicted in the table below:

Table 6-4
5-Year Salinity Values in WH Wells

WH Well	Salinity (ppt)
WH MW1D	0.8
WH P11	1.0
WH P12D	8.7
WH P12S	14.4
WH P13D	2.6
WH P13S	0.5
WH P1D	10.7
WH P1S	1.5
WH P2D	3.4
WH P2S	2.7
WH P3D	8.9
WH P3S	32.6
WH P4D	25.2
WH P4S	28.0
WH P5S	0.7
WH P6D	1.2
WH P6S	0.5
WH P8	0.5
WH P9	0.5
WH PW2	8.6
WH PW4S	3.0
WH PW5	0.5
WH PW6	0.5
WH RW2S	0.5
WH RW3D	0.5
WH RW4D	2.1
WH RW5D	16.8
WH RWTS	0.5

With the passage of years, the slug of impacted shallow water from seepage of the former brine pond has dissipated. The brine pond source has been removed. The slug has changed shape, is

smaller, and has moved towards the east while elongating northerly. In 2017, shallow impacted wells (WH P3S, WH P4S, and WH P12S) exhibited lessening salinity values. One deep well, WH P4D, exhibited 15 ppt, with past 5-year results ranging from 18- 36 ppt.

Site ground water salinity levels continue to improve and exhibit long-term gradual lessening trends. The improvement commenced shortly after the pond system was shut-off in early 1999 for pond closure construction and resumed when recovery pumping ended in Spring 2001.

Wells north, west and south of the former brine pond system (shallow and deep) do not exhibit salinity impacts.

7 Quality Assurance (QA)

The primary policy, requirements, and responsibilities for ensuring QA is performed at US DOE facilities are provided in:

- DOE Order 414.1D, Admin Chg 1, "Quality Assurance" (5-8-2013)
- 10 CFR 830, Subpart A, "Quality Assurance Requirements"

DOE Order 414.1D specifies 10 criteria of a quality program:

1. Management/Program
2. Management/Personnel Training and Qualification
3. Management/Quality Improvement
4. Management/Documents and Records
5. Performance/Work Processes Performance
6. Performance/Standards for Design and Verification
7. Performance/Procurement Requirements
8. Performance/Inspection & Acceptance Testing
9. Assessment/Management Assessment
10. Assessment/Independent Assessment

FFPO follows a "Management and Operations Contractor, Quality Assurance Procedure" (AS15700.15) that incorporates the above ten criteria. QA is performed to provide confidence in the results of effluent monitoring and environmental surveillance programs performed at the SPR sites. Data of high quality is necessary so that appropriate assessments and decisions based on those data can be made. Effluent is monitored at each SPR site in accordance with state and federal discharge permits. Environmental surveillance is performed via surface water and groundwater sampling at each site. Results are used to identify the presence or absence of SPR impacts on the surrounding media.

The SPR sites undergo biannual internal audits, as well as inspections by outside federal and state agencies. Every January and July, site laboratories (performing both environmental and crude oil sampling) are internally audited using a laboratory checklist. Audits performed in January and July of 2017 at each site are included in Appendix E. Regarding environmental samples, all audited were acceptable.

7.1 Field Quality Control

Effluent and surveillance monitoring activities are performed in accordance with procedures in the M&O Contractor Laboratory Programs and Procedures Manual (MSI7000.133), the Environmental Monitoring Plan (ASL5400.57), and in individual sampling and analytical work instructions. These procedures include maintenance of chain-of-custody, collection of quality control (QC) samples, and field documentation.

7.2 Data Management

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

Water quality data are added to the SPR ES&H Data Management System for retention, manipulation, and interpretation. The data are compiled and appear in various reports such as this SER, and in support of assessments of the SPR.

7.3 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. Sufficient quality assurance analyses were performed in 2017 to verify the continuing high quality of SPR laboratory data.

Table 7-1 SPR Wastewater Analytical Methodology

Parameter	Method	Source*	Description
Biochemical Oxygen Demand	5210(B) 405.1	SMEWW EPA-1	5 Day, 20 °C 5 Day, 20 °C
Chemical Oxygen Demand	D1252-88(B) 410.4 5220(D)	ASTM EPA-1 SMEWW	Micro Spectrophotometric Proc. Colorimetric, Manual Closed Reflux, Colorimetric
Fecal Coliform	Part III-C-2 9222(D)	EPA-2 SMEWW	Direct Membrane Filter Method Membrane Filter Procedure
Residual Chlorine	4500-C1(G) 330.5 8021	SMEWW EPA-1 Hach	DPD Colorimetric Spectrophotometric, DPD DPD Method
Oil & Grease (Total, Recoverable)	1664 Rev. A; 1664 Rev. B	EPA-1	Gravimetric, Separatory Funnel Extraction
Oil & Grease (Partition, Gravimetric)	5520-(B)	SMEWW	Gravimetric, Separatory Funnel Extraction

Table 7-1 SPR Wastewater Analytical Methodology			
Parameter	**Method**	**Source***	**Description**
Total Organic Carbon	415.1 D4839-88 5310(C) D2579(A) 5310(B)	EPA-1 ASTM SMEWW ASTM SMEWW	Combustion or Oxidation Persulfate – UV Oxidation, IR Persulfate – UV Oxidation, IR Combustion – IR Combustion - IR
Dissolved Oxygen	D888-87(D) 360.1 360.2 4500-O(C) 4500-O(G)	ASTM EPA-1 EPA-1 SMEWW SMEWW	Membrane Electrode Membrane Electrode Modified Winkler Method Winkler Method with Azide Modification Membrane Electrode
Hydrogen Ion conc. (pH)	D1293-84(A&B) 150.1 4500-H^+(B)	ASTM EPA-1 SMEWW	Electrometric Electrometric Electrometric
Total Dissolved Solids (Residual, Filterable)	160.1 2540(C)	EPA-1 APHA	Gravimetric, Dried at 180°C Gravimetric, Dried at 180°C
Total Suspended Solids (Residual, Non-Filterable)	160.2 2540(D)	EPA-1 SMEWW	Gravimetric, Dried at 103-105°C Gravimetric, Dried at 103-105°C
Salinity	D4542-85 (Sect. 7) 2520(B) 2510 (C)	ASTM SMEWW (16th Ed.) SMEWW (16th Ed.)	Refractometric Electrical Conductivity Density Method
Biomonitoring	1006.0 1007.0	EPA-3 EPA-3	*Menidia beryllina* 7-day survival *Mysidopsis bahia* 7-day survival

*Source:

SMEWW= American Public Health Association, et al., Standard Methods for the Examination of Water and Wastewater, most recent edition.

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

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

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

Hach = Hach Company, Hach Water Analysis Handbook.

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

7.4 Control of Subcontractor Laboratory Quality

The M&O Contractor subcontracts some of the required analytical work. The Laboratories Programs and Procedures Manual contains mandatory guidelines by which such contracts must be prepared. Also, the respective laboratory staff and M&O Contractor Quality Assurance,

Operations and Maintenance, and Environmental staff review laboratory procurement documents.

Only subcontractor laboratory service vendors that are state accredited under the National Environmental Laboratory Accreditation Program are approved for use on the SPR.

REFERENCES

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

Fluor Federal Petroleum Operations (FFPO) Continuity of Operations Implementation Plan, AAA9020.158

_____. Emergency Response Procedures. All sites: BCI5500.3, Bayou Choctaw; BHI5500.4, Big Hill; BMI5500.5, Bryan Mound, WHI5500.9, West Hackberry, AAA9020.159 New Orleans and AAA9020.160 Stennis.

_____. ISO 14001 Environmental Management Systems Manual. ASI5400.55.

_____. Laboratory Programs and Procedures Manual, MSI7000.133.

_____. Pollution Prevention Plan, ASL5400.41.

_____. Spill Prevention Control and Countermeasures Plans. All sites: BCL5400.16, Bayou Choctaw; BHL5400.21, Big Hill; BML5400.17, Bryan Mound; WHL5400.20, West Hackberry.

_____. SPR Environmental Monitoring Plan, ASL5400.57.

Faust, S. D., & Osman M. A.. 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.

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

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.

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

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

_____. Environmental Assessment and Finding of No Significant Impact to Address the Proposed Site Modifications at the Strategic Petroleum Reserve's West Hackberry Raw Water Intake Structure Site, Cameron Parish, Louisiana. November 10, 2005.

_____. 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 Petroleum Reserve St. James Terminal. January, 1995. U.S. Department of Energy.

_____. Environmental Assessment on the Leasing of the Strategic Petroleum 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 Environmental Impact Statement, Site Selection for the Expansion of the Strategic Petroleum Reserve. 2 volumes. December 2006, 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. U. S. Department of Energy.

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

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

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

End of References

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Appendix A

Appendix A1- Environmental Standards List

Appendix A2- SPR Project Management Office ES&H Directives

Appendix A1 – Environmental Standards List

DESCRIPTION	STANDARD
National Environmental Policy Act Implementing Procedures	10 CFR 1021
Compliance with Flood Plain/Wetlands Environmental Review	10 CFR 1022
Occupational Radiation Protection - Applicable and Enforceable Portions	10 CFR 835
Storage, treatment, and disposal of nondefense toxic and hazardous materials	10 USC 2692
Boiler And Pressure Vessels - Degas Project Only	120 IAC
(Aviation) Operating Requirements: Domestic, Flag, and Supplemental Operations	14 CFR 121
(Aviation) Certifications and Operations	14 CFR 125
(Aviation) Certification and Operations of Scheduled Air Carriers with Helicopters	14 CFR 127
(Aviation) Rotorcraft External Load Operations	14 CFR 133
(Aviation) Operating Requirements: Commuter and On-Demand Operations	14 CFR 135
(Aviation) Agricultural Aircraft Operations	14 CFR 137
(Aviation) Certification and Operation: Land Airport Serving Certain Air Carriers	14 CFR 139
(Aviation) Repair Stations	14 CFR 145
(Aviation) Objects Affecting Navigable Airspace	14 CFR 77
(Aviation) Notification And Reporting - Accidents and Incidents	14 CFR 830
(Aviation) General Operating and Flight Rules	14 CFR 91
Oil and Gas Division	16 TAC 1.3
Environmental Recycling	16 TAC 1.4
Fish and Wildlife Coordination Act	16 U.S.C. §§ 661-666c
Bald and Golden Eagle Protection Acts	16 U.S.C. §§ 668-668d
Migratory Bird Treaty Act	16 U.S.C. §§ 703-711
Endangered Species Act	16 USC Parts 1531-1544
Radiation Control	25 TAC 1.289
Commerce In Explosives (ATF)	27 CFR 55
Imminent Danger	29 CFR 1903.13
Posting of Notice: Availability of the Act, Regulations, and Applicable Standards	29 CFR 1903.2
Recordkeeping and Reporting Occupational Injuries and Illnesses	29 CFR 1904
General (1 through 8)	29 CFR 1910 SUBPART A
Adoption and Extension of Established Federal Standards (11 through 19)	29 CFR 1910 SUBPART B
Walking-Working Surfaces (21 through 30)	29 CFR 1910 SUBPART D
Means of Egress (35 through 38)	29 CFR 1910 SUBPART E
Powered Platforms, Manlifts, and Vehicle Mounted Work Platforms (66 through 68)	29 CFR 1910 SUBPART F
Occupational Health and Environmental Control (94 through 98)	29 CFR 1910 SUBPART G
Hazardous Materials (101 through 126)	29 CFR 1910 SUBPART H
Personal Protective Equipment (132 through 139)	29 CFR 1910 SUBPART I
General Environmental Controls (141 through 147)	29 CFR 1910 SUBPART J
Medical and First Aid (151)	29 CFR 1910 SUBPART K
Fire Protection (155 through 165)	29 CFR 1910 SUBPART L

DESCRIPTION	STANDARD
Compressed Gas and Compressed Air Equipment (169)	29 CFR 1910 SUBPART M
Materials Handling and Storage (176-179, 181, 183-184)	29 CFR 1910 SUBPART N
Machinery and Machine Guarding (211 through 213, 215, 219)	29 CFR 1910 SUBPART O
Hand/Portable Powered Tools and Other Hand-Held Equipment (241 through 244)	29 CFR 1910 SUBPART P
Welding, Cutting, and Brazing (251 through 255)	29 CFR 1910 SUBPART Q
Special Industries (269) Power generation, Transmission	29 CFR 1910 SUBPART R
Special Industries (268) Telecommunications	29 CFR 1910 SUBPART R
Electrical (301 through 306, 331–335, 399)	29 CFR 1910 SUBPART S
Commercial Diving Operations (401 through 402, 410, 420-427, 430, 440-441)	29 CFR 1910 SUBPART T
Toxic and Hazardous Substances (1000 through 1450 except 1029, 1043, 1045, 1047, 1050-1051)	29 CFR 1910 SUBPART Z
Designations for General Industry Standards Incorporated Into Body of Construction Standards	29 CFR 1926 APP. A
General (1 through 5)	29 CFR 1926 SUBPART A
General Interpretations (10 through 16)	29 CFR 1926 SUBPART B
General Safety and Health Provisions (20 through 35)	29 CFR 1926 SUBPART C
Occupational Health and Environmental Controls (50 through 66)	29 CFR 1926 SUBPART D
Personal Protection and Life Saving Equipment (95 through 107)	29 CFR 1926 SUBPART E
Fire Protection and Prevention (150 through 159)	29 CFR 1926 SUBPART F
Signs, Signals, and Barricades (200 through 203)	29 CFR 1926 SUBPART G
Materials Handling, Storage, Use, and Disposal (250 through 252)	29 CFR 1926 SUBPART H
Tools - Hand and Power (300 through 307)	29 CFR 1926 SUBPART I
Welding and Cutting (350 through 354)	29 CFR 1926 SUBPART J
Electrical (400 through 408, 416-417, 431-432, 441, 449)	29 CFR 1926 SUBPART K
Scaffolds (450 through 454)	29 CFR 1926 SUBPART L
Fall Protection (500 through 503)	29 CFR 1926 SUBPART M
Cranes, Derricks, Hoists, Elevators, and Conveyors (550 through 555)	29 CFR 1926 SUBPART N
Motor Vehicles, Mechanized Equipment, and Marine Operations (600 through 606)	29 CFR 1926 SUBPART O
Excavations (650 through 652)	29 CFR 1926 SUBPART P
Concrete and Masonry Construction (700 through 706)	29 CFR 1926 SUBPART Q
Steel Erection (750 through 752)	29 CFR 1926 SUBPART R
Demolition (850 through 860)	29 CFR 1926 SUBPART T
Blasting and the Use of Explosives (900 through 914)	29 CFR 1926 SUBPART U
Power Transmission and Distribution (950 through 960)	29 CFR 1926 SUBPART V
Rollover Protective Structures; Overhead Protection (1000 through 1003)	29 CFR 1926 SUBPART W
Stairways and Ladders (1050 through 1060)	29 CFR 1926 SUBPART X
Diving (1071 through 1092)	29 CFR 1926 SUBPART Y
Toxic and Hazardous Substances (1100 through 1152 except 1129, 1145, 1147)	29 CFR 1926 SUBPART Z
Hazardous Materials Information Development, Preparedness and Response Act	30 LA RS 2361-2379 SARA Title III
DELETED General Provisions - Document Filing Procedures	30 TAC 1.1.10 DELETED

DESCRIPTION	STANDARD
General Air Quality Rules	30 TAC 1.101
Permits by Rule	30 TAC 1.106
Control of Air Pollution from Visible Emissions and Particulate Matter	30 TAC 1.111
Control of Air Pollution from Sulfur Compounds	30 TAC 1.112
Control of Air Pollution from Hazardous Air Pollutants	30 TAC 1.113
DELETED Control of Air Pollution from Motor Vehicles	30 TAC 1.114 DELETED
Control of Air Pollution from Volatile Organic Compounds	30 TAC 1.115
Control of Air Pollution by Permits for New Construction or Modification	30 TAC 1.116
Control of Air Pollution from Nitrogen Compounds	30 TAC 1.117
Control of Air Pollution Episodes	30 TAC 1.118
DELETED Federal Operating Permits Program	30 TAC 1.122 DELETED
Electronic Reporting	30 TAC 1.19.3
DELETED - July 2014 Environmental Testing Laboratory Accreditation and Certification	30 TAC 1.25 - DELETED
Water Quality Certification	30 TAC 1.279
Applications Processing	30 TAC 1.281
Public Drinking Water	30 TAC 1.290
Water Rights, Procedural	30 TAC 1.295
Water Rights, Substantive	30 TAC 1.297
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Guidelines Establishing Test Procedures for the Analysis of Pollutants	40 CFR 136
National Primary Drinking Water Regulations	40 CFR 141
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State Underground Injection Control Programs	40 CFR 147
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NEPA Purpose, Policy and Mandate	40 CFR 1500
NEPA and Agency Planning	40 CFR 1501
NEPA Environmental Impact Statement	40 CFR 1502
NEPA Commenting	40 CFR 1503
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Section 404 (b) (1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material	40 CFR 230
Guidelines for Storage and Collection of Residential, Commercial, and Institutional Solid Wastes	40 CFR 243
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Standards for Management of Specific Hazardous Wastes	40 CFR 266
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Standard for Universal Waste Management	40 CFR 273
Standards for Management of Used Oil	40 CFR 279
Technical Standards and Corrective Action Requirements for Owners and Operators of UST	40 CFR 280
Approved Underground Storage Tank Programs	40 CFR 282
National Oil and Hazardous Substances Pollution Contingency Plans	40 CFR 300
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Emergency Planning and Notification	40 CFR 355
Hazardous Chemical Reporting: Community Right-to-Know	40 CFR 370
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Reporting Hazardous Substance Activity When Selling or Transferring Federal Real Property	40 CFR 373
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General Pretreatment Regulations for Existing and New Sources of Pollution	40 CFR 403
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Determination of Emissions from Volatile Compounds Leaks	40 CFR 60, Appendix A, Method 21
DELETED National Emission Standards for Hazardous Air Pollutants	40 CFR 61 DELETED
DELETED National Emission Standards for Hazardous Air Pollutant for Source Categories	40 CFR 63 DELETED
Assessment and Collection of Noncompliance Penalties	40 CFR 66
State Operating Permit Programs	40 CFR 70
General	40 CFR 700
PCB Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions	40 CFR 761
Regulations of Fuels and Fuel Additives	40 CFR 80
EPA Regulations Designating Areas for Air Quality Planning	40 CFR 81
Protection of Stratospheric Ozone	40 CFR 82
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Energy Policy Act of 2005	42 USC 15801
Energy Conservation Reauthorization 1998	42 USC 6201 et seq.
Energy Policy and Conservation Act 1975 and 1994	42 USC 6291-6309
RCRA and Affirmative Procurement	42 USC 6962
National Environmental Policy	42 USC Chapter 55
Air Pollution Prevention and Control	42 USC Chapter 85
National Energy Policy Act of 1992	42 USC Chapter 91
Coastal Management	43 LAC I.7
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General Information, Regulations, and Definitions	49 CFR 171
Hazardous Material Tables, Hazardous Materials Communications Requirements and Emergency Response Information Requirements	49 CFR 172
Shippers - General Requirements for Shipments and Packaging	49 CFR 173
Carriage by Public Highway	49 CFR 177
DOT Response Plans for Onshore Pipelines	49 CFR 194
Transportation of Hazardous Liquids by Pipeline	49 CFR 195
Drug and Alcohol Testing	49 CFR 199
Commercial Driver's License Standards; Requirements and Penalties	49 CFR 383
Endangered and Threatened Wildlife and Plants and Migratory Bird Permits	50 CFR 10, 13, 17, 21, 22
General Provisions	50 CFR 450
Disposal of Birds or Quadrupeds Becoming a Nuisance	56 LA RS 112
US Department of Agriculture Federal Biobased Products Preferred Procurement Program	7 CFR 3201-3202
Pesticide	7 LAC XXIII

DESCRIPTION	STANDARD
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)	7 USC 136
Farm Security and Rural Investment Act (FSRIA) of 2002, Section 9002	7 USC 8102
Control of Nuisance Wild Quadrupeds	76 LAC V.1.25
Nuisance Wildlife Control Operator Program	76 LAC V.1.27
Stennis Warehouse Spill Prevention, Control, and Countermeasures Plan	AAA 4010.10
Property Management Manual	AAA 7003.7
Threshold Limit Values For Chemical Substances - Current Year & Applicable Substances	ACGIH TLV
Area Contingency Plan for Lake Charles	ACP USCG
Area Contingency Plan for Port Arthur	ACP USCG
Area Contingency Plan for New Orleans	ACP USCG
Area Contingency Plan for Galveston	ACP USCG
Area Contingency Plan for EPA Region 6	ACP-EPA
Hazardous Materials Management Education Program Observations and Recommendations: Environmental Mgmt, Hazardous Waste Minimization, and Pollution Prevention for the SPR Operations	AIHMM
OBSOLETE- July 2014 Drill and Exercise Program Plan	AL 5500.11- OBSOLETE
Standard Methods for the Examination of Water and Wastewater	American Public Health Assoc.
OSHA Referenced Standards	ANSI Standards
Environmental Management Systems Specification With Guidance For Use	ANSI/ISO 14001:2004
Compilation of Air Pollutant Emission Factors	AP-42
Permit Regulations for the Construction and/or Operation of Air Emissions Equipment (Mississippi)	APC-S-2
Amer. Petroleum Institute - Recommended Practices and Guides	API
API Standard 653 for Tank Inspection, Repair, Alteration, and Reconstruction	API - Standard
Environmental Effects of Army Actions	AR 200-2
OBSOLETE - July 2014 Conduct of Training for the SPR M&O Contractor	ASI 3400.1 - OBSOLETE
Integrated Logistics Support Procedures	ASI 4000.10
SPR Plant Maintenance System	ASI 4330.16
Environmental Instructions Manual	ASI 5400.15
Conduct of Operations at the SPR	ASI 5480.19
Accident Prevention Manual	ASI 5480.22
Quality Assurance Instructions	ASI 5700.15
Design Review Procedure	ASI 6430.15
Configuration Management	ASL 4700.1
SPR Environmental Monitoring Plan	ASL 5400.57
Fire Protection Manual	ASL 5480.18
Emergency Readiness Assurance Plan	ASL 5500.10
Emergency Response Team Organization and Training Plan	ASL 5500.25
Emergency Management Plan and Implementing Procedures	ASL 5500.58
Drawdown Management Plan	ASL 6400.18

DESCRIPTION	STANDARD
Cavern Inventory & Integrity Control Plan	ASL 6400.30
Drawdown Readiness Program Plan	ASL 7000.397
OSHA Referenced Standards	ASME Standards
Environmental Policy	ASP 5400.2
DELETED - July 2014 SPR Crosstalk Information Exchange Program	ASR 7000.2 - DELETED
Readiness Review Board	ASR 7000.7
Membership in BRAMA	BC BRAMA
Membership in Greater Baton Rouge Industry Alliance	BC Greater BR Industry Alliance
Membership in Iberville CAER	BC Iberville CAER
Membership in the Iberville LEPC	BC Iberville LEPC
Membership in West Baton Rouge LEPC	BC West Baton Rouge LEPC
Bayou Choctaw Emergency Response Procedures	BCI 5500.3
Bayou Choctaw Spill Prevention, Control, and Countermeasures Plan	BCL 5400.16
Safety Agreement with NEWPARK	BH & NEWPARK
Membership in the LEPC	BH LEPC
Membership in the Local Law Enforcement Agency for BH	BH LLEA
Membership in Sabine-Neches Chiefs Mutual Aid	BH Sabine-Neches Chiefs Mutual Aid
Big Hill Emergency Response Procedures	BHI 5500.4
Big Hill Spill Prevention, Control, and Countermeasures Plan	BHL 5400.21
Membership in the BMAT for BM	BM BMAT
Membership in the Brazosport CAER	BM CAER
Membership in the LEPC	BM LEPC
Membership in the Local Law Enforcement Agency at BM	BM LLEA
Agreement between BM and VDD on restrictions to working on Hurricane Levees near BM	BM VDD
Bryan Mound Emergency Response Procedures	BMI 5500.5
Bryan Mound Spill Prevention, Control, and Countermeasures Plan	BML 5400.17
Seminar on Site Characterization for Subsurface Remediations	CERI-89-224
Fire Prevention and Protection; Emergency Services and Communication; and Hazardous Materials	Chapter 13 Jefferson Parish Code of Ordinances
County Regulation of Matters Relating to Explosives and Weapons Subchapter A. Explosives	Chapter 235 TX Statutes, Local Government, Title 7
Operation and Movement of Vehicles (Explosives)	Chapter 545 TX Statutes, Transportation, Title 7
Vehicle Equipment (Explosives)	Chapter 547 TX Statutes, Transportation, Title 7
Hoisting And Rigging Handbook	DOE HDBK, 1090-9
DOE Waste Minimization reporting Requirements, Nov. 1994	DOE Guideline
Waste Minimization Reporting System (Wmin) User's Guide	DOE Handbook

DESCRIPTION	STANDARD
Pollution Prevention Handbook	DOE Handbook
Guidance for the Preparation of the Waste Minimization and Pollution Prevention Awareness Plan, Dec 1993	DOE Handbook
EPA's Interim Final Guidance to Hazardous Waste Generators on the Elements of a Waste Minimization Program	DOE Memorandum
For all applicable DOE Orders See Contract No. DE-FE0011020 Applicable Standards List	DOE Orders
Pollution Prevention Program Plan	DOE S-0118
Paint Repair of Exterior Metal Surfaces	DOE Standard Spec. 17900
Management of Polychlorinated Biphenyls (PCBs)	DOE/EH-0350
Performance Objectives and Criteria for Conducting DOE Environmental Audits	DOE/EH-0358
Annual report on Waste Generation and Waste Minimization Progress	DOE/EM-0276
Standard for Fire Protection of DOE Electronic Computer/Data Processing Systems	DOE/EP-0108
Waste Minimization/Pollution Prevention Crosscut Plan 1994	DOE/FM-0145
Fire Protection	DOE-STD-1066-2012
Fire Protection for Relocatable Structures	DOE-STD-1088-95
All SPR Environmental Permits as listed in the Annual Site Environmental Report (SER)	Environmental Permits
Protection and Enhancement of Environmental Quality	EO 11514
Floodplain Management	EO 11988
Protection of Wetlands	EO 11990
Federal Compliance with Pollution Control Requirements	EO 12088
Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations	EO 12898
Marine Protected Area	EO 13158
Responsibilities of Federal Agencies to Protect Migratory Birds	EO 13186
Energy Efficient Standby Power Devices	EO 13221
Preserve America	EO 13287
REVOKED Strengthening Federal Environmental, Energy, and Transportation Management	EO 13423 REVOKED
REVOKED Federal Leadership in Environmental, Energy, and Economic Performance	EO 13514 REVOKED
Planning for Sustainability in the Next Decade	EO 13693
Protocol for Equipment Leak Emission Estimates, Jun 1993	EPA 453/R-93-026
Practical Guide for Groundwater Sampling	EPA 600/2-85/105
Handbook for Analytical Quality Control in Water and Wastewater Laboratories	EPA 600/4-79-019
Methods for Chemical Analysis of Water and Wastes	EPA 600/4-79-020
Handbook for Sampling and Sample Preservation of Water and Wastewater	EPA 600/4-82-029
Addendum to Handbook for Sampling and Sample Preservation, EPA 600/4-82-029	EPA 600/4-83-039
Microbiological Methods for Monitoring the Environment, Water and Wastes	EPA 600/8-78-017
Facility Pollution Prevention Guide	EPA 600/R-92/088
Short Term Methods for Measuring Acute Toxicity of Effluents to Aquatic Organisms	EPA 821-R-02-014
Water Measurement Manual	EPA 832B81102
Storm Water Management for Industrial Activities	EPA 833-R-92-002

DESCRIPTION	STANDARD
Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, 4/1/86	EPA Region IV
Current National Water Quality Criteria	EPA Web Site
EPA Waste Minimization Opportunity Assessment Manual	EPA,ISBN:0-86587-752-1
Specification for 8’ and 12’ Unlighted and Externally Lighted Wind Cone Assembly	FAA AC 150/5345-27
Heliport Design, January 4, 1988	FAA AC 150/5390-2
Obstruction Marking and Lighting, October 1985	FAA AC 70/7460-1G
For all applicable FAR and DEAR Clauses see Contract DE-FE0011020, Applicable Clauses List	FAR and DEAR Clauses
Factory Mutual - Approval Guide and Loss Prevention Data Sheets	FM
Hazardous Waste Management Regulations (Mississippi)	HW-1
Oil Cos. International. Marine Forum - International Oil Tanker & Terminal Safety Guide	ICIMF
OSHA Referenced Standards	IEEE Standards
OBSOLETE: STRATEGIC PETROLEUM RESERVE MANAGEMENT AND OPERATING AND CONSTUCTION MANAGEMENT SERVICES CONTRACTORS- ENVIRONMENTAL	IWA: DOE-DM-AGSC OBSOLETE
OBSOLETE: STRATEGIC PETROLEUM RESERVE MANAGEMENT AND OPERATING AND CONSTUCTION MANAGEMENT SERVICES CONTRACTORS- SAFETY AND HEALTH	IWA: DOE-DM-AGSC OBSOLETE
Pollution Prevention Assessment Manual for Texas Businesses	LP 92-03
Surface Water and Ground Water Use and Protection (Mississippi)	LW-2
Regarding Implementation of the Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds"	MOU- USFWS
MOU with ATFE for Louisiana Sites during Emergencies	MOU with ATFE in LA
MOU with ATFE for the Texas Sites during Emergencies	MOU with ATFE TX
MOU with the BCSO for BM during Emergencies	MOU with BCSO
MOU with Cameron Parish Sheriff's Office for WH during Emergencies	MOU with CamPSO
MOU with Calcasieu Parish Sheriff's Office for WH during Emergencies	MOU with CPSO
MOU with Entergy	MOU with Entergy
MOU with the FBI for Louisiana Sites during Emergencies	MOU with FBI in LA
MOU with the FBI for the Texas Sites during Emergencies	MOU with FBI TX
MOU with Ft. Polk for Louisiana Sites during Emergencies	MOU with Ft. Polk
MOU with JCSO for BH during Emergencies	MOU with JCSO
MOU with LA Homeland Security for Louisiana Sites during Emergencies	MOU with LA Homeland Security
MOU with LA State Police for Louisiana Sites during Emergencies	MOU with LA State Police
MOU with US Army 797th Explosive Ordinance Co. for the Texas Sites during Emergencies	MOU with US Army 797 EOC
SPR Gas and Geothermal Heat Effects on Crude Oil Vapor Pressure, Dec. 1994	MP 94W0000131
Power to capture or destroy animals injurious to property	MSC Section 49-1-39
Nuisance Wildlife	MSC Section 49-7-1
Laboratory Programs & Procedures	MSL 7000.133
National Association of Corrosion Engineers	NACE
National Electric Safety Code	NEC

DESCRIPTION	STANDARD
Fire Protection Handbook	NFPA
Fire Code	NFPA 1
Standard for Portable Fire Extinguishers	NFPA 10
Standard for Fire Service Professional Qualifications Accreditation and Certification Systems	NFPA 1000
Life Safety Code®	NFPA 101
Guide on Alternative Approaches to Life Safety	NFPA 101A
Standard for Fire Officer Professional Qualifications	NFPA 1021
Standard for Professional Qualifications for Fire Inspector and Plan Examiner	NFPA 1031
Standard for Professional Qualifications for Fire Investigator	NFPA 1033
Standard for Fire Service Instructor Professional Qualifications	NFPA 1041
Standard for the Installation of Smoke Door Assemblies and other Opening Protectives	NFPA 105
Standard for Industrial Fire Brigade Member Professional Qualifications	NFPA 1081
Standard for Low-, Medium-, and High-Expansion Foam	NFPA 11
Standard for Emergency and Standby Power Systems	NFPA 110
Standard on Stored Electrical Energy Emergency and Standby Power Systems	NFPA 111
Standard for the Installation of Sprinkler Systems	NFPA 13
Recommended Practice for Fire Department Operations in Properties Protected by Sprinkler and Standpipe Systems	NFPA 13E
Standard for the Installation of Standpipe and Hose Systems	NFPA 14
Recommended Practice for Fire Service Training Reports and Records	NFPA 1401
Standard for Fire Service Respiratory Protection Training	NFPA 1404
Standard on Training for Initial Emergency Scene Operations	NFPA 1410
Standard for Water Spray Fixed Systems for Fire Protection	NFPA 15
Standard on Fire Department Occupational Safety and Health Program	NFPA 1500
Standard on Emergency Services Incident Management System and Command Safety	NFPA 1561
Standard on Fire Department Infection Control Program	NFPA 1581
Standard on Comprehensive Occupational Medical Program for Fire Departments	NFPA 1582
Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems	NFPA 16
Standard on Disaster/Emergency Management and Business Continuity Programs	NFPA 1600
Standard for Dry Chemical Extinguishing Systems	NFPA 17
Standard for Fire Safety Symbols and Emergency Symbols	NFPA 170
Standard for Automotive Fire Apparatus	NFPA 1901
Standard for the Inspection, Maintenance, Testing & retirement of in Service Automotive Fire Apparatus	NFPA 1911
Standard on Fire Hose	NFPA 1961
Standard for the Care, Use, Inspection, Service Testing, and Replacement of Fire Hose, Couplings, Nozzles, and Fire Hose Appliances	NFPA 1962
Standard for Fire Hose Connections	NFPA 1963
Standard for Spray Nozzles	NFPA 1964
Standard for Fire Hose Appliances	NFPA 1965

DESCRIPTION	STANDARD
Standard on Protective Ensemble For Structural Fire Fighting and Proximity Fire Fighting	NFPA 1971
Standard on Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Fire and Emergency Services	NFPA 1981
Standard on Personal Alert Safety Systems (PASS)	NFPA 1982
Standard on Fire Service Life Safety Rope and Equipment for Emergency Service	NFPA 1983
Standard on Vapor-Protective Ensembles for Hazardous Materials Emergencies	NFPA 1991
Standard on Liquid Splash-Protective Ensembles and Clothing for Hazardous Materials Emergencies	NFPA 1992
Standard on Protective Clothing for Emergency Medical Operations	NFPA 1999
Standard for the Installation of Stationary Pumps for Fire Protection	NFPA 20
Standard on Clean Agent Fire Extinguishing Systems	NFPA 2001
Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire	NFPA 2012
Standard for Smoke and Heat Venting	NFPA 204
Standard on Selection, Care, Use, and Maintenance of Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire	NFPA 2113
Standard for Water Tanks for Private Fire Protection	NFPA 22
Standard on Types of Building Construction	NFPA 220
Standard for High Challenge Fire Walls, Fire Walls, & Fire Barrier Walls	NFPA 221
Standard for the Protection of Records	NFPA 232
Standard for the Installation of Private Fire Service Mains and Their Appurtenances	NFPA 24
Standard for Safeguarding Construction, Alteration, and Demolition Operations	NFPA 241
Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems	NFPA 25
Standard Methods of Tests of Fire Resistance of Building Construction and Materials	NFPA 251
Standard Methods of Fire Tests of Door Assemblies	NFPA 252
Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source	NFPA 253
Standard Method of Test of Surface Burning Characteristics of Building Materials	NFPA 255
Recommended Practice for Fire Flow Testing and Marking of Hydrants	NFPA 291
Flammable and Combustible Liquids Code	NFPA 30
Fire Protection Standard for Pleasure and Commercial Motor Craft	NFPA 302
Standard for the Control of Gas Hazards on Vessels	NFPA 306
Standard for the Construction and Fire Protection of Marine Terminals, Piers, and Wharves	NFPA 307
Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair	NFPA 326
Recommended Practice for Handling Releases of Flammable and Combustible Liquids and Gases	NFPA 329
Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines	NFPA 37
Standard for Tank Vehicles for Flammable and Combustible Liquids	NFPA 385
Standard for Heliports	NFPA 418
DELETED Code for the Storage of Liquid and Solid Oxidizers	NFPA 430 DELETED

DESCRIPTION	STANDARD
Standard on Fire Protection for Laboratories Using Chemicals	NFPA 45
Standard for Professional Competence of Responders to Hazardous Materials/Weapons of Mass Destruction Incidents	NFPA 472
Standard for Competencies for EMS Personnel Responding to Hazardous Materials/WMD Incidents	NFPA 473
Explosive Materials Code	NFPA 495
Recommended Practice for the Classification of Flammable Liquids, Gases, or Vapors and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas	NFPA 497
Building Construction and Safety Code	NFPA 5000
Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation	NFPA 505
Standard for Fire Prevention During Welding, Cutting, and Other Hot Work	NFPA 51B
ANSI Z223.1-2012 National Fuel Gas Code	NFPA 54
Compressed Gases and Cryogenic Fluids Code	NFPA 55
Guide to the Fire Safety Concepts Tree	NFPA 550
Liquefied Petroleum Gas Code	NFPA 58
Standard on Industrial Fire Brigades	NFPA 600
Standard for Security Services in Fire Loss Prevention	NFPA 601
National Electrical Code	NFPA 70
Standard for Fire Retardant Treated Wood and Fire Retardant Coatings for Building Materials	NFPA 703
Standard System for the Identification of the Hazards of Materials for Emergency Response	NFPA 704
Recommended Practice for Electrical Equipment Maintenance	NFPA 70B
Standard for Electrical Safety in the Workplace	NFPA 70E
National Fire Alarm and Signaling Code	NFPA 72
Standard for the Protection of Information Technology Equipment	NFPA 75
Standard on Water Mist Fire Protection Systems	NFPA 750
Recommended Practice on Static Electricity	NFPA 77
Standard for the Installation of Lightning Protection Systems	NFPA 780
Electrical Standard for Industrial Machinery	NFPA 79
Standard for Fire Doors and other Opening Protectives	NFPA 80
Recommended Practice for Protection of Buildings from Exterior Fire Exposures	NFPA 80A
Standard for Fire Protection in Wastewater Treatment and Collection Facilities	NFPA 820
Standard Classifications for Incident Reporting and Fire Protection Data	NFPA 901
Standard for the Installation of Air-Conditioning and Ventilating Systems	NFPA 90A
Standard for the Installation of Warm Air Heating and Air-Conditioning Systems	NFPA 90B
Guide for Fire and Explosion Investigations	NFPA 921
Standard for Smoke-Control Systems Utilizing Barriers & Pressure Differences	NFPA 92A
SPR Qualified Products List	No number
Construction of Geotechnical Boreholes and Groundwater Monitoring Systems Handbook (LDOTD and LDEQ)	No number

DESCRIPTION	STANDARD
FFPO and DOE Standard Environmental Contract Boilerplate	No Number
SPRPMO Level III Design Criteria	No number
Earth Manual, 3rd Ed., U.S. Department of the Interior, Bureau of Reclamation	No number
Louisiana's Suggested Chemical Weed Control Guide for 1994 (LA Cooperative Extension Services)	No number
The Sterling Brine Handbook (Int'l Salt Co.)	No number
Technical Guidance Package for Chemical Sources, Storage Tanks, TCEQ, Feb 2001	No number
Membership in Louisiana Environmental Leadership Program (LaELP) http://www.deq.state.la.us/assistance/elp	No number
OBSOLETE - July 2014 Environmental, Safety, and Health Management Plan (FY 1998 - FY 2002)	No number - OBSOLETE
OBSOLETE: DM/AGT cooling water discharge agreement	No Number OBSOLETE
OBSOLETE- Membership in Clean Texas Program http://www.cleantexas.org/index.cfm	No number OBSOLETE
Organizational and Management Assessments	NOI 1000.72
Pipkin Ranch Road use restrictions in emergencies	Pipkin Ranch Road
Mississippi DWFP Nuisance Animals	Public Notice LE-3799 and LEI 3799
Louisiana Department of Environmental Quality Risk Evaluation/Corrective Action Program	RECAP (2003)
Pollution Prevention Assessment Manual	RG-133
Summary of Work	S# 01010
Demolition of Facilities	S# 02050
Excavation, Backfilling, & Compaction	S# 02222
Dikes & Embankments	S# 02223
Roadways (Texas)	S# 02230
Roadways (Louisiana)	S# 02233
Drilled and Belled Concrete Piers	S# 02362
Piles and Pile Driving	S# 02364
Steel Sheet Piling	S# 02369
Fences & Gates	S# 02444
Sensor - Compatible Fences and Gates	S# 02445
Signage	S# 02450
Seeding	S# 02485
Asphaltic Concrete Pavement	S# 02513
Asphaltic Concrete Pavement (Louisiana)	S# 02514
Cast-In-Place Concrete	S# 03300
Shotcrete	S# 03361
Grout	S# 03600
Brick Masonry	S# 04210
Concrete Unit Masonry	S# 04220
Structural Steel green	S# 05120
Metal Roof Deck	S# 05310

DESCRIPTION	STANDARD
Rough Carpentry	S# 06100
Finish Carpentry	S# 06200
Vinyl Sheet Piles	S# 06521
Rigid Insulation	S# 07212
Built-Up Bituminous Roofing	S# 07510
Aluminum Clad Flashing Membrane	S# 07550
Fluid Applied Roofing	S# 07560
Sealants & Caulking	S# 07920
Metal Doors & Frames	S# 08100
Flush Wood Doors	S# 08211
Hurricane Windows	S# 08520
Glass & Glazing	S# 08800
Gypsum Wallboard	S# 09250
Ceramic Tile	S# 09310
Resilient Rubber Flooring	S# 09650
Resilient Tile Flooring	S# 09660
Carpet - Glue Down	S# 09688
Epoxy Flooring	S# 09722
Interior Painting	S# 09900
Painting (Buildings)	S# 09901
Metal Toilet Partitions	S# 10162
Toilet Room Accessories	S# 10800
Prefabricated Industrial/Commercial Metal Building	S# 13121
Modular Insulated Building	S# 13126
Prefabricated Metal Shelter/Housing	S# 13127
Prefabricated Fiberglass Shelter/Housing	S# 13128
Duct Insulation	S# 15258
Plumbing Systems	S# 15400
Plumbing Fixtures & Trim	S# 15450
Air Cooled Condensing Unit	S# 15695
Packaged Terminal Air Conditioners	S# 15731
Conduit	S# 16111
Wood Poles	S# 16503
Lighting	S# 16510
DOE Policy on Signatures of RCRA Permit Applications	SEN-22-90
Nonhazardous Solid Waste Management Regulations and Criteria (Mississippi)	SW-2
Texas Tier Two Reporting Forms and Instructions	TCRA, 505-507 SARA Title III
Special Licenses and Permits	TPWC Chapter 43
Birds; Protection of Nongame Birds; Destroying Nests or Eggs	TPWC Chapter 64
Alligators	TPWC Chapter 65

DESCRIPTION	STANDARD
Disposition of Protected Wildlife	TPWC Section 43.024
Alligators in Texas: Rules, regulations, and general information, 2013-2014	TPWD
Texas Regulations for Control of Radiation - General provisions	TRCR part 11
Texas Regulations for Control of Radiation - Fees	TRCR part 12
Texas Regulations for Control of Radiation - Hearing and Enforcement Procedures	TRCR part 13
Standards for Protection Against Radiation - Permissible Doses, Precautionary Procedures, Waste Disposal	TRCR part 21
Notices, Instructions and Reports to Workers; Inspections	TRCR part 22
Radiation Safety Requirements and Licensing and Registration Procedures for Industrial Radiography	TRCR part 31
Licensing of Radioactive Material -Exemptions, Licenses, General Licenses, Specific Licenses, Reciprocity, Transport	TRCR part 41
State Fire Marshall (Explosives)	TX Statute Chapter 417 State Fire Marshall
Fire Protection Engineering for Facilities	UFC 3-600-01
International Conference of Building Officials - Uniform Building Code and Uniform Fire Code	UFC/UBC
Underwriter's Laboratory - Building Materials, Fire Resistance, Fire Prot. Equip., & Haz. Location Equip. Directories	UL
West Hackberry Emergency Response Procedures	WHI 5500.9
West Hackberry Spill Prevention, Control, and Countermeasures Plan	WHL 5400.20

Appendix A2 – SPR Project Management Office ES&H Directives

DIRECTIVE	DESCRIPTION
DOE O 151.1C	Comprehensive Emergency Management System
DOE O 225.1B	Accident Investigations
DOE O 231.1B Admin Chg. 1	Environment, Safety and Health Reporting
DOE O 420.1C Change 1	Facility Safety
DOE O 422.1 Admin Chg. 1, Admin Chg. 2	Conduct of Operations
DOE O 430.1B, Change 1, Change 2	Real Property Asset Management
DOE O 436.1	Departmental Sustainability
DOE O 440.2C, Admin Change 1	Aviation Management Safety
DOE O 450.2 Chg 1 (MinChg)	Integrated Safety Management
DOE O 460.1C	Packaging and Transportation Safety
DOE O 460.2A	Departmental Materials Transportation and Packaging Management
DOE P 450.4A	Safety Management System Policy
SPRPMO O 232.1A	Occurrence Reporting and Processing System
SPRPMO O 420.1D	Conduct of Operations Requirements for SPR Facilities
SPRPMO O 436.1A	Site Sustainability
SPRPMO O 440.2B	Aviation Implementation Plan
SPRPMO O 451.1D	National Environmental Policy Act Implementation Plan
SPRPMO P 451.1E	SPR Environmental Policy
SPRPMO N 450.11	Strategic Petroleum Reserve Environmental, Security, Safety & Health, and Emergency Preparedness Goals FY2011
SPRPMO N 450.4	Implementation of Environmental, Safety and Health Contractor Requirements Documents

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Appendix B

SPR Environmental Policy

U. S. Department of Energy
STRATEGIC PETROLEUM RESERVE PROJECT MANAGEMENT OFFICE
New Orleans, La.

POLICY

SPRPMO P 451.1E

APPROVED: **5/4/16**

SUBJECT: SPR ENVIRONMENTAL POLICY STATEMENT

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1. **PURPOSE AND SCOPE.** This environmental policy applies to the facilities and pipelines that comprise the Strategic Petroleum Reserve (SPR). The mission of SPR is to store petroleum and maintain drawdown readiness. To achieve its mission, the Department of Energy (DOE) and SPR contractors will design, develop, construct, operate, and maintain SPR facilities and operations in a manner that shall be sustainable, resource-efficient, and will protect the quality of the environment consistent with all applicable environmental laws, regulations, and standards. Environmental protection will be integrated at all management levels and into all phases of activity.

   This environmental policy is implemented by SPR top management through an environmental management system (EMS) under an integrated safety management umbrella.

2. **POLICY STATEMENT.** The SPR operates only in an environmentally responsible manner.

   Environmentally responsible manner means that top management pledges all functional levels will:

   a. Comply with applicable Federal, State, and local environmental legal and regulatory, requirements which relate to the environmental aspects of SPR activities;

   b. Prevent pollution by undertaking measures to prevent the generation of wastes, and other residual materials requiring disposal or release to the environment through recycling, reuse, and source reduction. Where the generation of such wastes cannot be avoided, the SPR Project Management Office will take action to reduce their volume and toxicity and ensure proper disposal; and

c. Improve environmental performance continually via the EMS and by establishing and maintaining documented environmental objectives and targets.

This Environmental Policy provides the framework for setting and reviewing environmental objectives and targets that assure excellence in environmental management. Management communicates the Policy to all persons working for, or on behalf of, the SPR. It is available on request at all SPR facilities and electronically on-line at www.spr.doe.gov and www.fluorfpo.com.

The SPR Environmental, Safety and Health Division of Technical Assurance is responsible for prompting the periodic review of this Policy by DOE and Fluor Federal Petroleum Operations top management as well as its update.

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

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Appendix C

GROUND WATER SURVEILLANCE MONITORING

DURING 2017

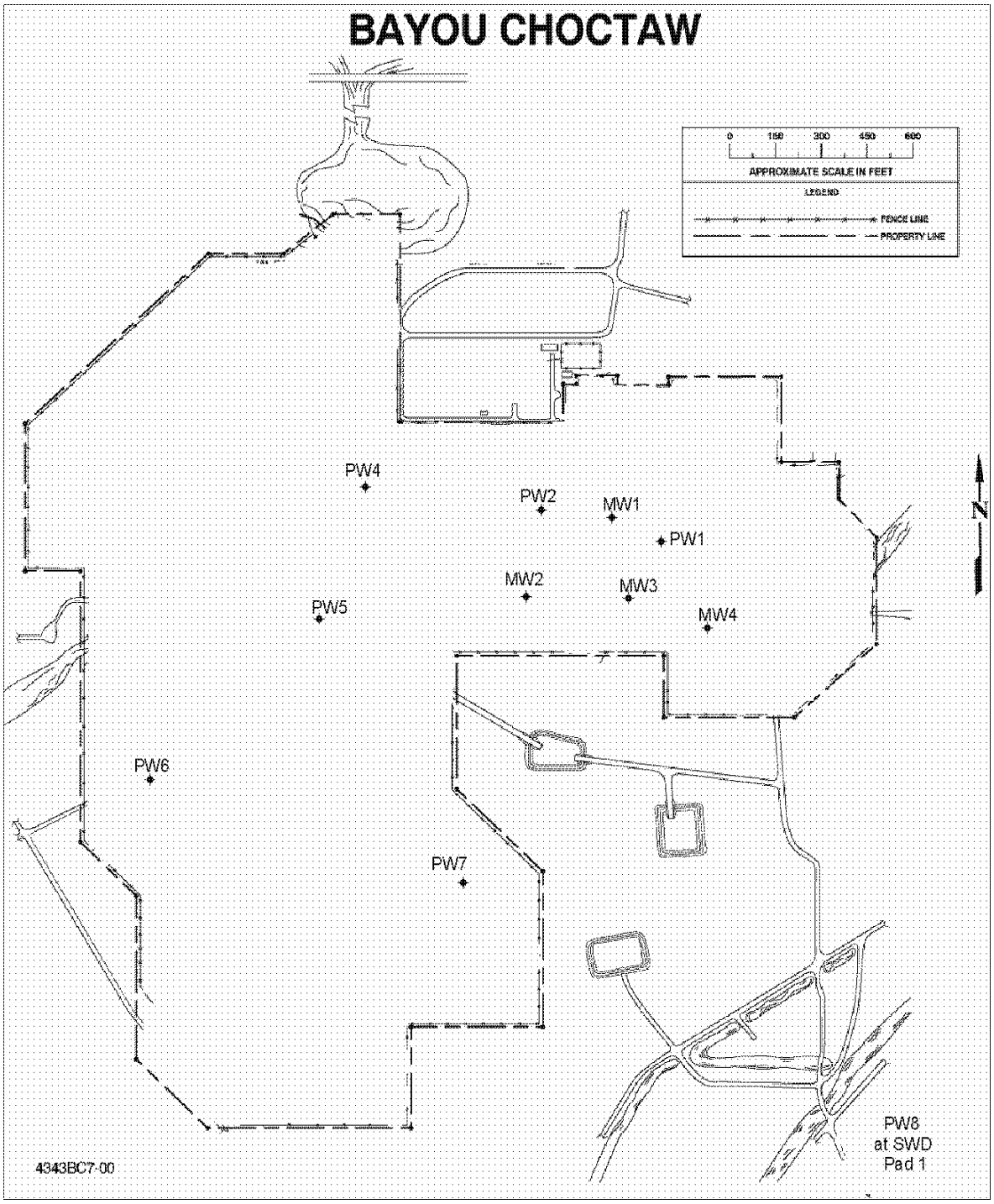


Figure C-1. Bayou Choctaw Ground Water Monitoring Stations

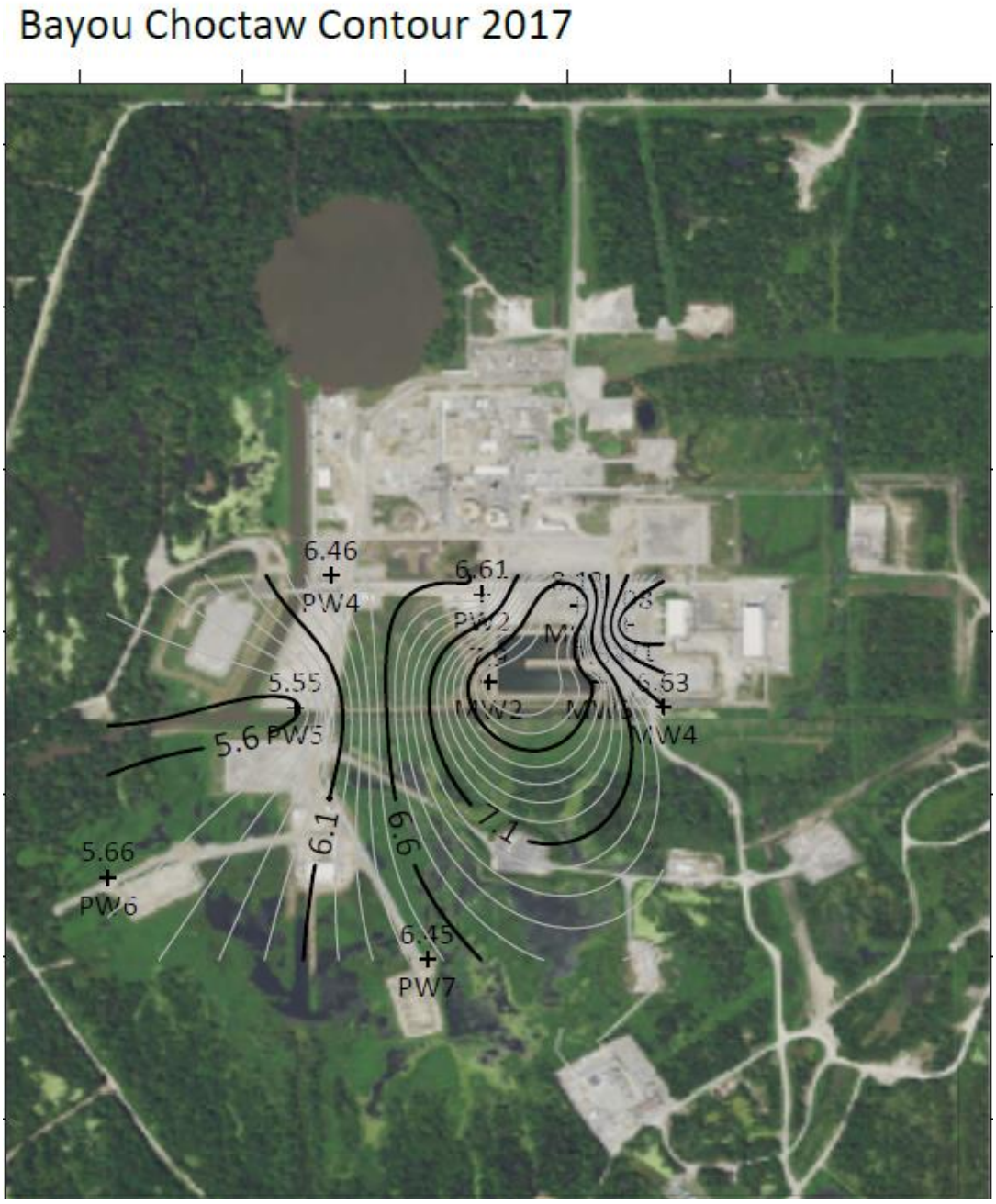
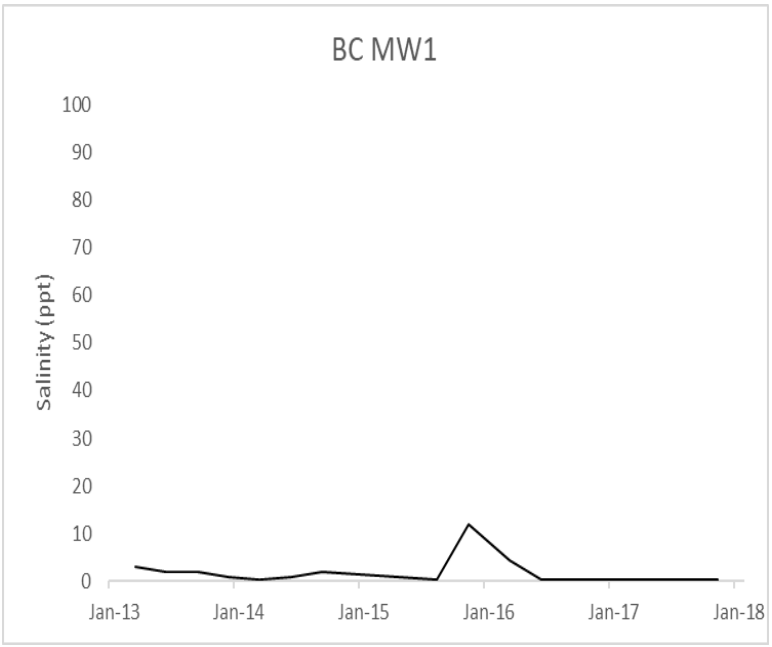


Figure C-2. Bayou Choctaw Ground Water Contoured Elevations June 2017

WELL ID	DATE	SALINITY (PPT)
MW1	Mar-13	3
MW1	Jun-13	2
MW1	Sep-13	2
MW1	Dec-13	1
MW1	Mar-14	0.5
MW1	Jun-14	1
MW1	Sep-14	2
MW1	Aug-15	0.5
MW1	Nov-15	12
MW1	Mar-16	4.4
MW1	Jun-16	0.5
MW1	Sep-16	0.5
MW1	Dec-16	0.5
MW1	Mar-17	0.5
MW1	Jun-17	0.5
MW1	Sep-17	0.5
MW1	Nov-17	0.5
	Average	**1.88**
MW2	Mar-13	2
MW2	Jun-13	1
MW2	Sep-13	3
MW2	Dec-13	2
MW2	Mar-14	3
MW2	Jun-14	2
MW2	Sep-14	0.5
MW2	Aug-15	0.5
MW2	Nov-15	11
MW2	Mar-16	0.5
MW2	Jun-16	0.5
MW2	Sep-16	0.5
MW2	Dec-16	0.5
MW2	Mar-17	0.5
MW2	Jun-17	0.5
MW2	Sep-17	0.5
MW2	Nov-17	0.5
	Average	**1.71**



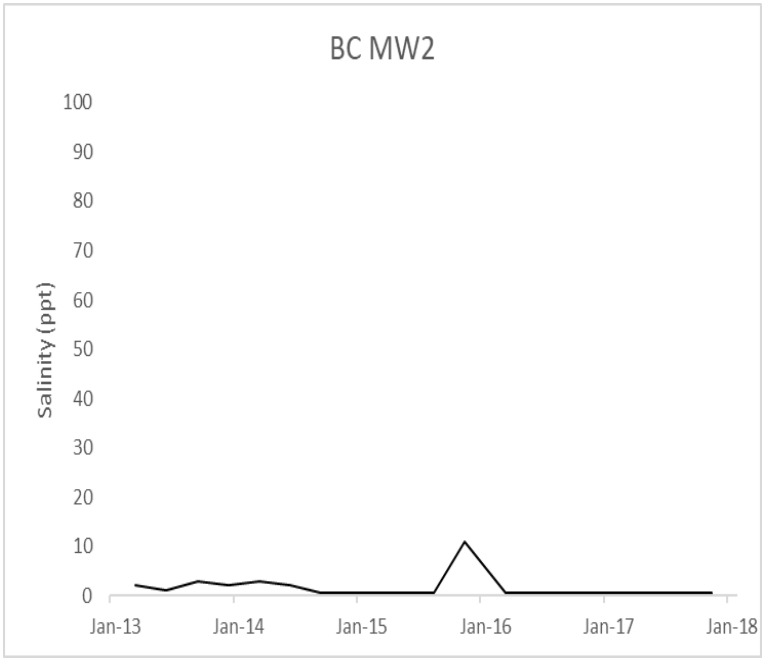
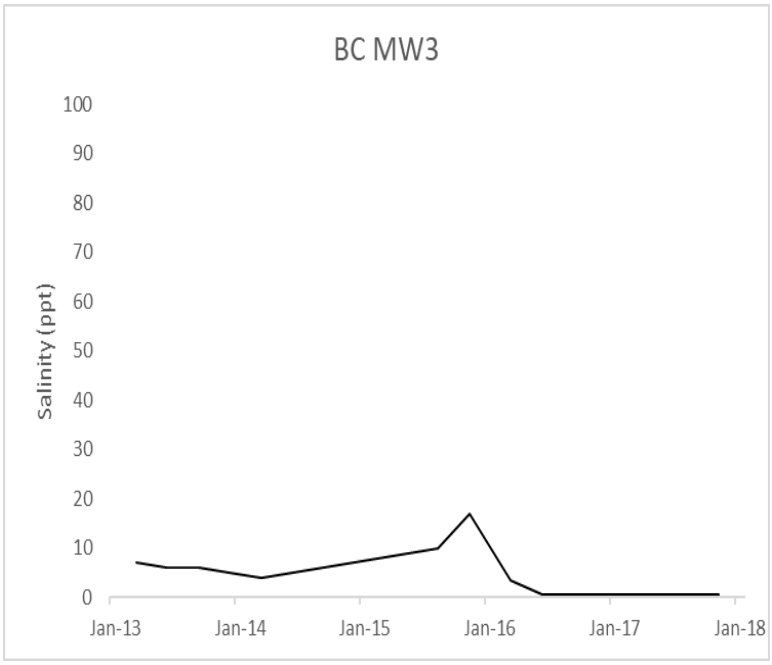


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

MW3	Mar-13	7
MW3	Jun-13	6
MW3	Sep-13	6
MW3	Dec-13	5
MW3	Mar-14	4
MW3	Jun-14	5
MW3	Sep-14	6
MW3	Aug-15	10
MW3	Nov-15	17
MW3	Mar-16	3.4
MW3	Jun-16	0.5
MW3	Sep-16	0.5
MW3	Dec-16	0.5
MW3	Mar-17	0.5
MW3	Jun-17	0.5
MW3	Sep-17	0.5
MW3	Nov-17	0.5
	Average	**4.29**



MW4	Mar-13	8
MW4	Jun-13	6
MW4	Sep-13	7
MW4	Dec-13	7
MW4	Mar-14	6
MW4	Jun-14	5
MW4	Sep-14	6
MW4	Aug-15	20
MW4	Nov-15	28
MW4	Mar-16	15.4
MW4	Jun-16	0.5
MW4	Sep-16	0.5
MW4	Dec-16	0.5
MW4	Mar-17	0.5
MW4	Jun-17	0.5
MW4	Sep-17	0.5
MW4	Nov-17	0.5
	Average	**6.58**

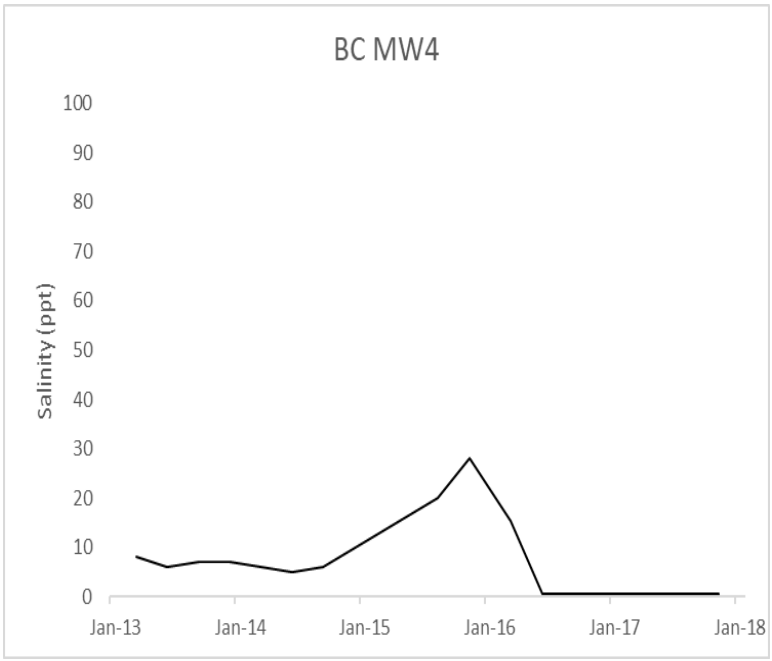
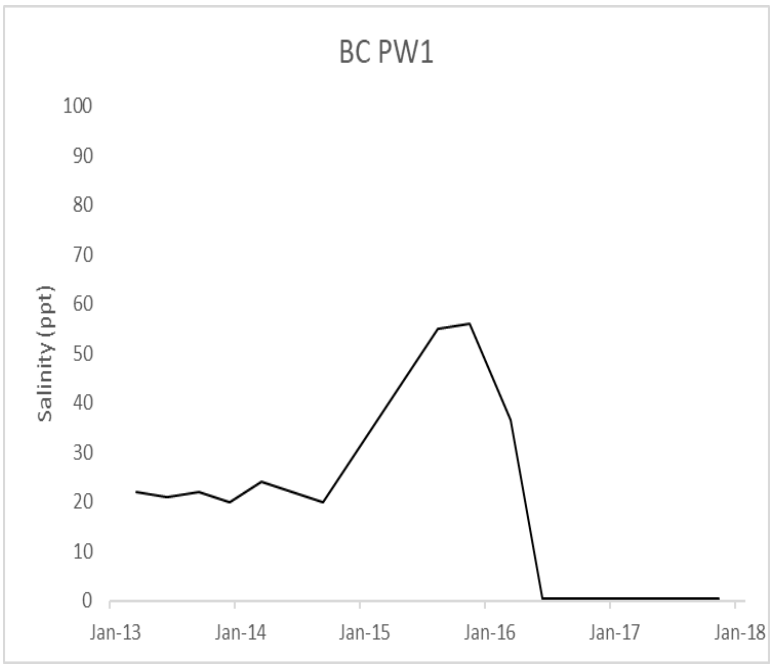


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW1	Mar-13	22
PW1	Jun-13	21
PW1	Sep-13	22
PW1	Dec-13	20
PW1	Mar-14	24
PW1	Jun-14	22
PW1	Sep-14	20
PW1	Aug-15	55
PW1	Nov-15	56
PW1	Mar-16	36.6
PW1	Jun-16	0.5
PW1	Sep-16	0.5
PW1	Dec-16	0.5
PW1	Mar-17	0.5
PW1	Jun-17	0.5
PW1	Sep-17	0.5
PW1	Nov-17	0.5
	Average	**17.77**



PW2	Mar-13	39
PW2	Jun-13	35
PW2	Sep-13	39
PW2	Dec-13	36
PW2	Mar-14	31
PW2	Jun-14	29
PW2	Sep-14	34
PW2	Aug-15	55
PW2	Nov-15	56
PW2	Mar-16	4
PW2	Jun-16	0.5
PW2	Sep-16	0.5
PW2	Dec-16	0.5
PW2	Mar-17	0.5
PW2	Jun-17	0.5
PW2	Sep-17	0.5
PW2	Nov-17	0.5
	Average	**21.26**

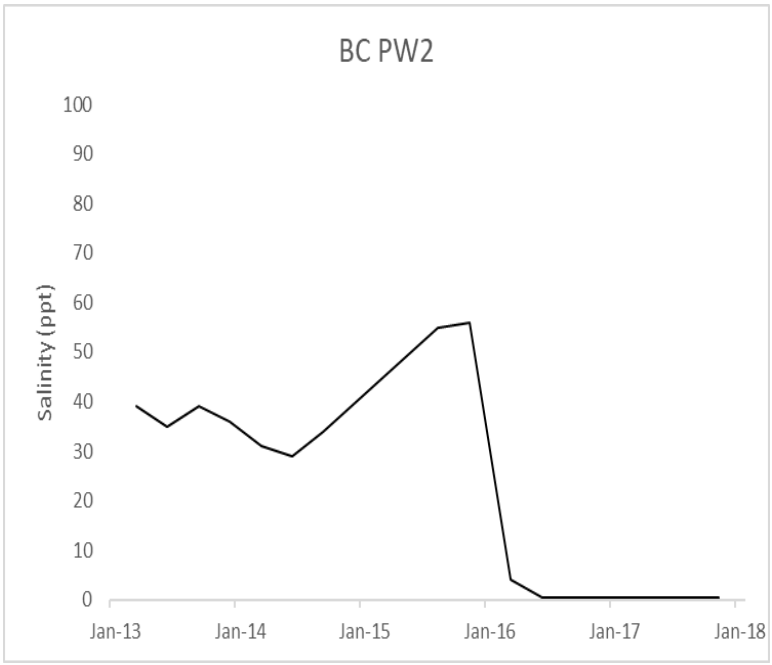
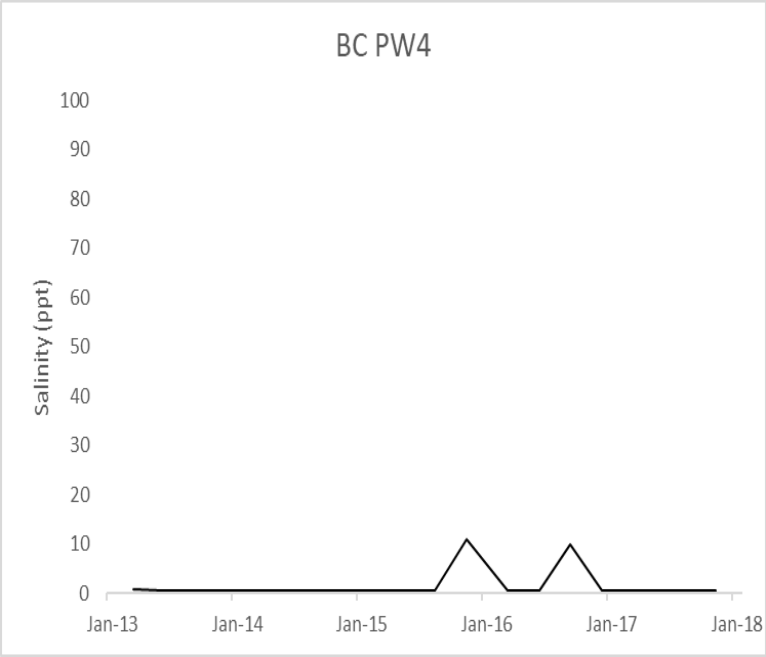


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW4	Mar-13	1
PW4	Jun-13	0.5
PW4	Sep-13	0.5
PW4	Dec-13	0.5
PW4	Mar-14	0.5
PW4	Jun-14	0.5
PW4	Sep-14	0.5
PW4	Aug-15	0.5
PW4	Nov-15	11
PW4	Mar-16	0.5
PW4	Jun-16	0.5
PW4	Sep-16	10
PW4	Dec-16	0.5
PW4	Mar-17	0.5
PW4	Jun-17	0.5
PW4	Sep-17	0.5
PW4	Nov-17	0.5
	Average	**1.71**



PW5	Mar-13	25
PW5	Jun-13	22
PW5	Sep-13	29
PW5	Dec-13	30
PW5	Mar-14	36
PW5	Jun-14	35
PW5	Sep-14	20
PW5	Aug-15	20
PW5	Nov-15	35
PW5	Mar-16	16.6
PW5	Jun-16	0.5
PW5	Sep-16	10
PW5	Mar-17	0.5
PW5	Jun-17	0.5
PW5	Sep-17	0.5
PW5	Nov-17	0.5
	Average	**17.57**

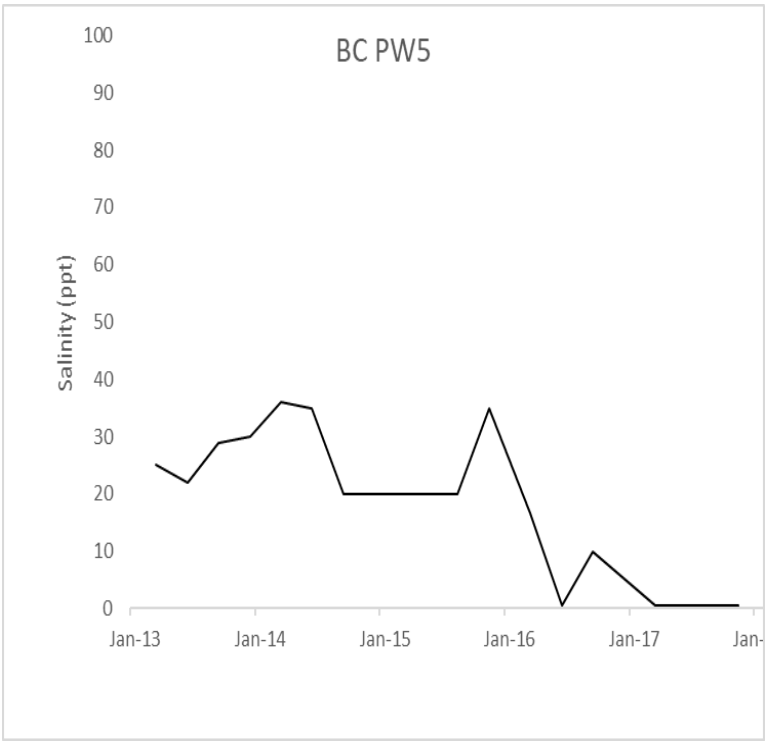
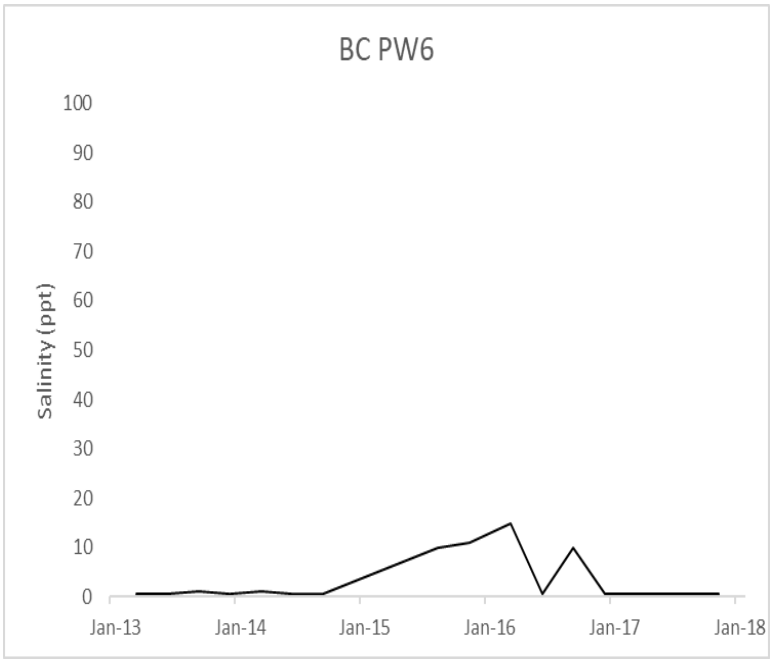


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW6	Mar-13	0.5
PW6	Jun-13	0.5
PW6	Sep-13	1
PW6	Dec-13	0.5
PW6	Mar-14	1
PW6	Jun-14	0.5
PW6	Sep-14	0.5
PW6	Aug-15	10
PW6	Nov-15	11
PW6	Mar-16	14.8
PW6	Jun-16	0.5
PW6	Sep-16	10
PW6	Dec-16	0.5
PW6	Mar-17	0.5
PW6	Jun-17	0.5
PW6	Sep-17	0.5
PW6	Nov-17	0.5
	Average	**3.14**



PW7	Mar-13	32
PW7	Jun-13	30
PW7	Sep-13	31
PW7	Dec-13	27
PW7	Mar-14	25
PW7	Jun-14	22
PW7	Sep-14	31
PW7	Aug-15	65
PW7	Nov-15	47
PW7	Mar-16	0.5
PW7	Jun-16	0.5
PW7	Sep-16	0.5
PW7	Dec-16	0.5
PW7	Mar-17	0.5
PW7	Jun-17	0.5
PW7	Sep-17	0.5
PW7	Nov-17	0.5
	Average	**18.47**

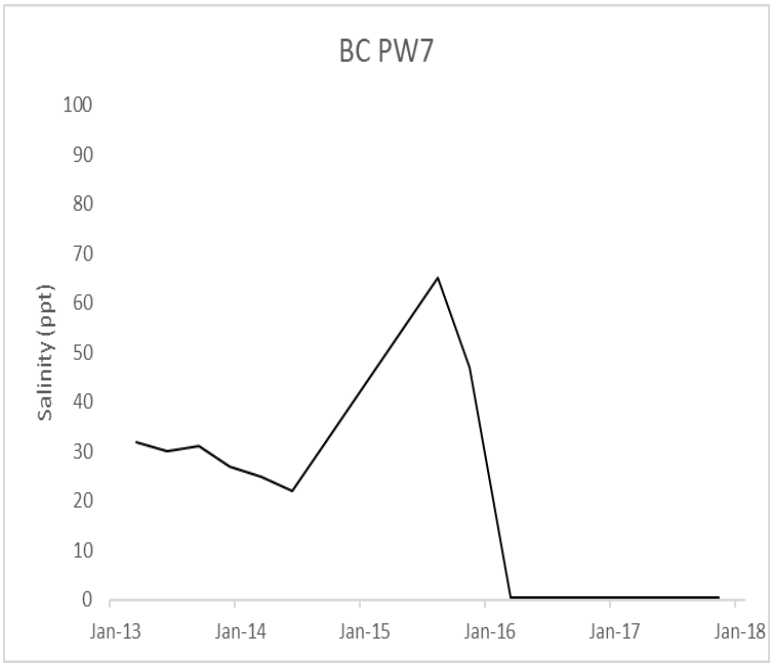


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

PW8	Mar-13	16
PW8	Jun-13	14
PW8	Sep-13	18
PW8	Dec-13	16
PW8	Mar-14	17
PW8	Jun-14	16
PW8	Sep-14	15
PW8	Aug-15	25
PW8	Nov-15	30
PW8	Mar-16	5.7
PW8	Jun-16	0.5
PW8	Sep-16	0.5
PW8	Dec-16	0.5
PW8	Mar-17	0.5
PW8	Jun-17	0.5
PW8	Sep-17	0.5
PW8	Nov-17	0.5
	Average	**10.36**

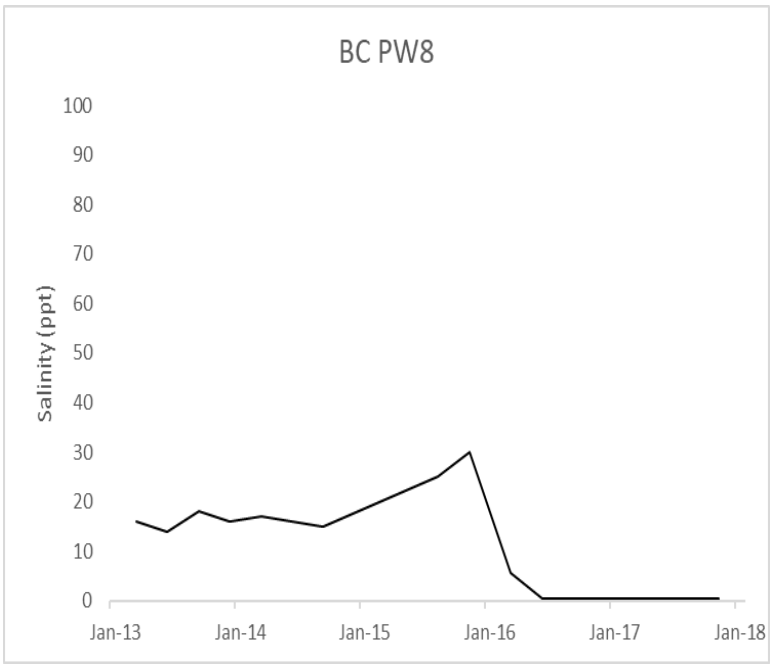


Figure C-3. Bayou Choctaw Ground Water Monitoring Well Salinities

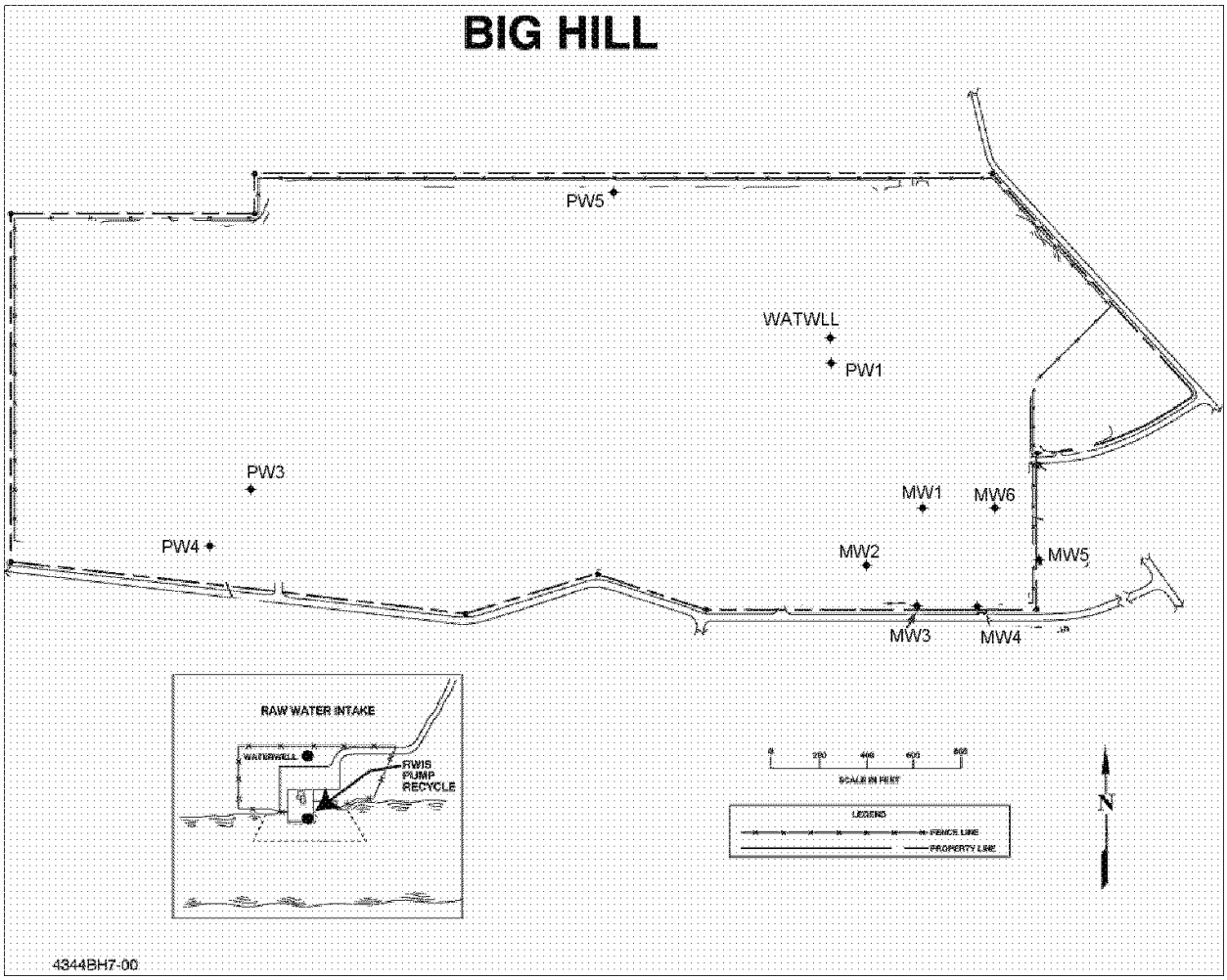


Figure C-4. Big Hill Ground Water Monitoring Stations

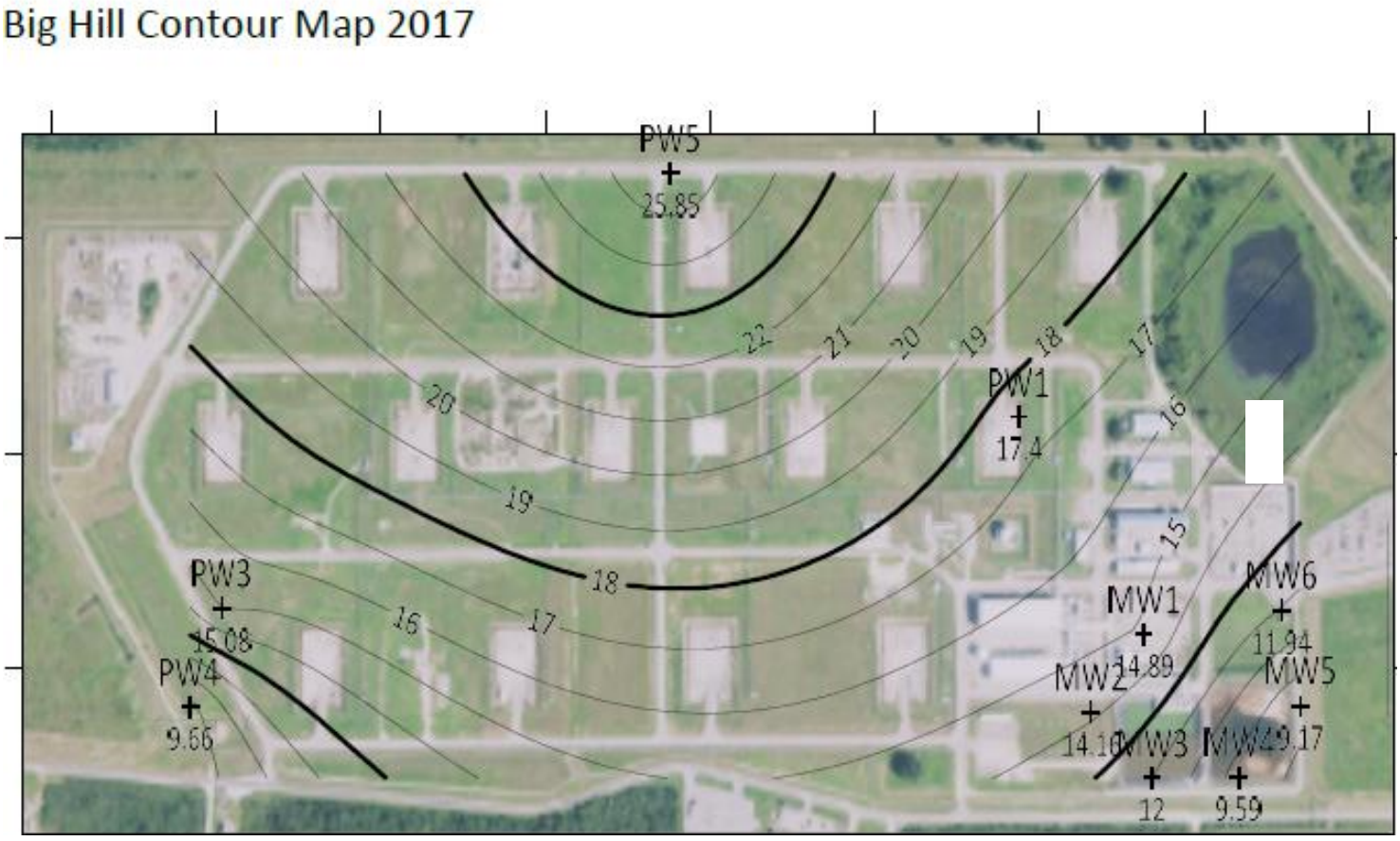
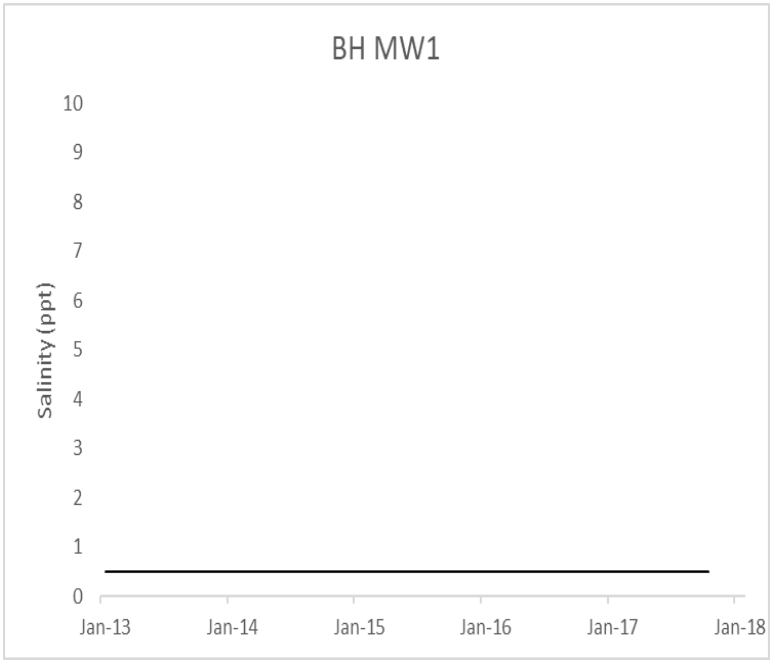


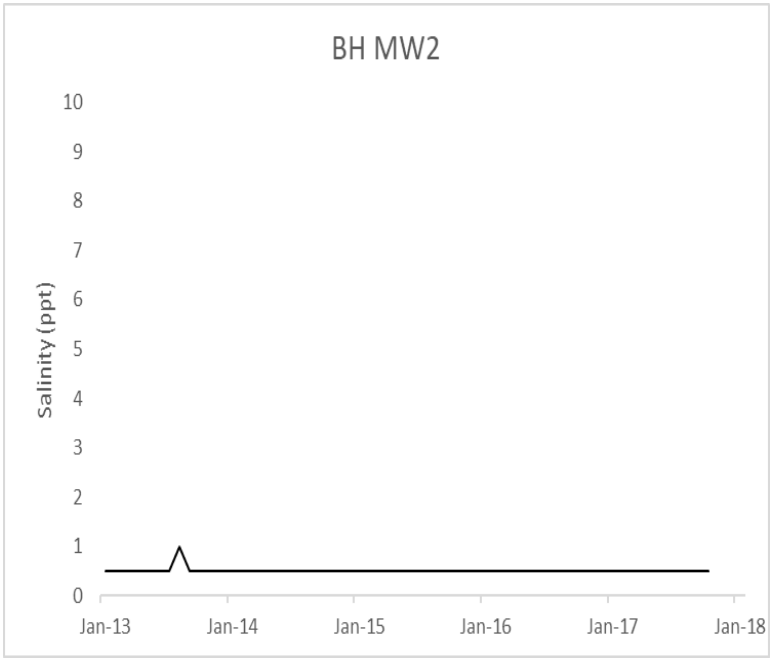
Figure C-5. Big Hill Ground Water Contoured Elevations July 2017

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



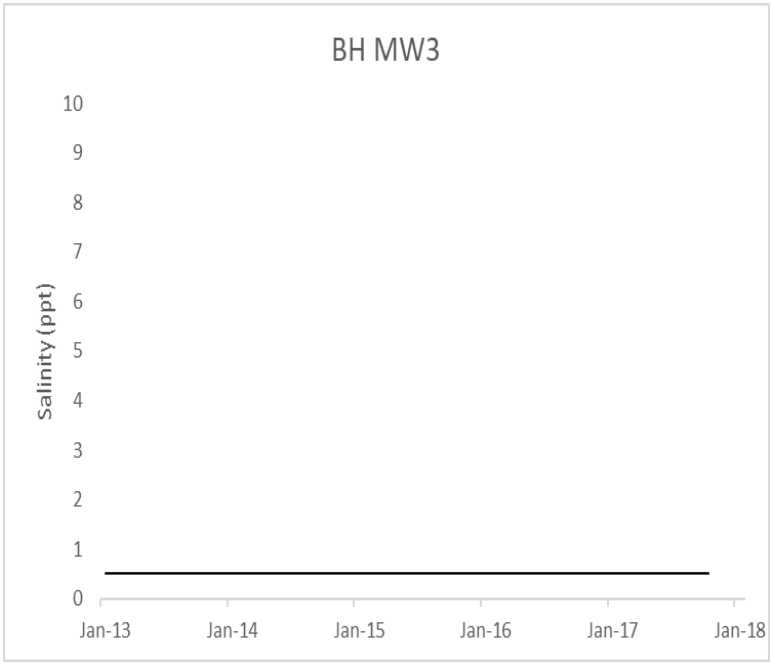
MW1	Jan-13	0.5
MW1	Feb-13	0.5
MW1	Mar-13	0.5
MW1	Mar-13	0.5
MW1	Apr-13	0.5
MW1	May-13	0.5
MW1	Jun-13	0.5
MW1	Jul-13	0.5
MW1	Aug-13	0.5
MW1	Sep-13	0.5
MW1	Oct-13	0.5
MW1	Nov-13	0.5
MW1	Dec-13	0.5
MW1	Jan-14	0.5
MW1	Feb-14	0.5
MW1	Mar-14	0.5
MW1	Apr-14	0.5
MW1	May-14	0.5
MW1	Jun-14	0.5
MW1	Jul-14	0.5
MW1	Aug-14	0.5
MW1	Sep-14	0.5
MW1	Oct-14	0.5
MW1	Nov-14	0.5
MW1	Dec-14	0.5
MW1	Jan-15	0.5
MW1	Feb-15	0.5
MW1	Mar-15	0.5
MW1	Apr-15	0.5
MW1	May-15	0.5
MW1	Jun-15	0.5
MW1	Jul-15	0.5
MW1	Aug-15	0.5
MW1	Sep-15	0.5
MW1	Oct-15	0.5
MW1	Nov-15	0.5
MW1	Dec-15	0.5
MW1	Jan-16	0.5
MW1	Feb-16	0.5
MW1	Mar-16	0.5
MW1	Apr-16	0.5
MW1	May-16	0.5
MW1	Jun-16	0.5
MW1	Jul-16	0.5
MW1	Aug-16	0.5
MW1	Sep-16	0.5
MW1	Oct-16	0.5
MW1	Nov-16	0.5
MW1	Dec-16	0.5
MW1	Jan-17	0.5
MW1	Feb-17	0.5
MW1	Mar-17	0.5
MW1	Jun-17	0.5
MW1	Jul-17	0.5
MW1	Aug-17	0.5
MW1	Sep-17	0.5
MW1	Oct-17	0.5
	Average	**0.5**

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



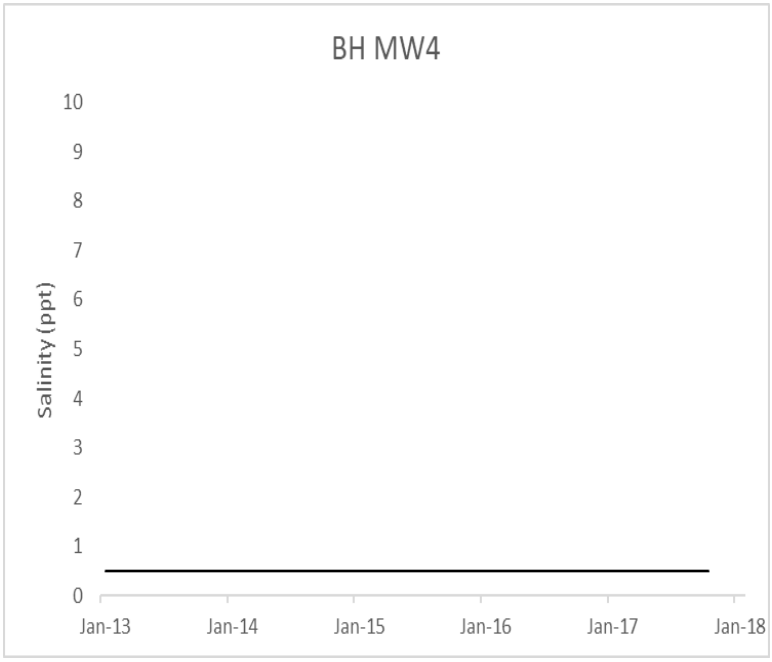
MW2	Jan-13	0.5
MW2	Feb-13	0.5
MW2	Mar-13	0.5
MW2	Apr-13	0.5
MW2	May-13	0.5
MW2	Jun-13	0.5
MW2	Jul-13	0.5
MW2	Aug-13	1
MW2	Sep-13	0.5
MW2	Oct-13	0.5
MW2	Nov-13	0.5
MW2	Dec-13	0.5
MW2	Jan-14	0.5
MW2	Feb-14	0.5
MW2	Mar-14	0.5
MW2	Apr-14	0.5
MW2	May-14	0.5
MW2	Jun-14	0.5
MW2	Jul-14	0.5
MW2	Aug-14	0.5
MW2	Sep-14	0.5
MW2	Oct-14	0.5
MW2	Nov-14	0.5
MW2	Dec-14	0.5
MW2	Jan-15	0.5
MW2	Feb-15	0.5
MW2	Mar-15	0.5
MW2	Apr-15	0.5
MW2	May-15	0.5
MW2	Jun-15	0.5
MW2	Jul-15	0.5
MW2	Aug-15	0.5
MW2	Sep-15	0.5
MW2	Oct-15	0.5
MW2	Nov-15	0.5
MW2	Dec-15	0.5
MW2	Jan-16	0.5
MW2	Feb-16	0.5
MW2	Mar-16	0.5
MW2	Apr-16	0.5
MW2	May-16	0.5
MW2	Jun-16	0.5
MW2	Jul-16	0.5
MW2	Aug-16	0.5
MW2	Sep-16	0.5
MW2	Oct-16	0.5
MW2	Nov-16	0.5
MW2	Dec-16	0.5
MW2	Jan-17	0.5
MW2	Feb-17	0.5
MW2	Mar-17	0.5
MW2	Jun-17	0.5
MW2	Jul-17	0.5
MW2	Aug-17	0.5
MW2	Sep-17	0.5
MW2	Oct-17	0.5
	Average	**0.51**

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



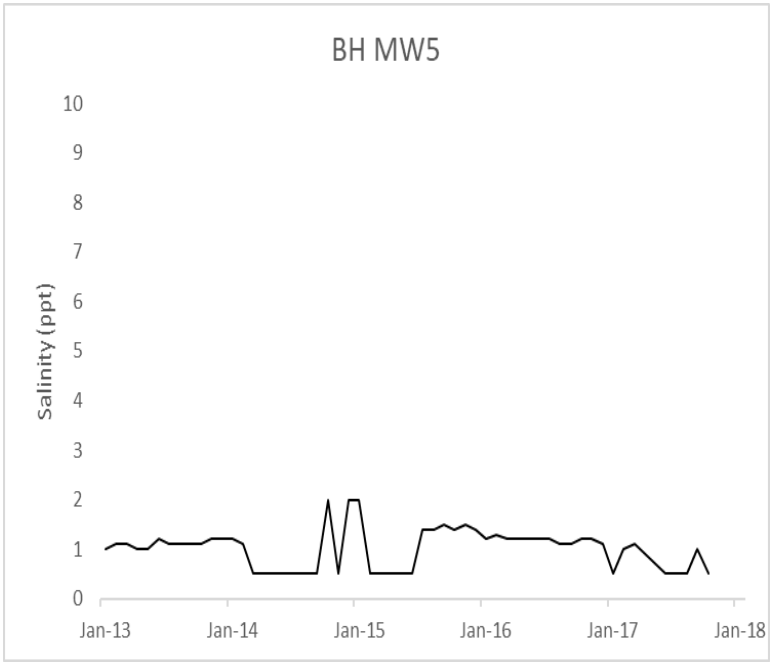
MW3	Jan-13	0.5
MW3	Feb-13	0.5
MW3	Mar-13	0.5
MW3	Apr-13	0.5
MW3	May-13	0.5
MW3	Jun-13	0.5
MW3	Jul-13	0.5
MW3	Aug-13	0.5
MW3	Sep-13	0.5
MW3	Oct-13	0.5
MW3	Nov-13	0.5
MW3	Dec-13	0.5
MW3	Jan-14	0.5
MW3	Feb-14	0.5
MW3	Mar-14	0.5
MW3	Apr-14	0.5
MW3	May-14	0.5
MW3	Jun-14	0.5
MW3	Jul-14	0.5
MW3	Aug-14	0.5
MW3	Sep-14	0.5
MW3	Oct-14	0.5
MW3	Nov-14	0.5
MW3	Dec-14	0.5
MW3	Jan-15	0.5
MW3	Feb-15	0.5
MW3	Mar-15	0.5
MW3	Apr-15	0.5
MW3	May-15	0.5
MW3	Jun-15	0.5
MW3	Jul-15	0.5
MW3	Aug-15	0.5
MW3	Sep-15	0.5
MW3	Oct-15	0.5
MW3	Nov-15	0.5
MW3	Dec-15	0.5
MW3	Jan-16	0.5
MW3	Feb-16	0.5
MW3	Mar-16	0.5
MW3	Apr-16	0.5
MW3	May-16	0.5
MW3	Jun-16	0.5
MW3	Jul-16	0.5
MW3	Aug-16	0.5
MW3	Sep-16	0.5
MW3	Oct-16	0.5
MW3	Nov-16	0.5
MW3	Dec-16	0.5
MW3	Jan-17	0.5
MW3	Feb-17	0.5
MW3	Mar-17	0.5
MW3	Jun-17	0.5
MW3	Jul-17	0.5
MW3	Aug-17	0.5
MW3	Sep-17	0.5
MW3	Oct-17	0.5
	Average	**0.5**

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



MW4	Jan-13	0.5
MW4	Feb-13	0.5
MW4	Mar-13	0.5
MW4	Apr-13	0.5
MW4	May-13	0.5
MW4	Jun-13	0.5
MW4	Jul-13	0.5
MW4	Aug-13	0.5
MW4	Sep-13	0.5
MW4	Oct-13	0.5
MW4	Nov-13	0.5
MW4	Dec-13	0.5
MW4	Jan-14	0.5
MW4	Feb-14	0.5
MW4	Mar-14	0.5
MW4	Apr-14	0.5
MW4	May-14	0.5
MW4	Jun-14	0.5
MW4	Jul-14	0.5
MW4	Aug-14	0.5
MW4	Sep-14	0.5
MW4	Oct-14	0.5
MW4	Nov-14	0.5
MW4	Dec-14	0.5
MW4	Jan-15	0.5
MW4	Feb-15	0.5
MW4	Mar-15	0.5
MW4	Apr-15	0.5
MW4	May-15	0.5
MW4	Jun-15	0.5
MW4	Jul-15	0.5
MW4	Aug-15	0.5
MW4	Sep-15	0.5
MW4	Oct-15	0.5
MW4	Nov-15	0.5
MW4	Dec-15	0.5
MW4	Jan-16	0.5
MW4	Feb-16	0.5
MW4	Mar-16	0.5
MW4	Apr-16	0.5
MW4	May-16	0.5
MW4	Jun-16	0.5
MW4	Jul-16	0.5
MW4	Aug-16	0.5
MW4	Sep-16	0.5
MW4	Oct-16	0.5
MW4	Nov-16	0.5
MW4	Dec-16	0.5
MW4	Jan-17	0.5
MW4	Feb-17	0.5
MW4	Mar-17	0.5
MW4	Jun-17	0.5
MW4	Jul-17	0.5
MW4	Aug-17	0.5
MW4	Sep-17	0.5
MW4	Oct-17	0.5
	Average	**0.5**

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



MW5	Jan-13	1
MW5	Feb-13	1.1
MW5	Mar-13	1.1
MW5	Apr-13	1
MW5	May-13	1
MW5	Jun-13	1.2
MW5	Jul-13	1.1
MW5	Aug-13	1.1
MW5	Sep-13	1.1
MW5	Oct-13	1.1
MW5	Nov-13	1.2
MW5	Dec-13	1.2
MW5	Jan-14	1.2
MW5	Feb-14	1.1
MW5	Mar-14	0.5
MW5	Apr-14	0.5
MW5	May-14	0.5
MW5	Jun-14	0.5
MW5	Jul-14	0.5
MW5	Aug-14	0.5
MW5	Sep-14	0.5
MW5	Oct-14	2
MW5	Nov-14	0.5
MW5	Dec-14	2
MW5	Jan-15	2
MW5	Feb-15	0.5
MW5	Mar-15	0.5
MW5	Apr-15	0.5
MW5	May-15	0.5
MW5	Jun-15	0.5
MW5	Jul-15	1.4
MW5	Aug-15	1.4
MW5	Sep-15	1.5
MW5	Oct-15	1.4
MW5	Nov-15	1.5
MW5	Dec-15	1.4
MW5	Jan-16	1.2
MW5	Feb-16	1.3
MW5	Mar-16	1.2
MW5	Apr-16	1.2
MW5	May-16	1.2
MW5	Jun-16	1.2
MW5	Jul-16	1.2
MW5	Aug-16	1.1
MW5	Sep-16	1.1
MW5	Oct-16	1.2
MW5	Nov-16	1.2
MW5	Dec-16	1.1
MW5	Jan-17	0.5
MW5	Feb-17	1
MW5	Mar-17	1.1
MW5	Jun-17	0.5
MW5	Jul-17	0.5
MW5	Aug-17	0.5
MW5	Sep-17	1
MW5	Oct-17	0.5
	Average	**1.01**

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

MW6	Jan-13	0.5
MW6	Feb-13	0.5
MW6	Mar-13	0.5
MW6	Apr-13	0.5
MW6	May-13	0.5
MW6	Jun-13	0.5
MW6	Jul-13	0.5
MW6	Aug-13	0.5
MW6	Sep-13	0.5
MW6	Oct-13	0.5
MW6	Nov-13	0.5
MW6	Dec-13	0.5
MW6	Jan-14	0.5
MW6	Feb-14	0.5
MW6	Mar-14	0.5
MW6	Apr-14	0.5
MW6	May-14	0.5
MW6	Jun-14	0.5
MW6	Jul-14	0.5
MW6	Aug-14	0.5
MW6	Sep-14	0.5
MW6	Oct-14	0.5
MW6	Nov-14	0.5
MW6	Dec-14	0.5
MW6	Jan-15	0.5
MW6	Feb-15	0.5
MW6	Mar-15	0.5
MW6	Apr-15	0.5
MW6	May-15	0.5
MW6	Jun-15	0.5
MW6	Jul-15	0.5
MW6	Aug-15	0.5
MW6	Sep-15	0.5
MW6	Oct-15	0.5
MW6	Nov-15	0.5
MW6	Dec-15	0.5
MW6	Jan-16	0.5
MW6	Feb-16	0.5
MW6	Mar-16	0.5
MW6	Apr-16	0.5
MW6	May-16	0.5
MW6	Jun-16	0.5
MW6	Jul-16	0.5
MW6	Aug-16	0.5
MW6	Sep-16	0.5
MW6	Oct-16	0.5
MW6	Nov-16	0.5
MW6	Dec-16	0.5
MW6	Jan-17	0.5
MW6	Feb-17	0.5
MW6	Mar-17	0.5
MW6	Jun-17	0.5
MW6	Jul-17	0.5
MW6	Aug-17	0.5
MW6	Sep-17	0.5
MW6	Oct-17	0.5
	Average	**0.5**

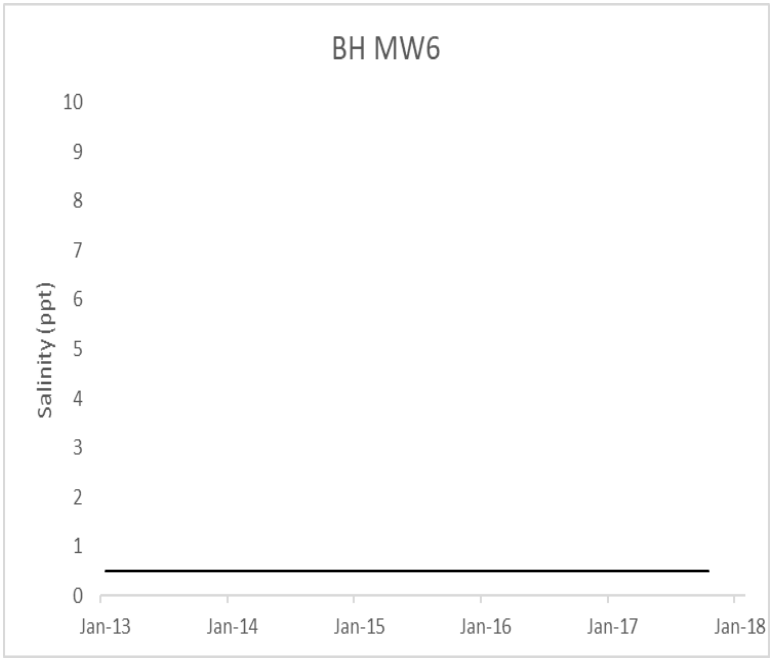
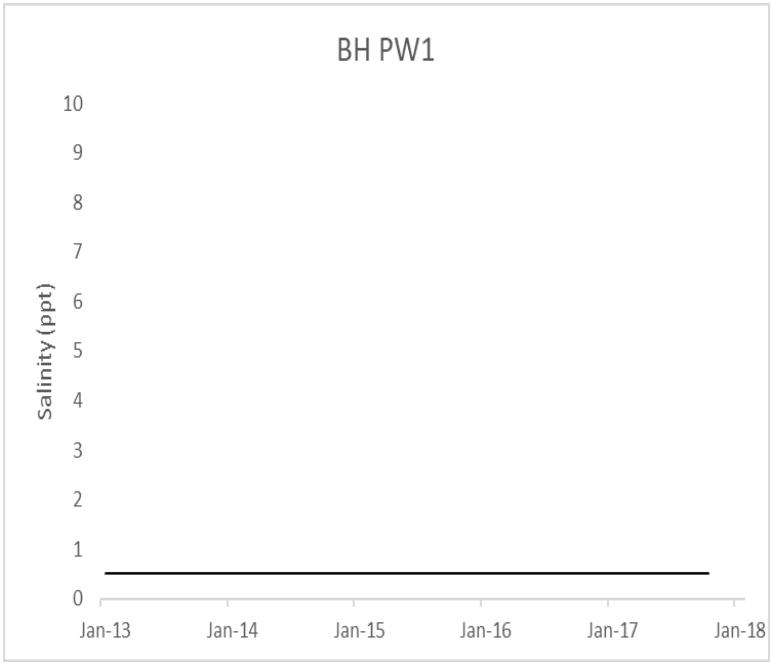


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

PW1	Jan-13	0.5
PW1	Apr-13	0.5
PW1	Oct-13	0.5
PW1	Jan-14	0.5
PW1	Apr-14	0.5
PW1	Jul-14	0.5
PW1	Oct-14	0.5
PW1	Jan-15	0.5
PW1	Apr-15	0.5
PW1	Jul-15	0.5
PW1	Oct-15	0.5
PW1	Jan-16	0.5
PW1	Apr-16	0.5
PW1	Jul-16	0.5
PW1	Oct-16	0.5
PW1	Jul-17	0.5
PW1	Oct-17	0.5
	Average	**0.5**



PW3	Jan-13	0.5
PW3	Apr-13	0.5
PW3	Oct-13	0.5
PW3	Apr-14	0.5
PW3	Jul-14	0.5
PW3	Oct-14	0.5
PW3	Jan-15	0.5
PW3	Apr-15	0.5
PW3	Jul-15	0.5
PW3	Oct-15	0.5
PW3	Jan-16	0.5
PW3	Apr-16	0.5
PW3	Jul-16	0.5
PW3	Oct-16	0.5
PW3	Jan-17	0.5
PW3	Jul-17	0.5
PW3	Oct-17	0.5
	Average	**0.5**

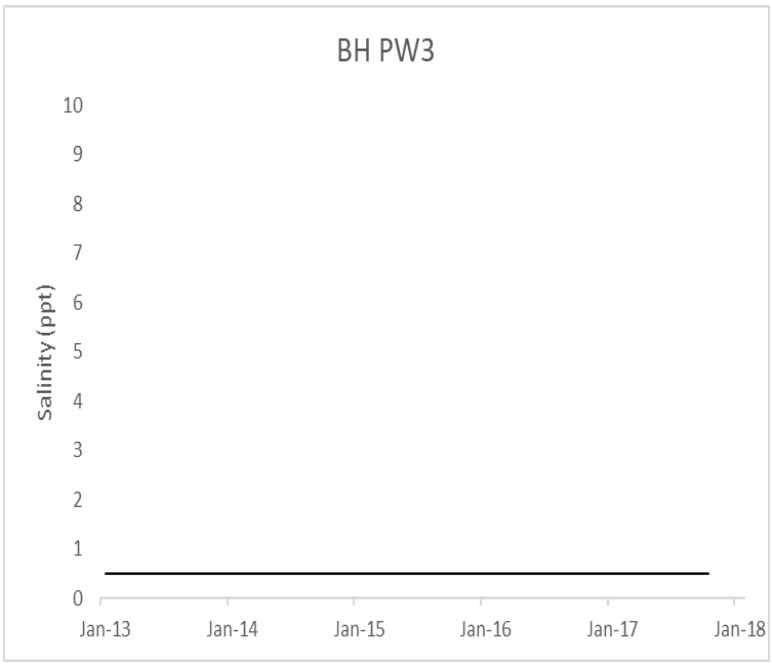
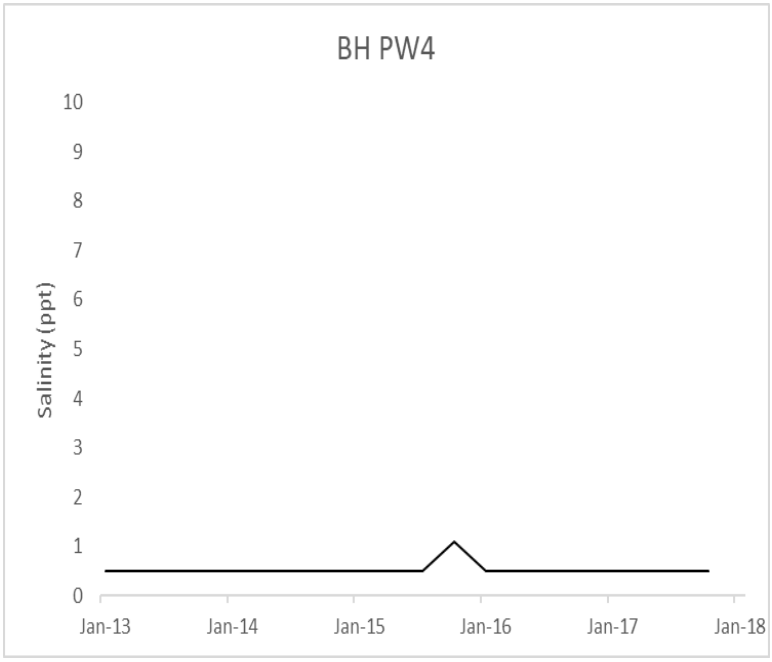
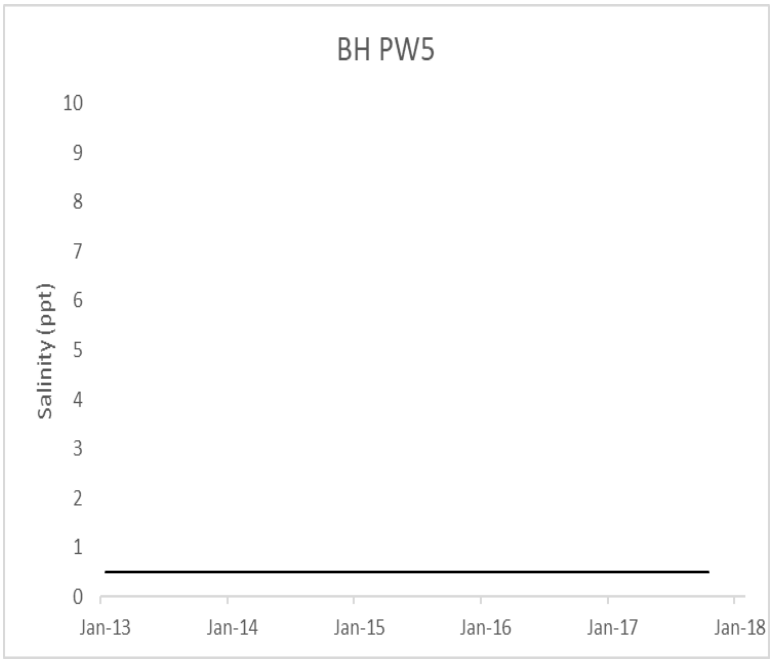


Figure C-6. Big Hill Ground Water Monitoring Well Salinities

PW4	Jan-13	0.5
PW4	Apr-13	0.5
PW4	Oct-13	0.5
PW4	Jan-14	0.5
PW4	Apr-14	0.5
PW4	Jul-14	0.5
PW4	Oct-14	0.5
PW4	Jan-15	0.5
PW4	Apr-15	0.5
PW4	Jul-15	0.5
PW4	Oct-15	1.1
PW4	Jan-16	0.5
PW4	Apr-16	0.5
PW4	Jul-16	0.5
PW4	Oct-16	0.5
PW4	Jan-17	0.5
PW4	Jul-17	0.5
PW4	Oct-17	0.5
	Average	**0.53**



PW5	Jan-13	0.5
PW5	Apr-13	0.5
PW5	Oct-13	0.5
PW5	Jan-14	0.5
PW5	Apr-14	0.5
PW5	Jul-14	0.5
PW5	Oct-14	0.5
PW5	Jan-15	0.5
PW5	Apr-15	0.5
PW5	Jul-15	0.5
PW5	Oct-15	0.5
PW5	Jan-16	0.5
PW5	Apr-16	0.5
PW5	Jul-16	0.5
PW5	Oct-16	0.5
PW5	Jan-17	0.5
PW5	Jul-17	0.5
PW5	Oct-17	0.5
	Average	**0.5**



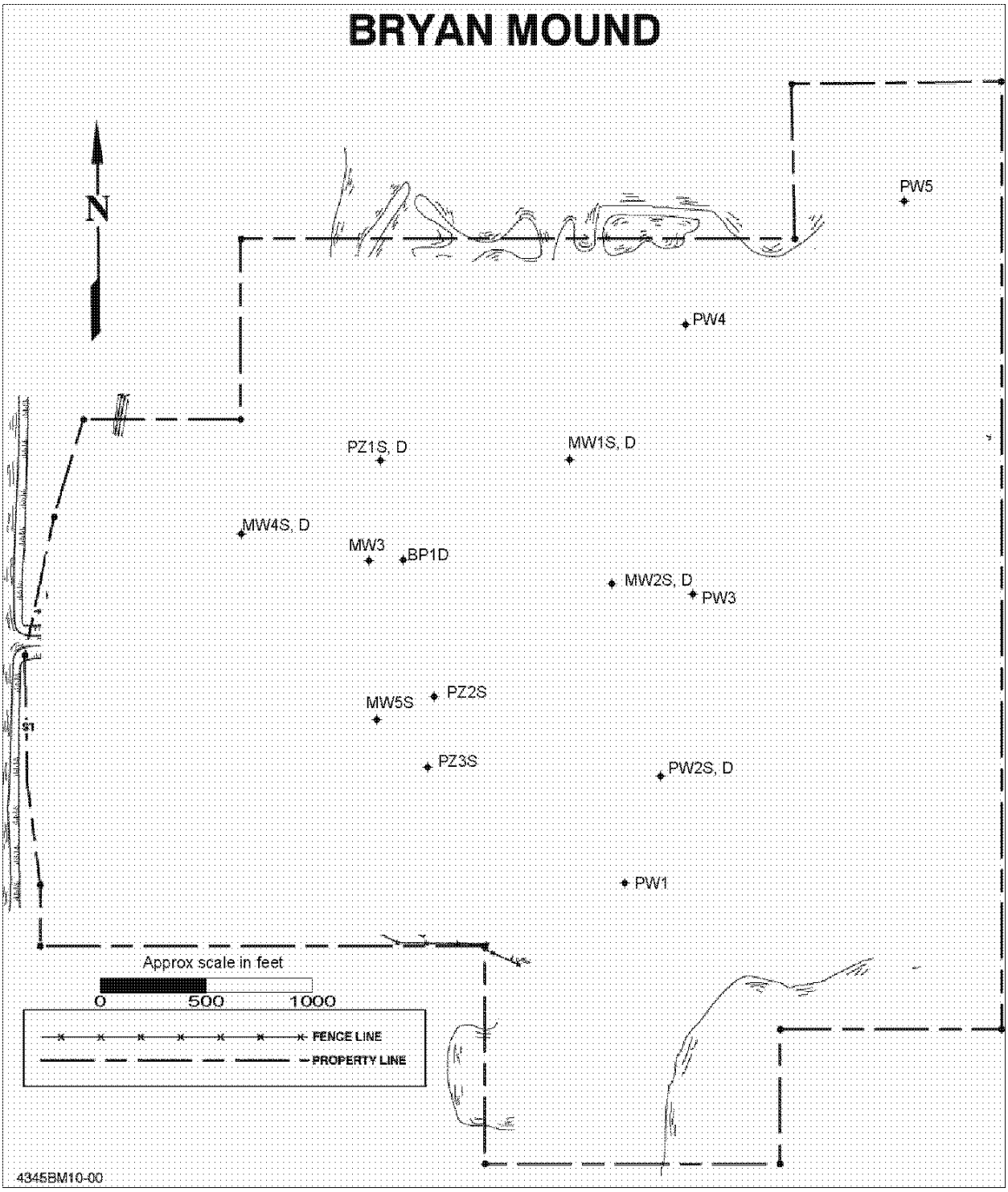


Figure C-7. Bryan Mound Ground Water Monitoring Stations, Deep and Shallow

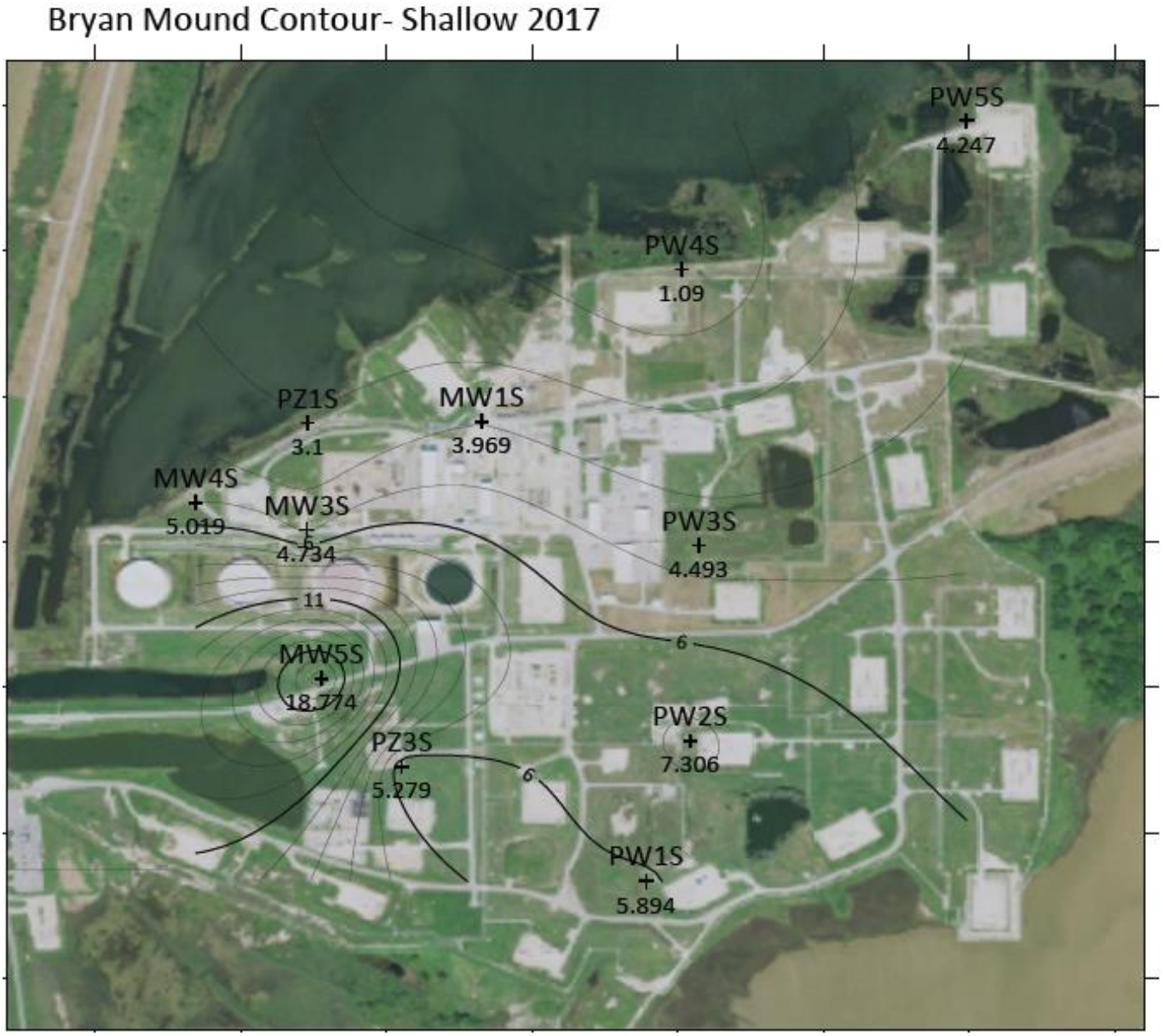


Figure C-8. Bryan Mound Shallow Ground Water Zone Contoured Elevations September 2017

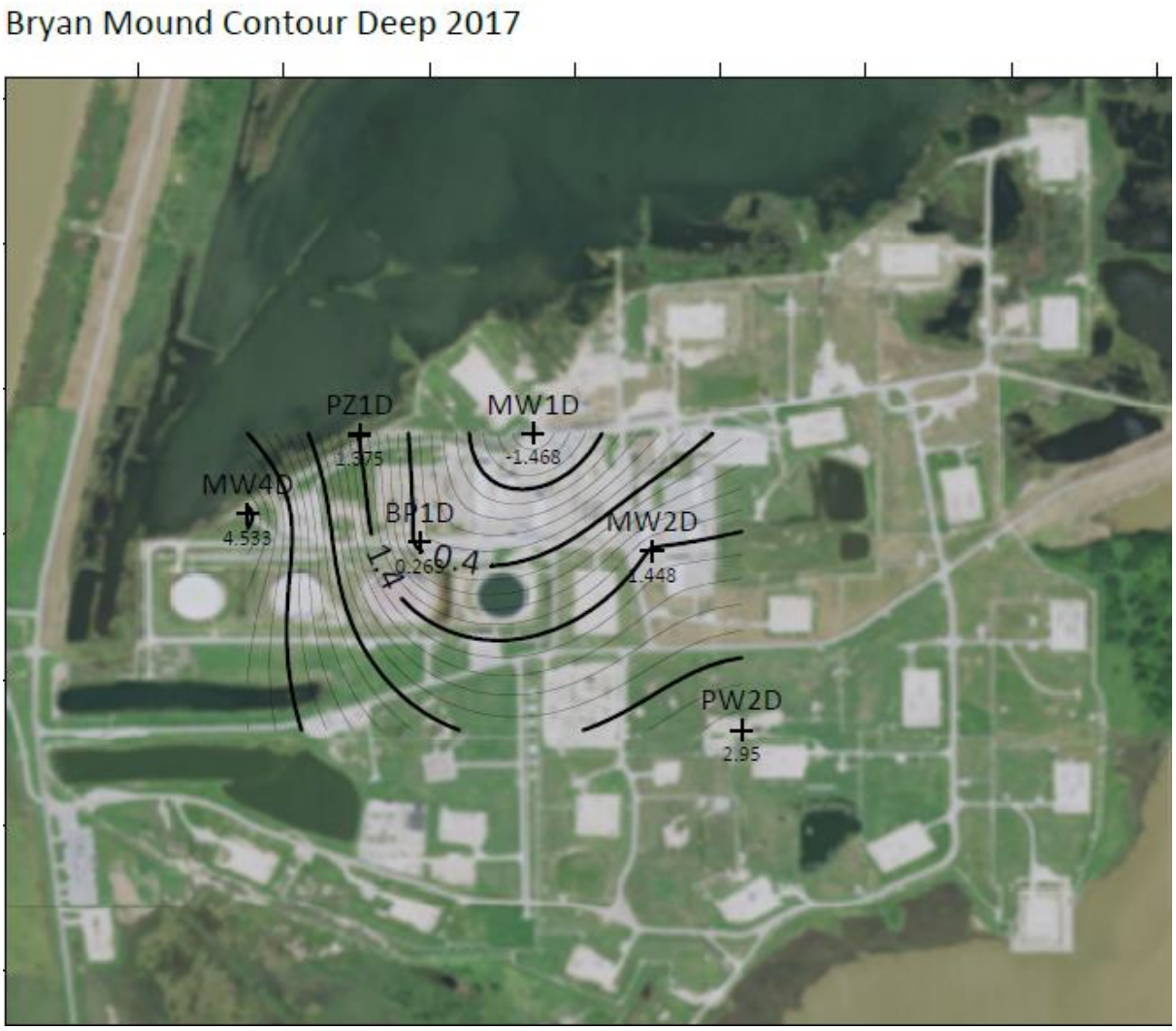
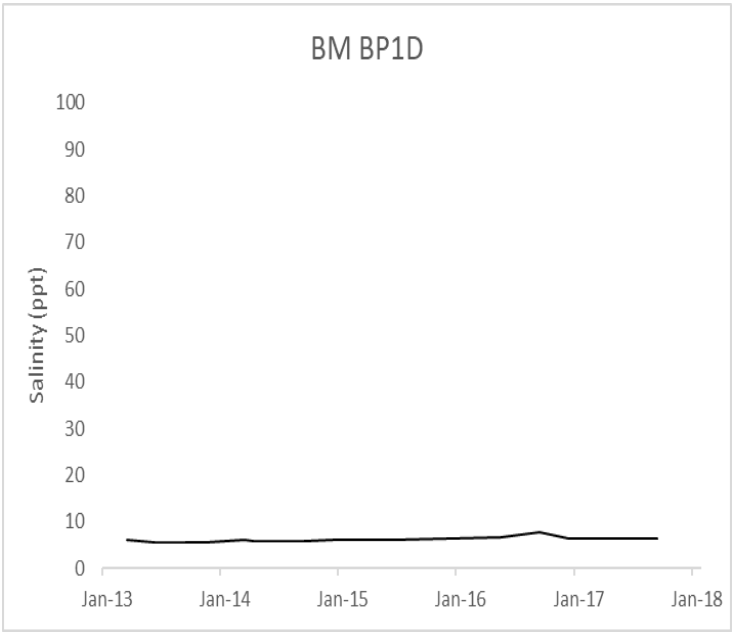


Figure C-9. Bryan Mound Deep Ground Water Zone Contoured Elevations September 2017

BP1D	Mar-13	6
BP1D	Jun-13	5.5
BP1D	Sep-13	5.5
BP1D	Nov-13	5.7
BP1D	Mar-14	6.1
BP1D	Apr-14	5.8
BP1D	Sep-14	5.8
BP1D	Dec-14	6.2
BP1D	Mar-15	6.1
BP1D	Jun-15	6.2
BP1D	May-16	6.6
BP1D	Sep-16	7.8
BP1D	Dec-16	6.5
BP1D	Sep-17	6.3
	Average	**6.15**



MW1D	Mar-13	156
MW1D	Jun-13	154
MW1D	Nov-13	154
MW1D	Mar-14	178
MW1D	Dec-14	57
MW1D	Mar-15	44
MW1D	Jun-15	156
MW1D	Sep-15	180
MW1D	Mar-16	162
MW1D	May-16	170
MW1D	Sep-16	155
MW1D	Dec-16	161
MW1D	Jun-17	168
MW1D	Sep-17	169
MW1D	Oct-17	169
MW1D	Dec-17	174
	Average	**150.44**

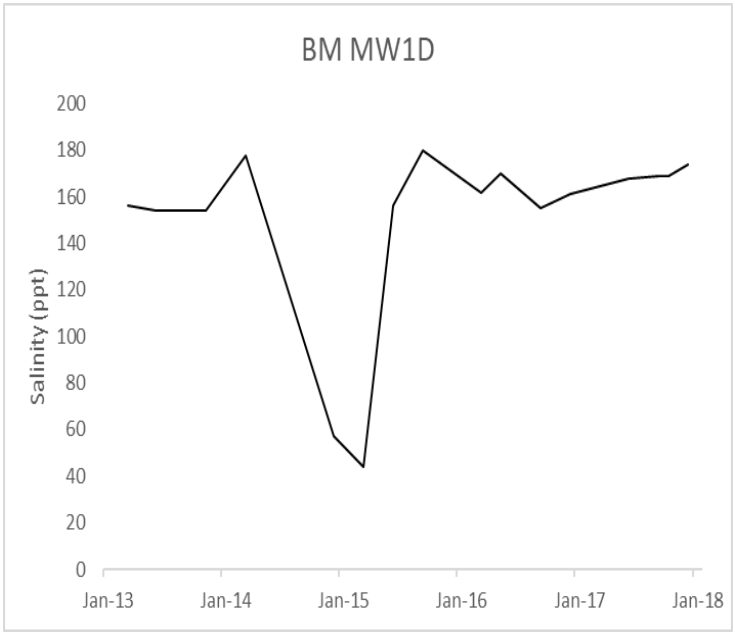
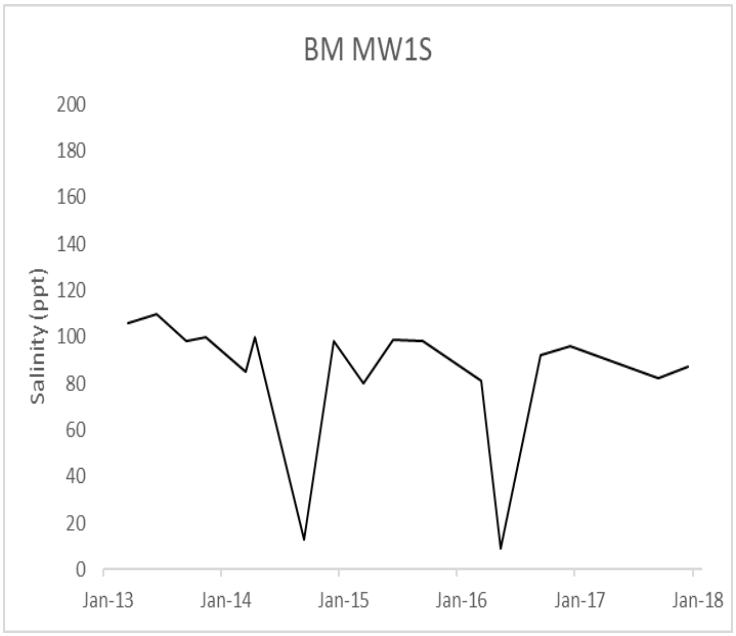


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW1S	Mar-13	106
MW1S	Jun-13	110
MW1S	Sep-13	98
MW1S	Nov-13	100
MW1S	Mar-14	85
MW1S	Apr-14	100
MW1S	Sep-14	13
MW1S	Dec-14	98
MW1S	Mar-15	80
MW1S	Jun-15	99
MW1S	Sep-15	98
MW1S	Mar-16	81
MW1S	May-16	9
MW1S	Sep-16	92
MW1S	Dec-16	96
MW1S	Sep-17	82
MW1S	Dec-17	87
	Average	**84.35**



MW2D	Mar-13	65
MW2D	Jun-13	54
MW2D	Sep-13	57
MW2D	Nov-13	56
MW2D	Sep-14	82
MW2D	Dec-14	70
MW2D	Mar-15	60
MW2D	Jun-15	58
MW2D	Sep-15	60
MW2D	Mar-16	56.6
MW2D	Sep-16	55
MW2D	Dec-16	56
MW2D	Jun-17	11.8
MW2D	Sep-17	54
MW2D	Dec-17	53
	Average	**56.56**

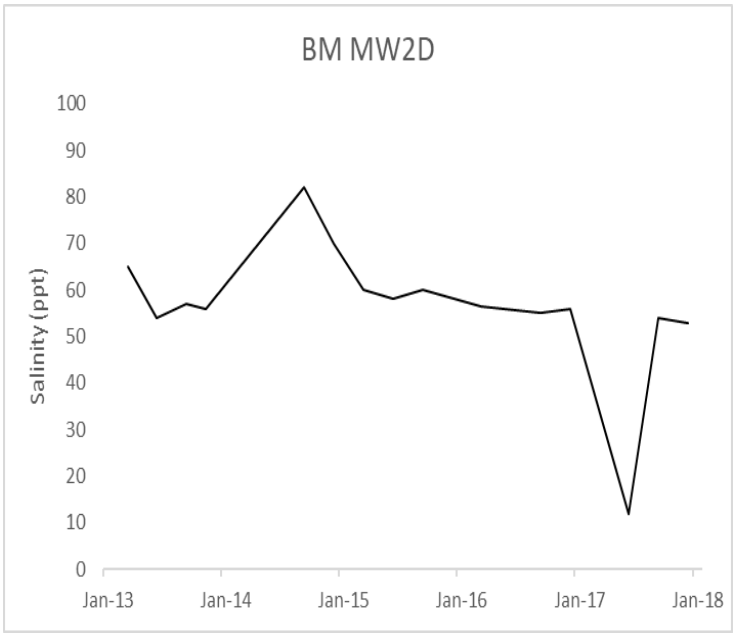
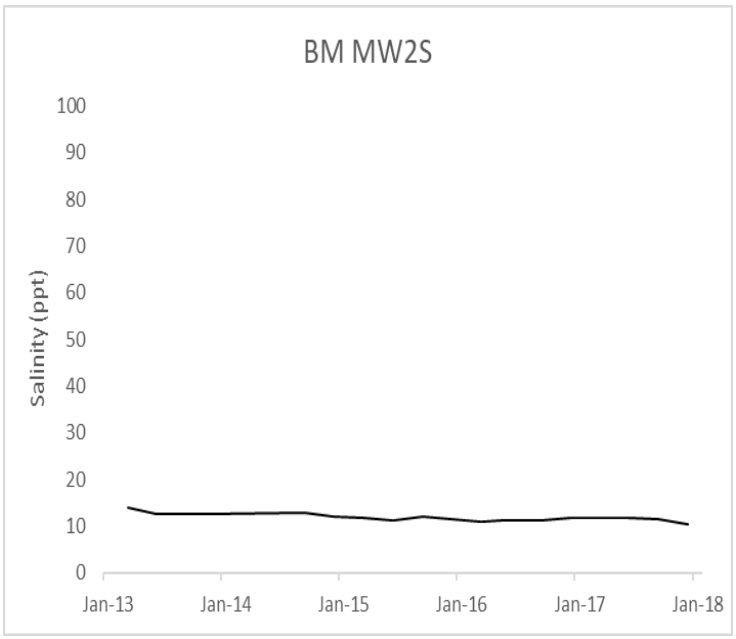


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW2S	Mar-13	14
MW2S	Jun-13	12.6
MW2S	Sep-13	12.7
MW2S	Nov-13	12.6
MW2S	Sep-14	12.9
MW2S	Dec-14	12
MW2S	Mar-15	11.8
MW2S	Jun-15	11.2
MW2S	Sep-15	12.1
MW2S	Mar-16	10.9
MW2S	May-16	11.1
MW2S	Sep-16	11.3
MW2S	Dec-16	11.8
MW2S	Jun-17	11.8
MW2S	Sep-17	11.4
MW2S	Dec-17	10.5
	Average	**11.92**



MW3	Mar-13	6.8
MW3	Sep-13	6.2
MW3	Nov-13	7.9
MW3	Mar-14	7
MW3	Apr-14	6.7
MW3	Sep-14	6.6
MW3	Dec-14	7.1
MW3	Mar-15	6.7
MW3	Jun-15	7.3
MW3	Mar-16	6.8
MW3	May-16	7.8
MW3	Sep-16	9.8
MW3	Dec-16	7.3
MW3	Jun-17	7.1
MW3	Sep-17	7.2
MW3	Dec-17	7.1
	Average	**7.21**

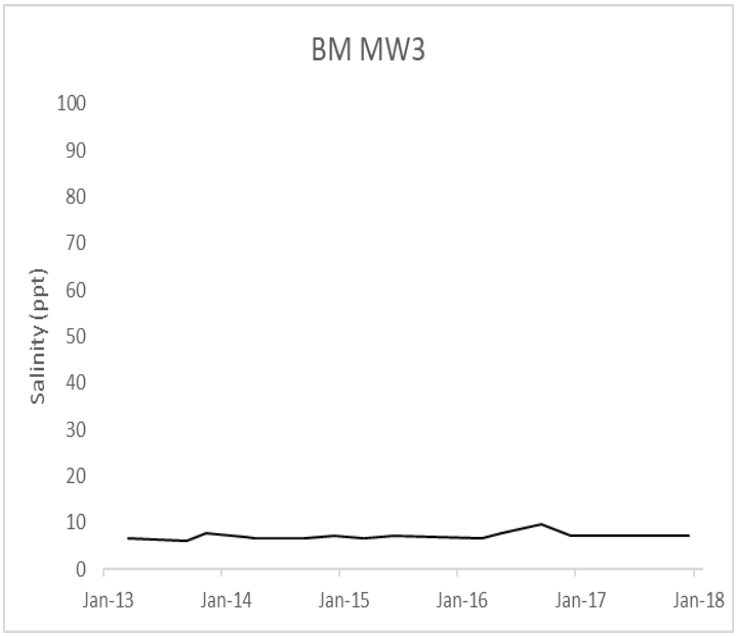
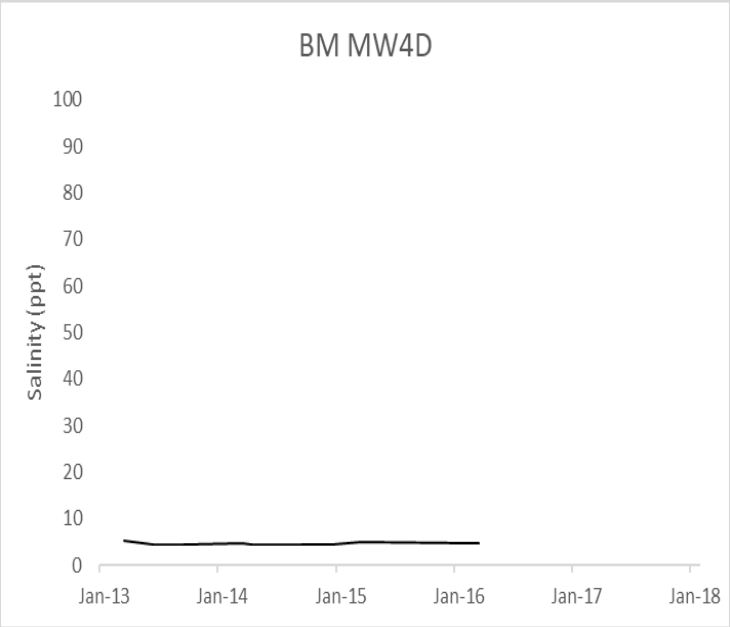


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW4D	Mar-13	5.2
MW4D	Jun-13	4.5
MW4D	Sep-13	4.4
MW4D	Mar-14	4.7
MW4D	Apr-14	4.6
MW4D	Sep-14	4.6
MW4D	Dec-14	4.6
MW4D	Mar-15	4.9
MW4D	Mar-16	4.8
	Average	**4.7**



MW4S	Mar-13	9.5
MW4S	Jun-13	8.8
MW4S	Sep-13	9.5
MW4S	Mar-14	10.6
MW4S	Apr-14	10
MW4S	Sep-14	9.8
MW4S	Dec-14	9.8
MW4S	Mar-15	9.6
MW4S	Mar-16	10.1
	Average	**9.74**

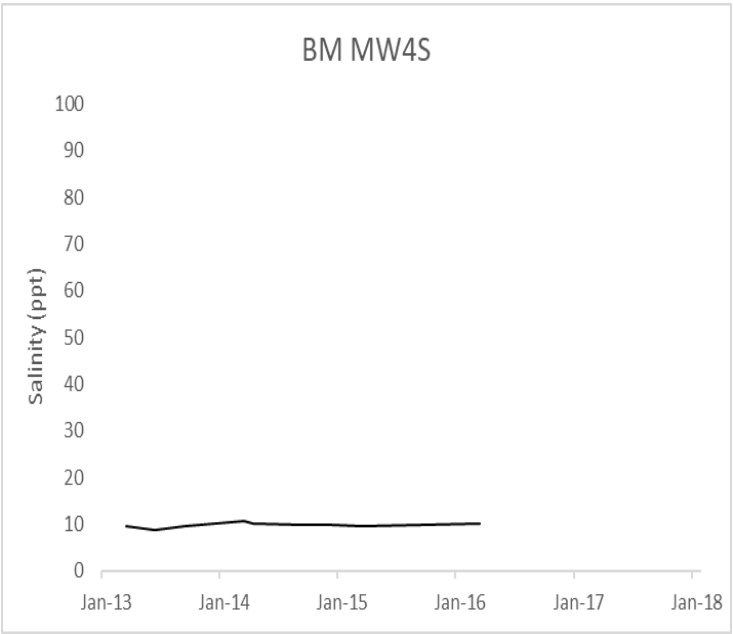
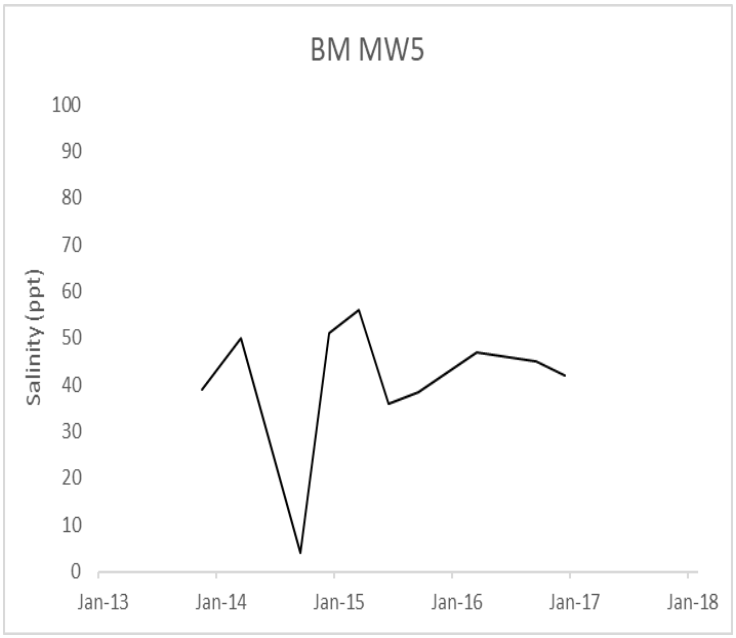


Figure C-10. Bryan Mound Water Monitoring Well Salinities

MW5	Nov-13	38.9
MW5	Mar-14	50
MW5	Sep-14	3.87
MW5	Dec-14	51
MW5	Mar-15	56
MW5	Jun-15	35.9
MW5	Sep-15	38.3
MW5	Mar-16	47
MW5	Sep-16	45
MW5	Dec-16	42
	Average	**40.80**



PW1	Mar-13	26.4
PW1	Nov-13	26.7
PW1	Mar-14	26.6
PW1	Apr-14	25.2
PW1	Sep-17	27.9
PW1	Oct-17	27.9
	Average	**26.78**

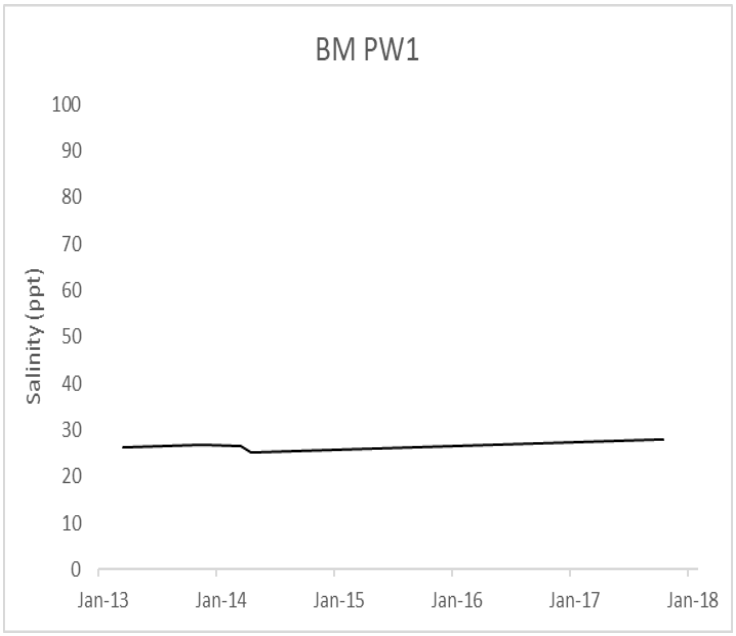
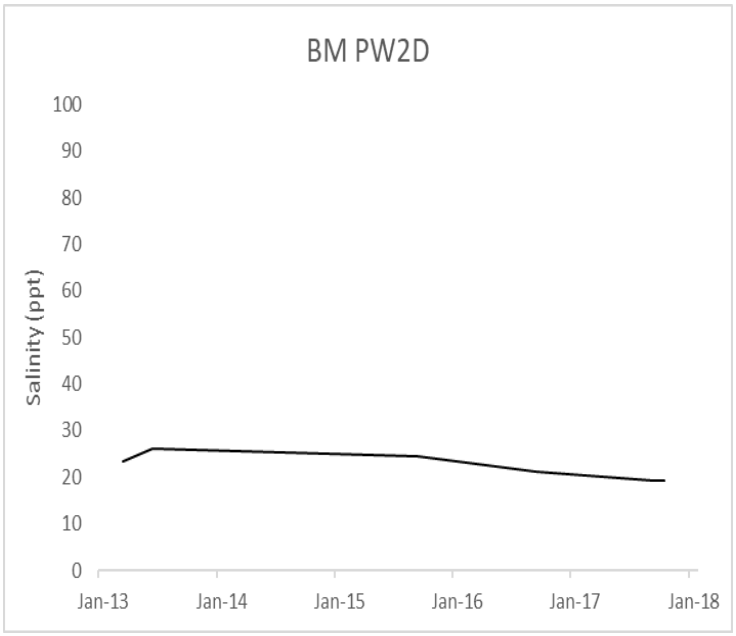


Figure C-10. Bryan Mound Water Monitoring Well Salinities

PW2D	Mar-13	23.4
PW2D	Jun-13	26
PW2D	Sep-15	24.4
PW2D	Sep-16	21.2
PW2D	Sep-17	19.2
PW2D	Oct-17	19.2
	Average	**22.23**



PW2S	Mar-13	13.1
PW2S	Jun-13	12.4
PW2S	Nov-13	13.4
PW2S	Mar-14	12.4
PW2S	Apr-14	9.5
PW2S	Jun-15	7.7
PW2S	Sep-15	9.1
PW2S	Mar-16	7.5
PW2S	Sep-16	8.1
PW2S	Sep-17	9.3
PW2S	Oct-17	9.3
	Average	**10.16**

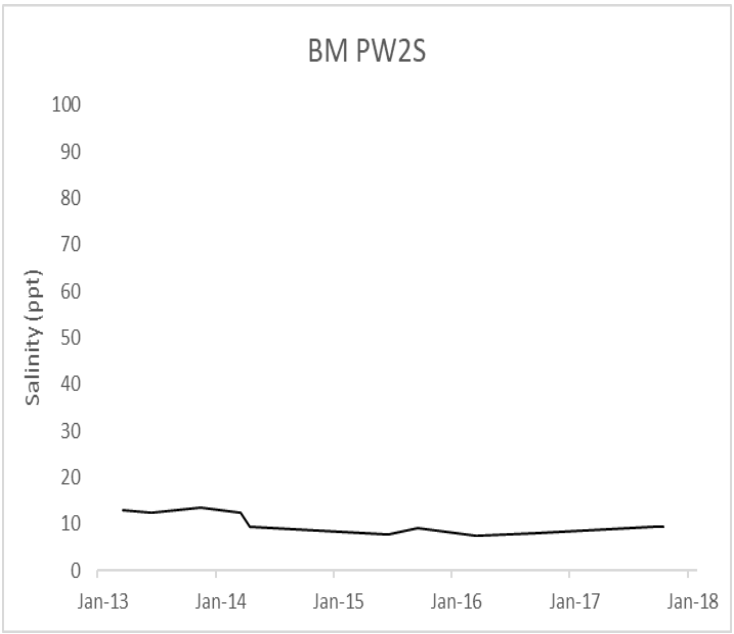
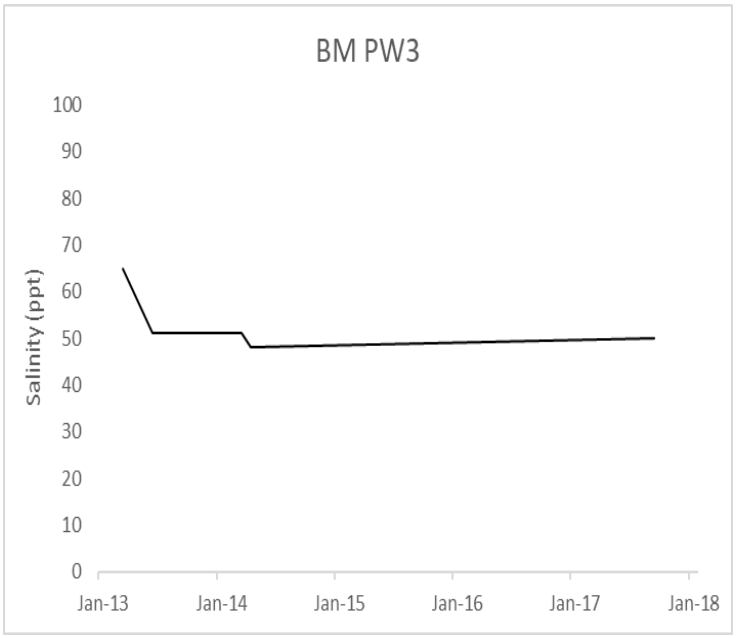


Figure C-10. Bryan Mound Water Monitoring Well Salinities

PW3	Mar-13	65
PW3	Jun-13	51
PW3	Mar-14	51
PW3	Apr-14	48
PW3	Sep-17	50
	Average	**53**



PW4	Mar-13	130
PW4	Jun-13	104
PW4	Nov-13	106
PW4	Sep-17	110
	Average	**112.5**

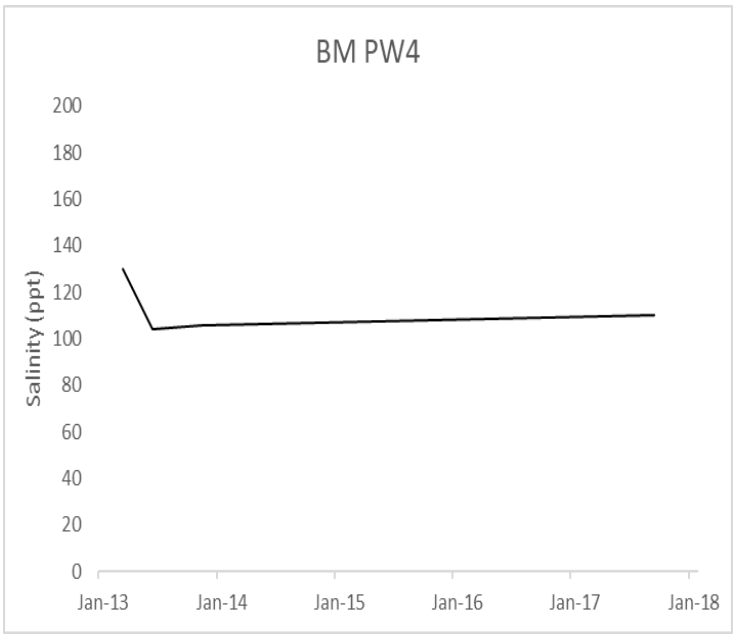
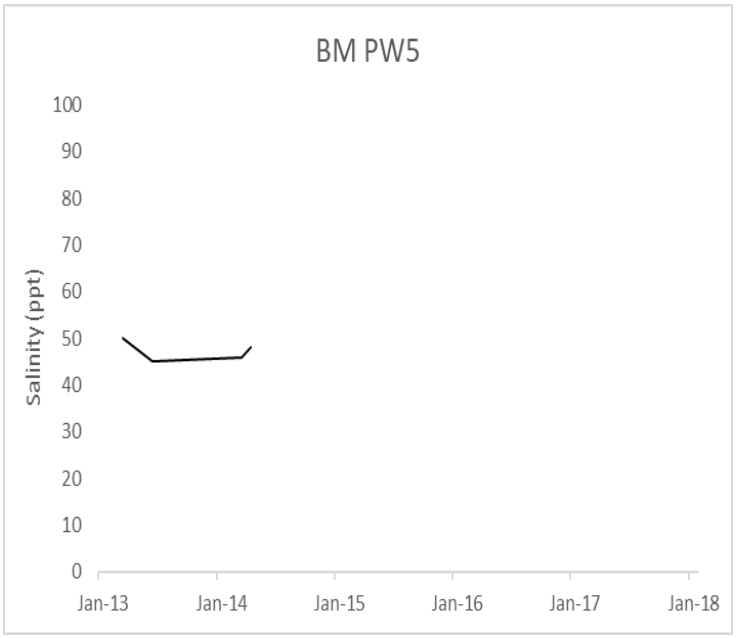


Figure C-10. Bryan Mound Water Monitoring Well Salinities

PW5	Mar-13	50
PW5	Jun-13	45
PW5	Mar-14	46
PW5	Apr-14	48



PZ1D	Mar-13	19
PZ1D	Jun-13	20.7
PZ1D	Sep-13	21.5
PZ1D	Nov-13	25.6
PZ1D	Mar-14	22.6
PZ1D	Apr-14	23.9
PZ1D	Sep-14	25
PZ1D	Dec-14	25.5
PZ1D	Mar-15	26.5
PZ1D	Jun-15	27.2
PZ1D	Sep-15	25.5
PZ1D	Mar-16	25.6
PZ1D	May-16	27.3
PZ1D	Dec-16	26.8
PZ1D	Jun-17	21.1
PZ1D	Sep-17	24.5
PZ1D	Oct-17	24.5
PZ1D	Dec-17	22.4
	Average	**24.18**

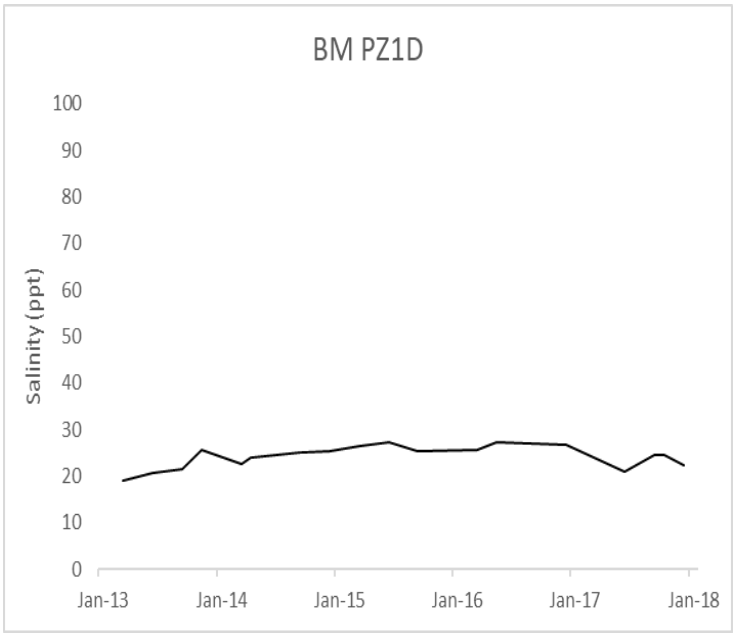
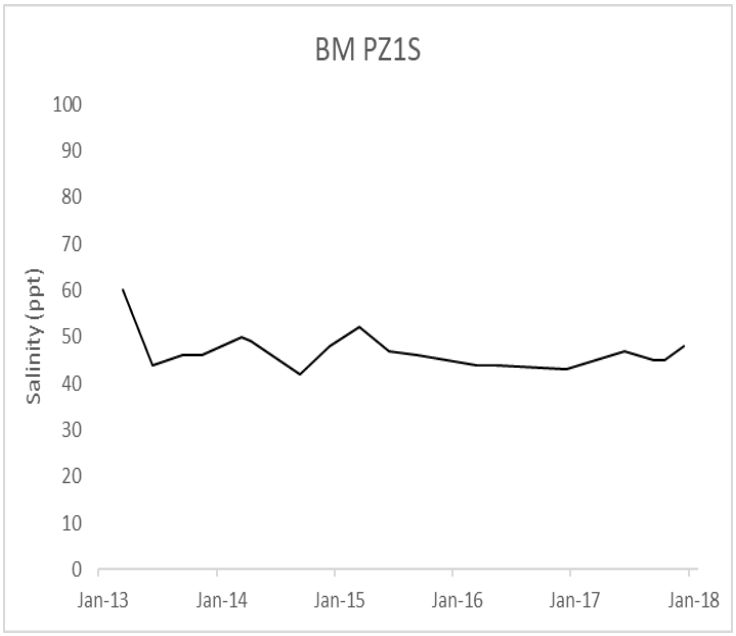


Figure C-10. Bryan Mound Water Monitoring Well Salinities

PZ1S	Mar-13	60
PZ1S	Jun-13	44
PZ1S	Sep-13	46
PZ1S	Nov-13	46
PZ1S	Mar-14	50
PZ1S	Apr-14	49
PZ1S	Sep-14	42
PZ1S	Dec-14	48
PZ1S	Mar-15	52
PZ1S	Jun-15	47
PZ1S	Sep-15	46
PZ1S	Mar-16	44
PZ1S	May-16	44
PZ1S	Dec-16	43
PZ1S	Jun-17	47
PZ1S	Sep-17	45
PZ1S	Oct-17	45
PZ1S	Dec-17	48
	Average	**47**



PZ3	Mar-13	22.9
PZ3	Jun-13	21
PZ3	Nov-13	21.7
PZ3	Apr-14	21.8
PZ3	Sep-17	22.3
PZ3	Oct-17	22.3
	Average	**22**

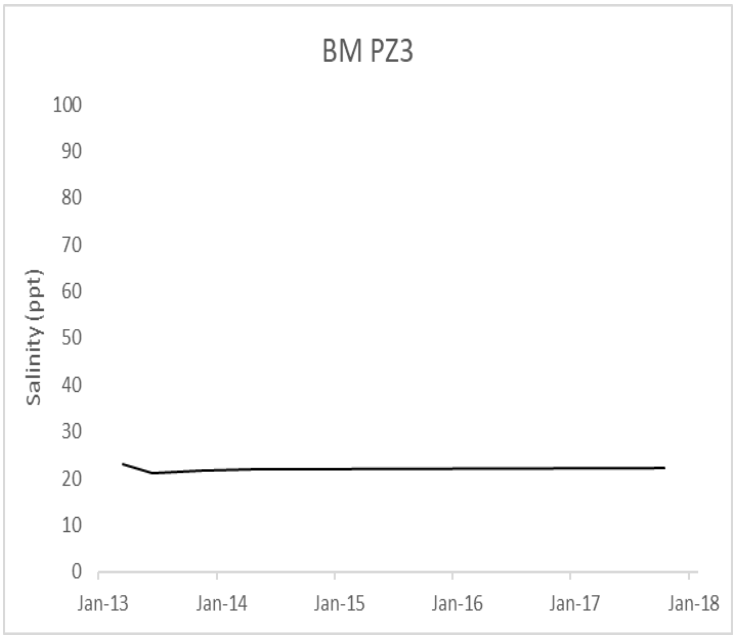


Figure C-10. Bryan Mound Water Monitoring Well Salinities

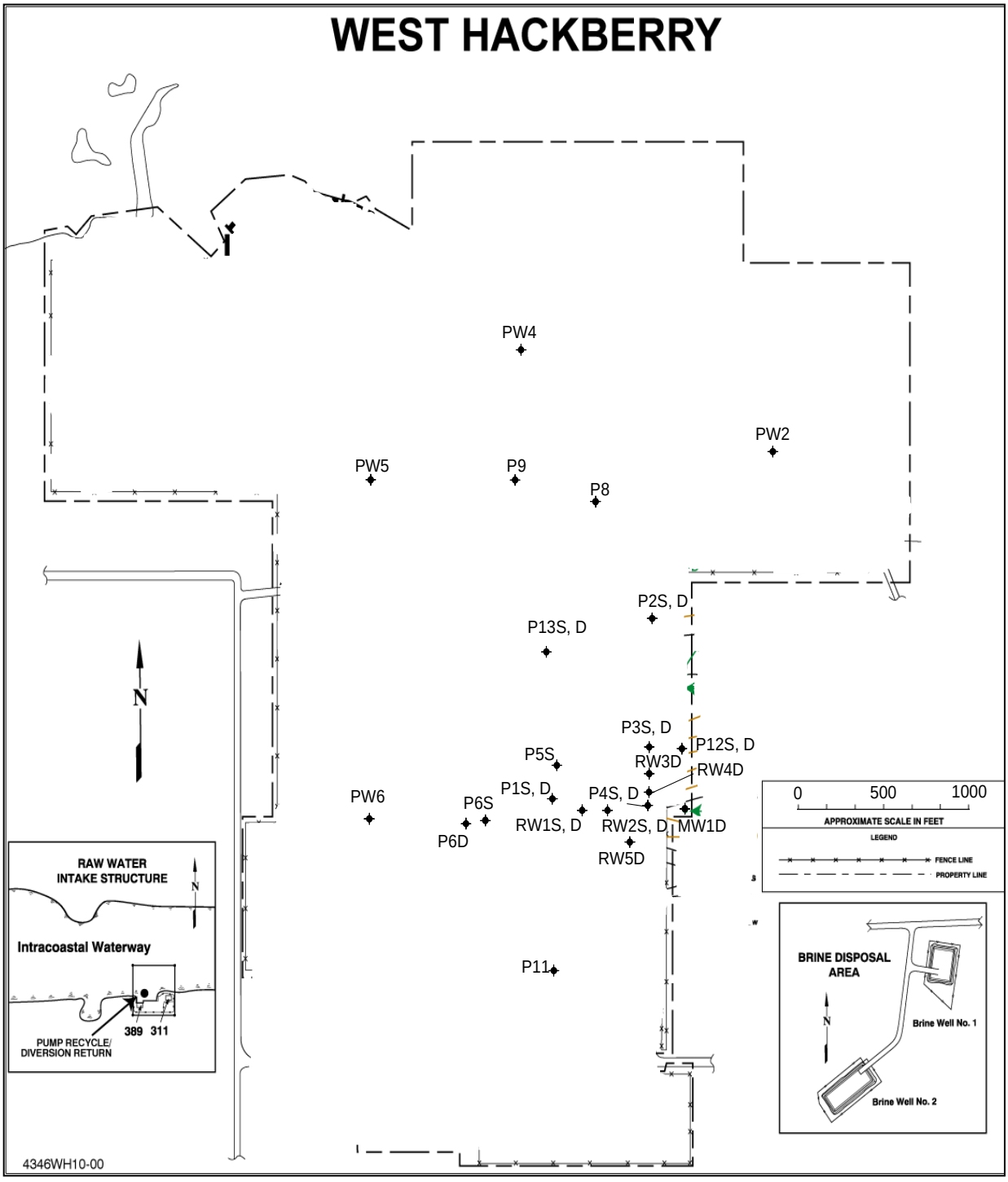


Figure C-11. West Hackberry Ground Water Monitoring Stations, Deep and Shallow

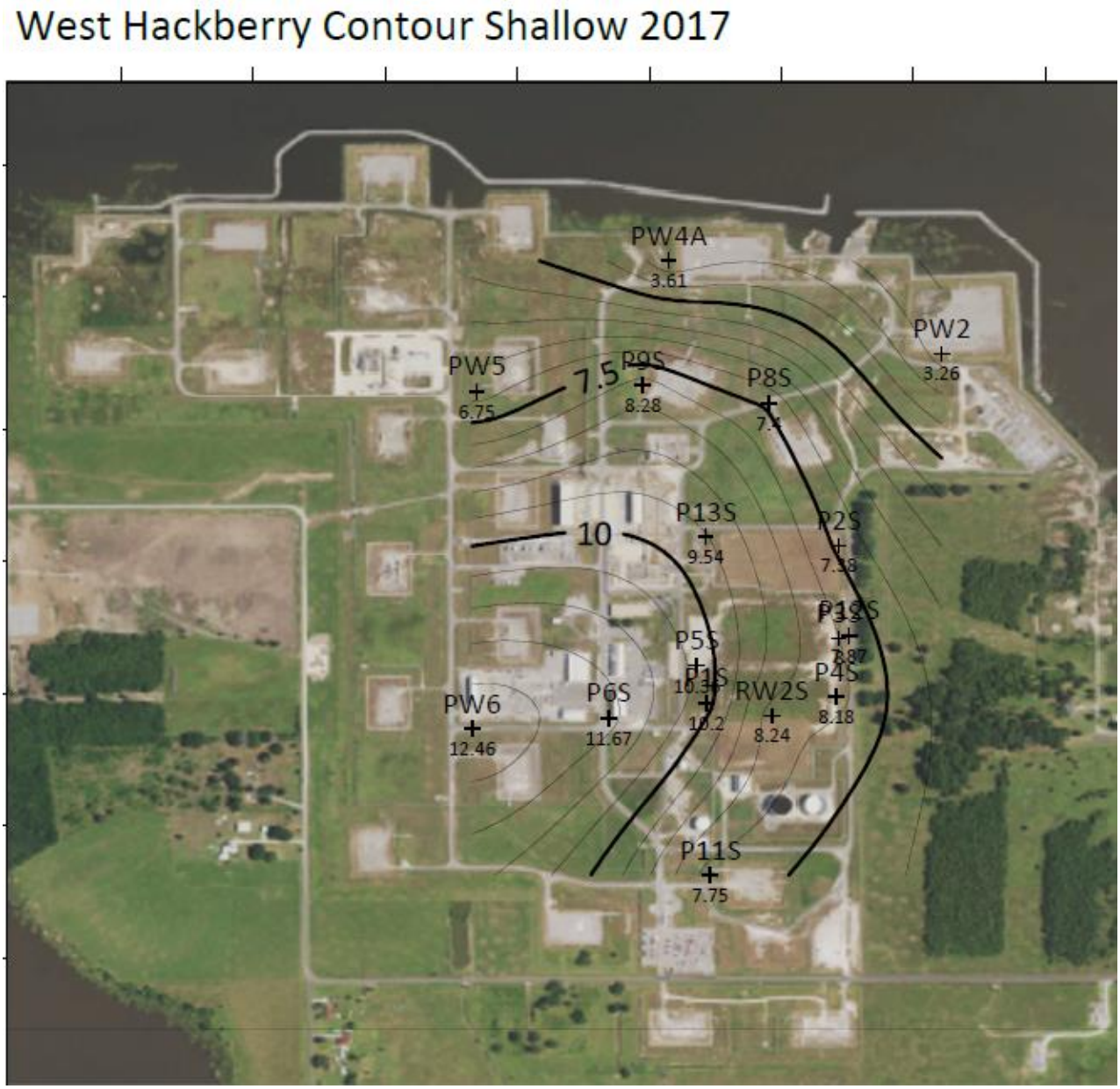


Figure C-12. West Hackberry Shallow Ground Water Zone Contoured Elevations June 2017

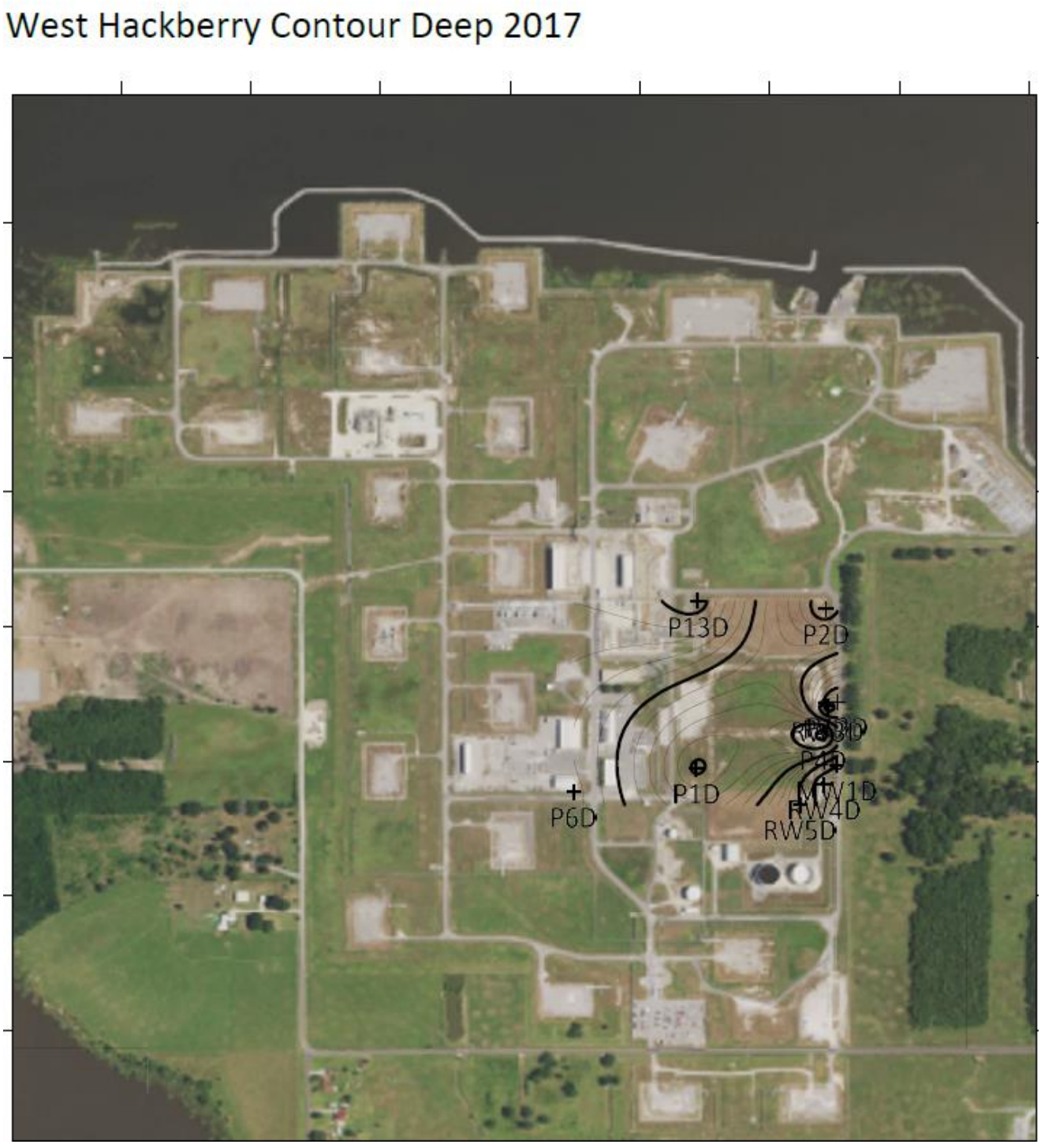
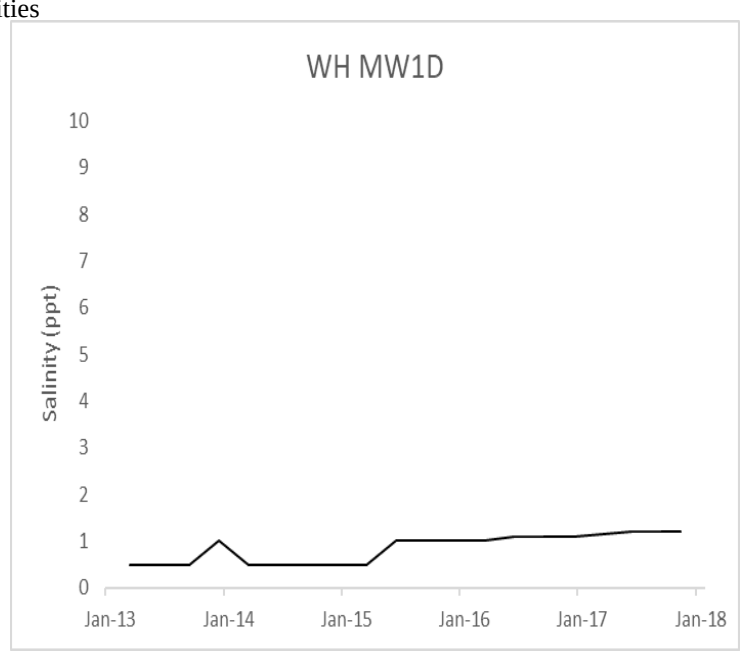


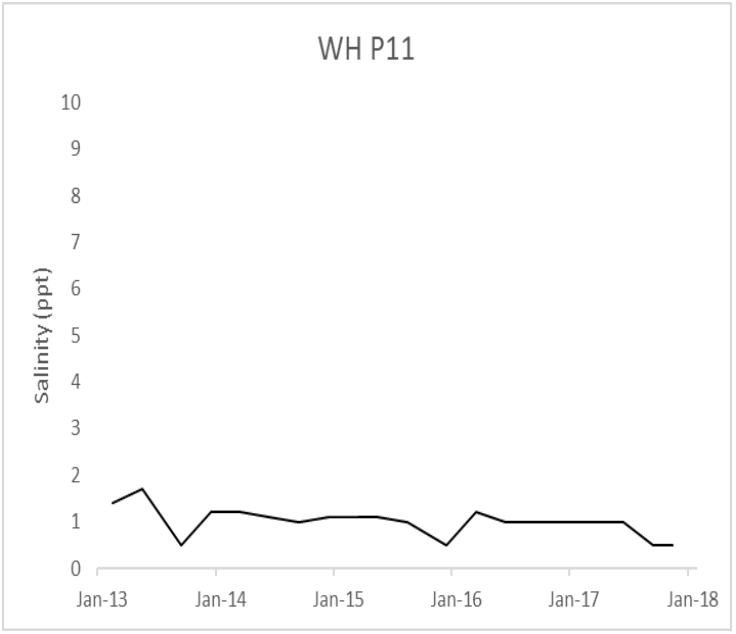
Figure C-13 West Hackberry Deep Ground Water Zone Contoured Elevations June 2017

Figure C-14. West Hackberry Monitoring Well Salinities

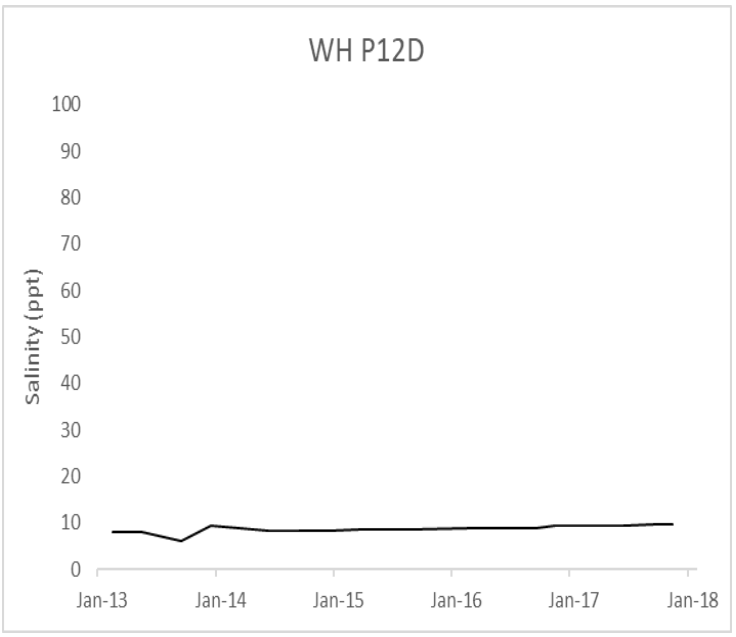
MW1D	Mar-13	0.5
MW1D	Jun-13	0.5
MW1D	Sep-13	0.5
MW1D	Dec-13	1
MW1D	Mar-14	0.5
MW1D	Jun-14	0.5
MW1D	Sep-14	0.5
MW1D	Dec-14	0.5
MW1D	Mar-15	0.5
MW1D	Jun-15	1
MW1D	Sep-15	1
MW1D	Dec-15	1
MW1D	Mar-16	1
MW1D	Jun-16	1.1
MW1D	Sep-16	1.1
MW1D	Dec-16	1.1
MW1D	Jun-17	1.2
MW1D	Sep-17	1.2
MW1D	Nov-17	1.2
	Average	**0.84**



P11	Feb-13	1.4
P11	May-13	1.7
P11	Sep-13	0.5
P11	Dec-13	1.2
P11	Mar-14	1.2
P11	Jun-14	1.1
P11	Sep-14	1
P11	Dec-14	1.1
P11	Mar-15	1.1
P11	May-15	1.1
P11	Aug-15	1
P11	Dec-15	0.5
P11	Mar-16	1.2
P11	Jun-16	1
P11	Sep-16	1
P11	Nov-16	1
P11	Jun-17	1
P11	Sep-17	0.5
P11	Nov-17	0.5
	Average	**1.01**



P12D	Feb-13	8
P12D	May-13	8.1
P12D	Sep-13	6
P12D	Dec-13	9.3
P12D	Mar-14	8.9
P12D	Jun-14	8.2
P12D	Sep-14	8.3
P12D	Dec-14	8.4
P12D	Mar-15	8.5
P12D	May-15	8.5
P12D	Aug-15	8.7
P12D	Feb-16	9
P12D	Jun-16	9
P12D	Sep-16	9
P12D	Nov-16	9.3
P12D	Jun-17	9.4
P12D	Sep-17	9.7
P12D	Nov-17	9.8
	Average	**8.67**



P12S	Feb-13	17.8
P12S	May-13	18.6
P12S	Sep-13	14
P12S	Dec-13	20
P12S	Mar-14	22
P12S	Jun-14	16
P12S	Sep-14	15
P12S	Dec-14	15
P12S	Mar-15	14
P12S	May-15	14
P12S	Aug-15	14
P12S	Dec-15	13
P12S	Feb-16	13
P12S	Jun-16	12
P12S	Sep-16	8.8
P12S	Nov-16	12
P12S	Jun-17	11
P12S	Sep-17	11
P12S	Nov-17	12
	Average	**14.38**

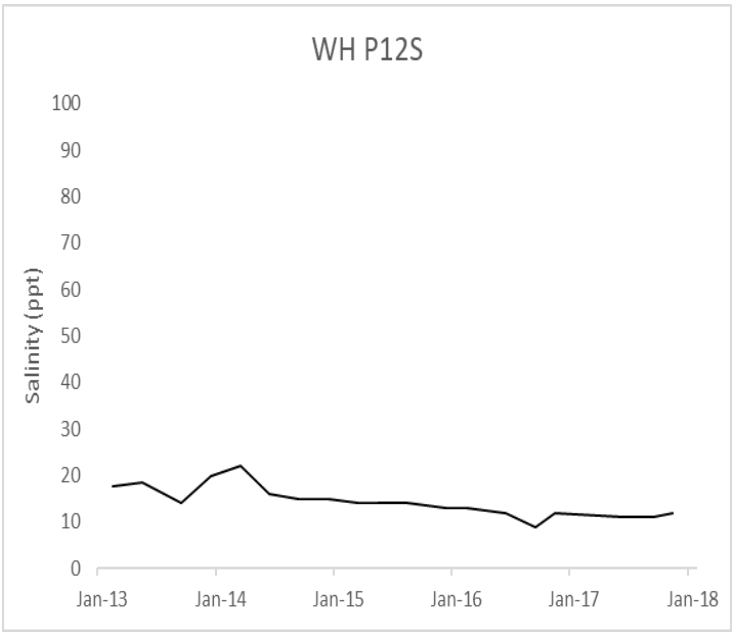
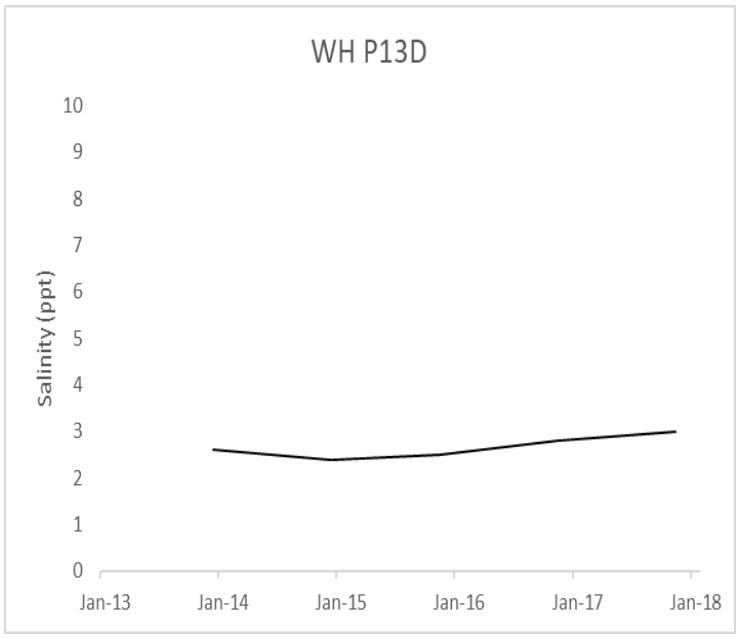


Figure C-14. West Hackberry Monitoring Well Salinities

P13D	Dec-13	2.6
P13D	Dec-14	2.4
P13D	Nov-15	2.5
P13D	Nov-16	2.8
P13D	Nov-17	3
	Average	**2.66**



P13S	Dec-13	0.5
P13S	Dec-14	0.5
P13S	Nov-15	0.5
P13S	Nov-16	0.5
P13S	Nov-17	0.5
	Average	**0.5**

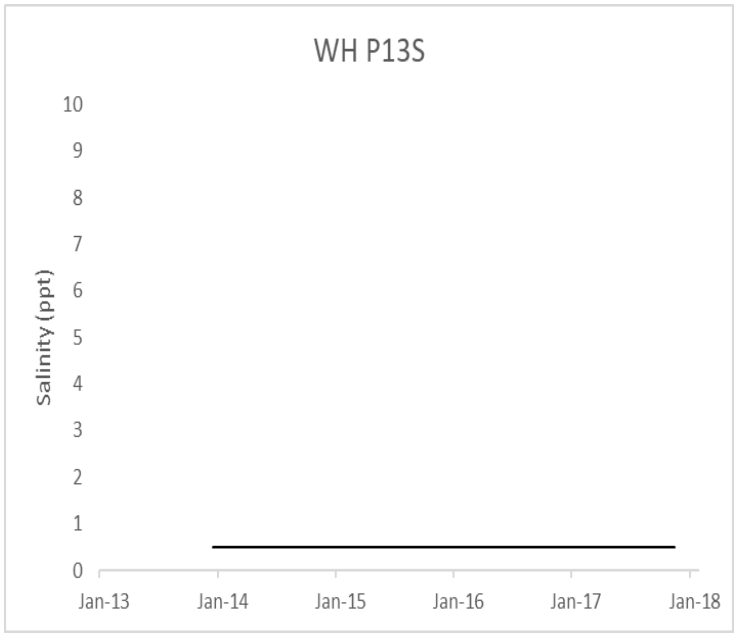
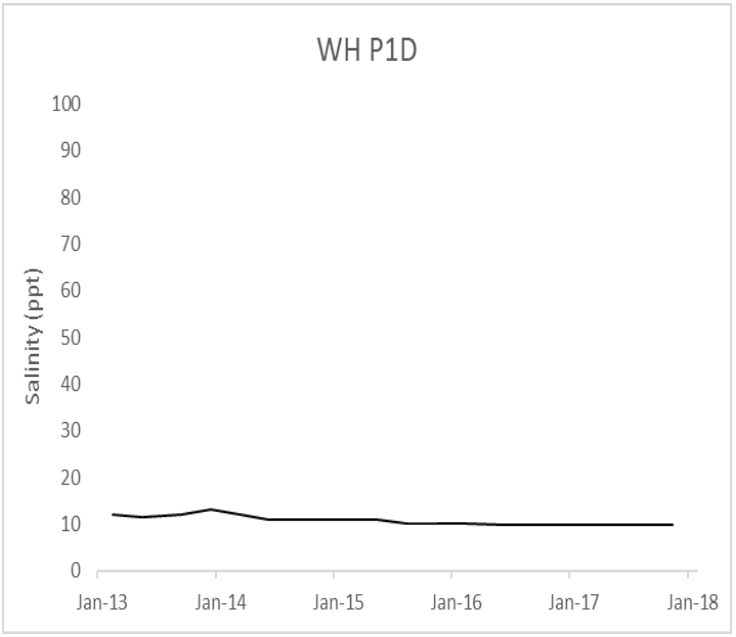


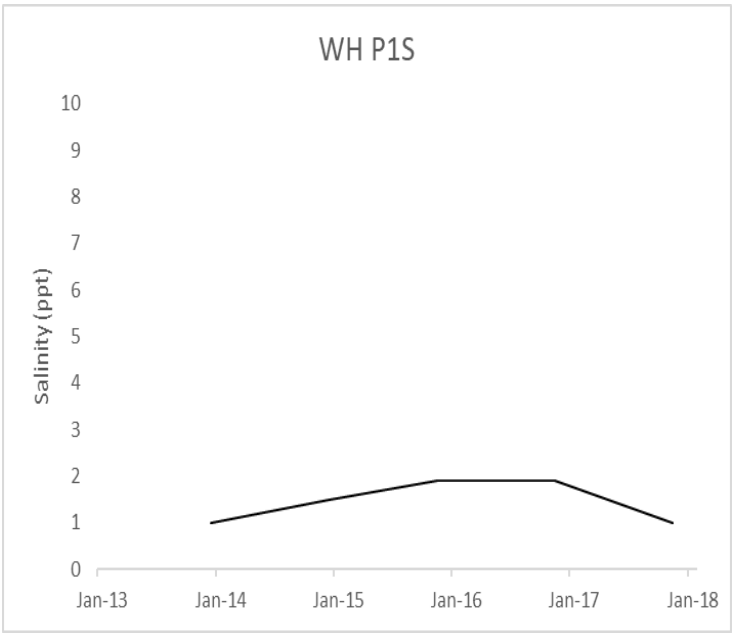
Figure C-14. West Hackberry Monitoring Well Salinities

Figure C-14. West Hackberry Monitoring Well Salinities

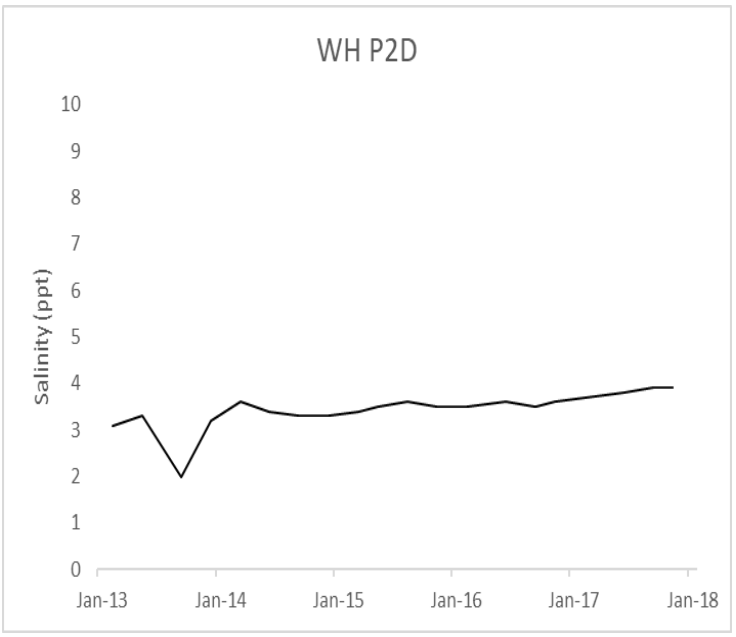
P1D	Feb-13	11.9
P1D	May-13	11.5
P1D	Sep-13	12
P1D	Dec-13	13
P1D	Mar-14	12
P1D	Jun-14	11
P1D	Sep-14	11
P1D	Dec-14	11
P1D	Mar-15	11
P1D	May-15	11
P1D	Aug-15	10
P1D	Nov-15	10
P1D	Feb-16	10
P1D	Jun-16	9.9
P1D	Sep-16	9.7
P1D	Nov-16	9.8
P1D	Jun-17	9.7
P1D	Sep-17	9.7
P1D	Nov-17	9.7
	Average	**10.73**



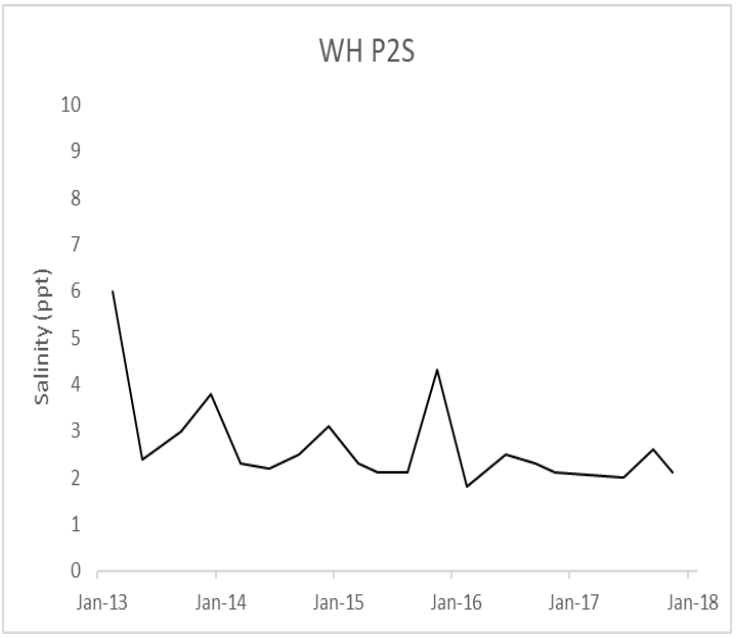
P1S	Dec-13	1
P1S	Dec-14	1.5
P1S	Nov-15	1.9
P1S	Nov-16	1.9
P1S	Nov-17	1
	Average	**1.46**



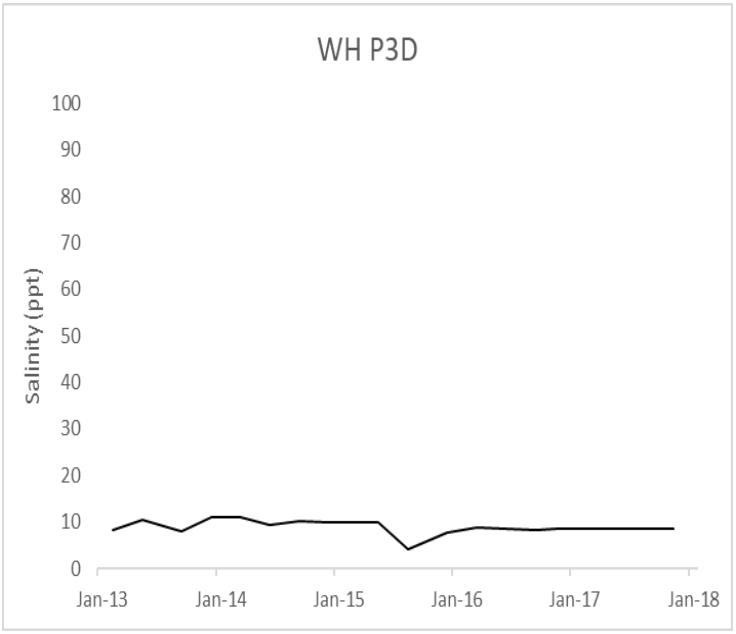
P2D	Feb-13	3.1
P2D	May-13	3.3
P2D	Sep-13	2
P2D	Dec-13	3.2
P2D	Mar-14	3.6
P2D	Jun-14	3.4
P2D	Sep-14	3.3
P2D	Dec-14	3.3
P2D	Mar-15	3.4
P2D	May-15	3.5
P2D	Aug-15	3.6
P2D	Nov-15	3.5
P2D	Feb-16	3.5
P2D	Jun-16	3.6
P2D	Sep-16	3.5
P2D	Nov-16	3.6
P2D	Jun-17	3.8
P2D	Sep-17	3.9
P2D	Nov-17	3.9
	Average	**3.42**



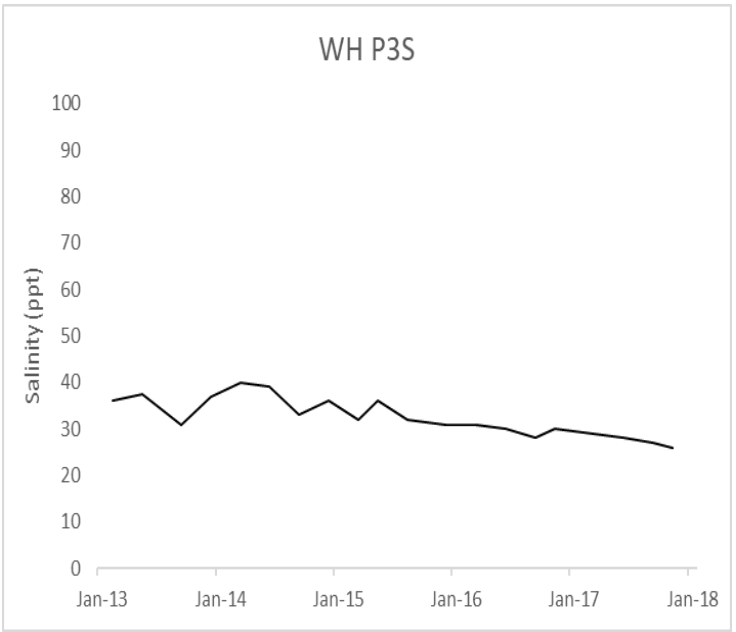
P2S	Feb-13	6
P2S	May-13	2.4
P2S	Sep-13	3
P2S	Dec-13	3.8
P2S	Mar-14	2.3
P2S	Jun-14	2.2
P2S	Sep-14	2.5
P2S	Dec-14	3.1
P2S	Mar-15	2.3
P2S	May-15	2.1
P2S	Aug-15	2.1
P2S	Nov-15	4.3
P2S	Feb-16	1.8
P2S	Jun-16	2.5
P2S	Sep-16	2.3
P2S	Nov-16	2.1
P2S	Jun-17	2
P2S	Sep-17	2.6
P2S	Nov-17	2.1
	Average	**2.71**



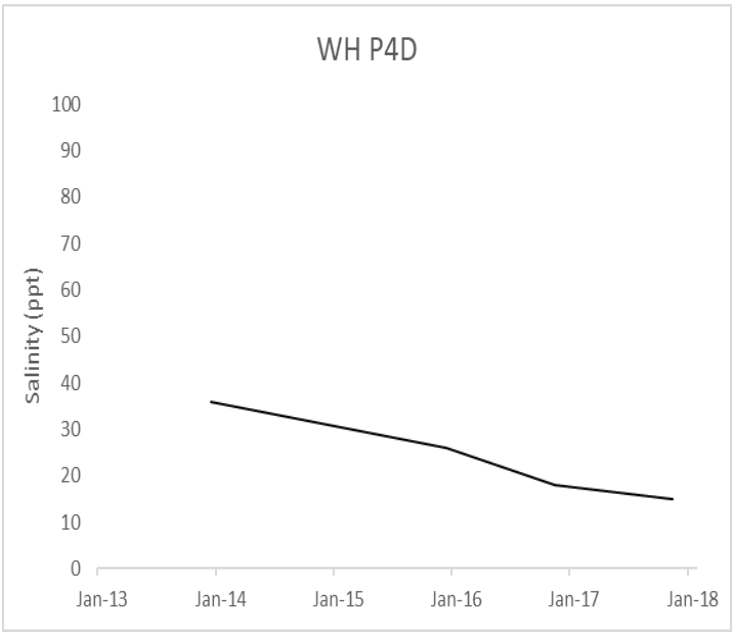
P3D	Feb-13	8.2
P3D	May-13	10.5
P3D	Sep-13	8
P3D	Dec-13	11
P3D	Mar-14	11
P3D	Jun-14	9.4
P3D	Sep-14	10.2
P3D	Dec-14	10
P3D	Mar-15	10
P3D	May-15	10
P3D	Aug-15	4.1
P3D	Dec-15	7.8
P3D	Mar-16	8.8
P3D	Jun-16	8.4
P3D	Sep-16	8.2
P3D	Nov-16	8.4
P3D	Jun-17	8.5
P3D	Sep-17	8.6
P3D	Nov-17	8.5
	Average	**8.93**



P3S	Feb-13	36.1
P3S	May-13	37.6
P3S	Sep-13	31
P3S	Dec-13	37
P3S	Mar-14	40
P3S	Jun-14	39
P3S	Sep-14	33
P3S	Dec-14	36
P3S	Mar-15	32
P3S	May-15	36
P3S	Aug-15	32
P3S	Dec-15	31
P3S	Mar-16	31
P3S	Jun-16	30
P3S	Sep-16	28
P3S	Nov-16	30
P3S	Jun-17	28
P3S	Sep-17	27
P3S	Nov-17	26
	Average	**32.67**



P4D	Dec-13	36
P4D	Dec-14	31
P4D	Dec-15	26
P4D	Nov-16	18
P4D	Nov-17	15
	Average	**25.2**



P4S	Feb-13	36.3
P4S	May-13	31.6
P4S	Sep-13	30
P4S	Dec-13	39
P4S	Mar-14	28
P4S	Jun-14	30
P4S	Sep-14	30
P4S	Dec-14	35
P4S	Mar-15	30
P4S	May-15	24
P4S	Aug-15	29
P4S	Dec-15	26
P4S	Mar-16	24
P4S	Jun-16	21
P4S	Sep-16	24
P4S	Nov-16	28
P4S	Jun-17	23
P4S	Sep-17	20
P4S	Nov-17	24
	Average	**28.05**

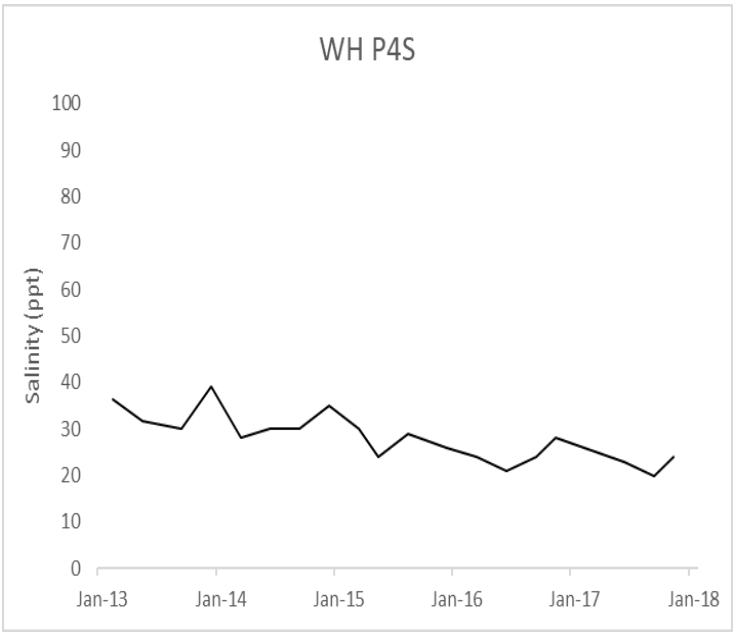
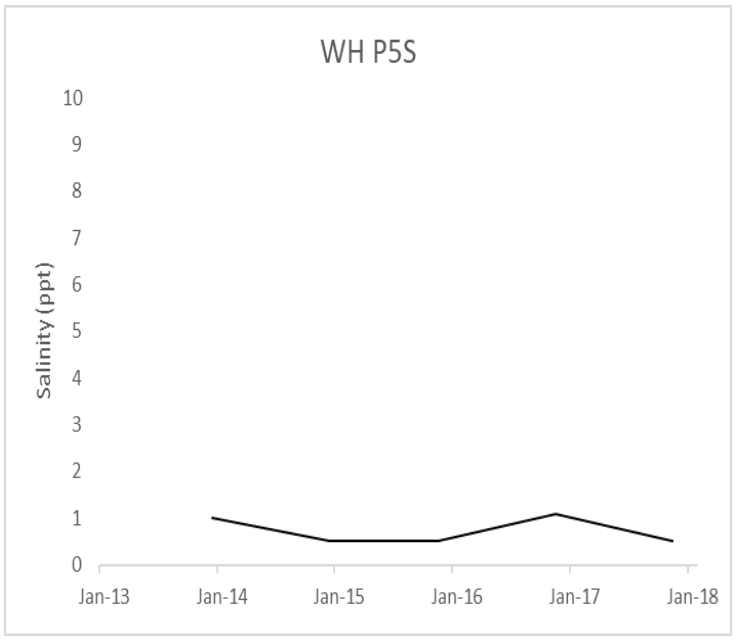


Figure C-14. West Hackberry Monitoring Well Salinities

P5S	Dec-13	1
P5S	Dec-14	0.5
P5S	Nov-15	0.5
P5S	Nov-16	1.1
P5S	Nov-17	0.5
	Average	**0.72**



P6D	Mar-13	0.5
P6D	May-13	0.5
P6D	Sep-13	0.5
P6D	Dec-13	0.5
P6D	Mar-14	0.5
P6D	Jun-14	1
P6D	Sep-14	0.5
P6D	Dec-14	0.5
P6D	Mar-15	1.6
P6D	May-15	2
P6D	Aug-15	2
P6D	Dec-15	1.6
P6D	Mar-16	1.6
P6D	Jun-16	1.9
P6D	Sep-16	1.8
P6D	Dec-16	1.6
P6D	Jun-17	1.3
P6D	Sep-17	1.2
P6D	Nov-17	1.1
	Average	**1.17**

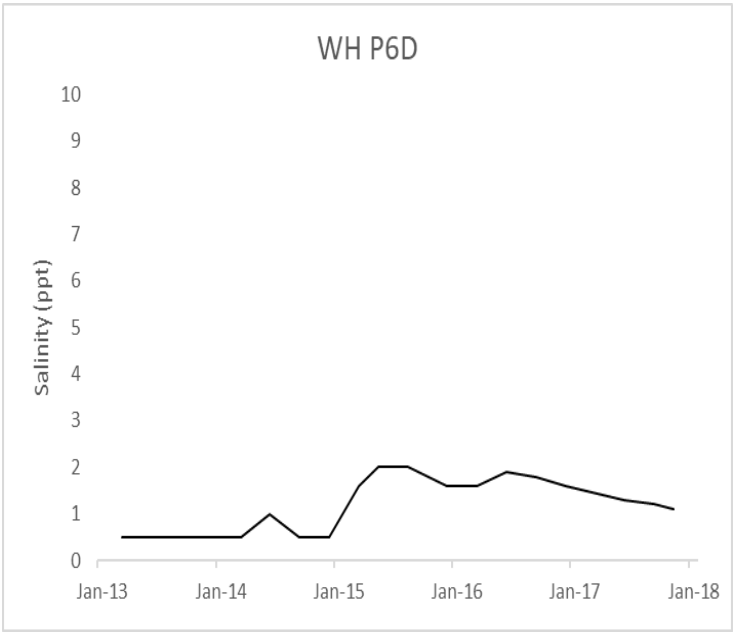
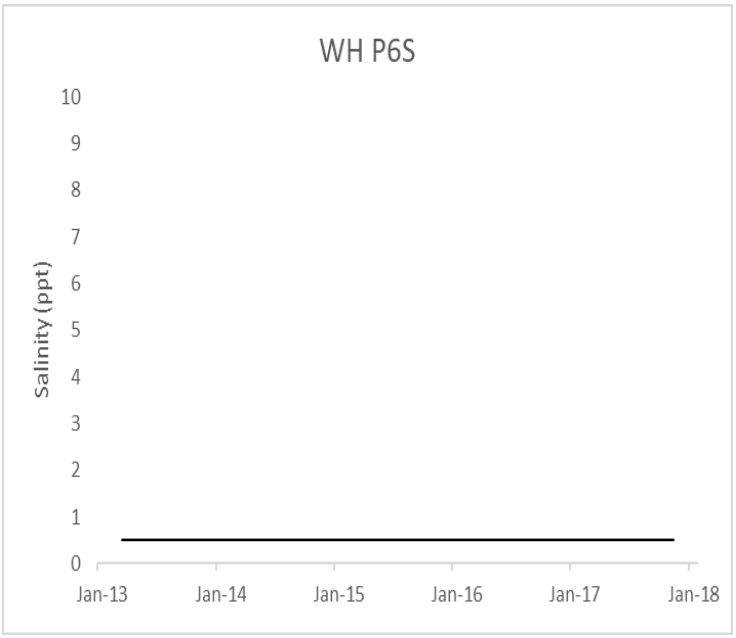


Figure C-14. West Hackberry Monitoring Well Salinities

P6S	Mar-13	0.5
P6S	May-13	0.5
P6S	Sep-13	0.5
P6S	Dec-13	0.5
P6S	Mar-14	0.5
P6S	Jun-14	0.5
P6S	Sep-14	0.5
P6S	Dec-14	0.5
P6S	Mar-15	0.5
P6S	May-15	0.5
P6S	Aug-15	0.5
P6S	Dec-15	0.5
P6S	Mar-16	0.5
P6S	Jun-16	0.5
P6S	Sep-16	0.5
P6S	Dec-16	0.5
P6S	Jun-17	0.5
P6S	Sep-17	0.5
P6S	Nov-17	0.5
	Average	**0.5**



P8	Dec-13	0.5
P8	Dec-14	0.5
P8	Dec-15	0.5
P8	Dec-16	0.5
P8	Nov-17	0.5
	Average	**0.5**

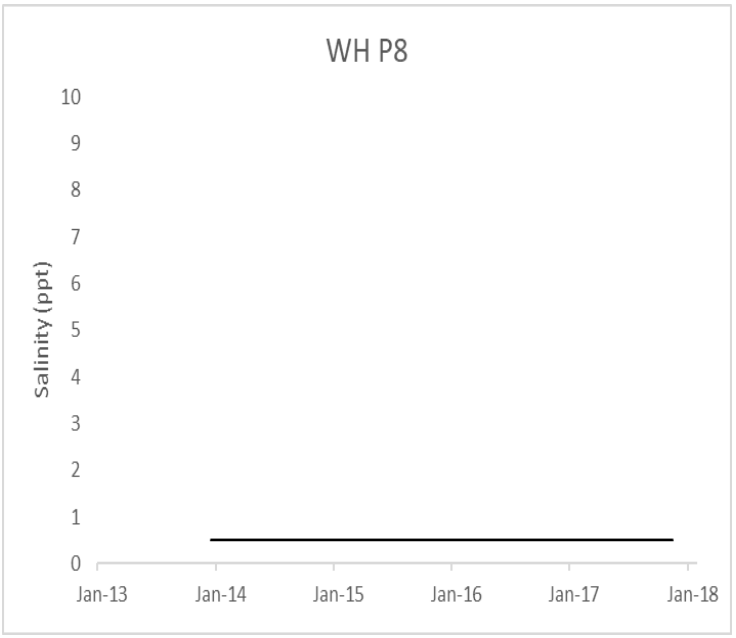
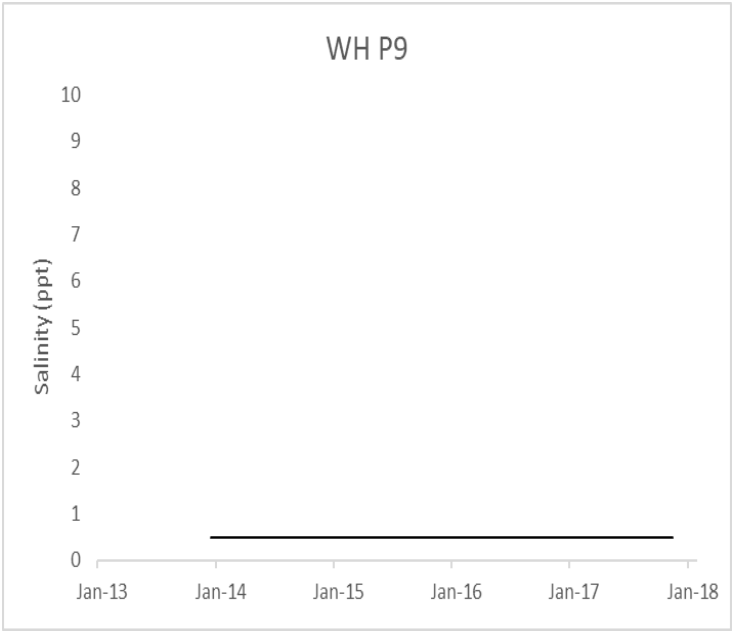


Figure C-14. West Hackberry Monitoring Well Salinities

P9	Dec-13	0.5
P9	Dec-14	0.5
P9	Dec-15	0.5
P9	Dec-16	0.5
P9	Nov-17	0.5
	Average	**0.5**



PW2	Mar-13	6.9
PW2	Jun-13	6.9
PW2	Sep-13	8
PW2	Dec-13	7.7
PW2	Mar-14	8.2
PW2	Jun-14	7.7
PW2	Sep-14	7.8
PW2	Dec-14	8.2
PW2	Mar-15	8.7
PW2	Jun-15	8.8
PW2	Aug-15	8.9
PW2	Nov-15	8.9
PW2	Mar-16	9.7
PW2	Jun-16	9.7
PW2	Sep-16	9.7
PW2	Dec-16	9.7
PW2	Jun-17	9.5
PW2	Sep-17	9.4
PW2	Nov-17	9.4
	Average	**8.62**

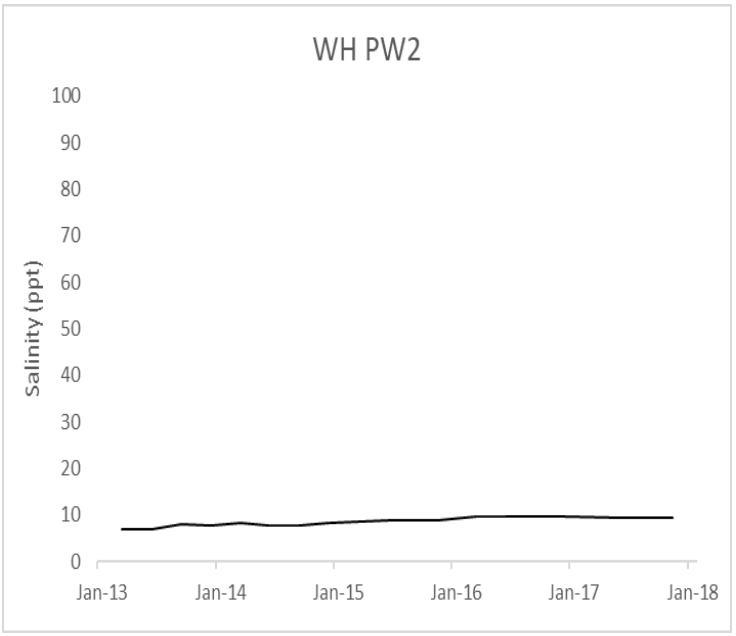
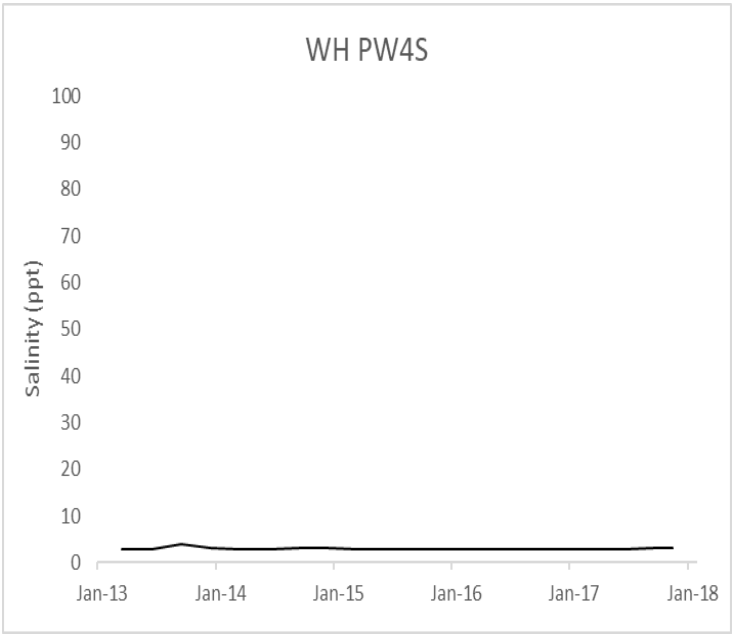


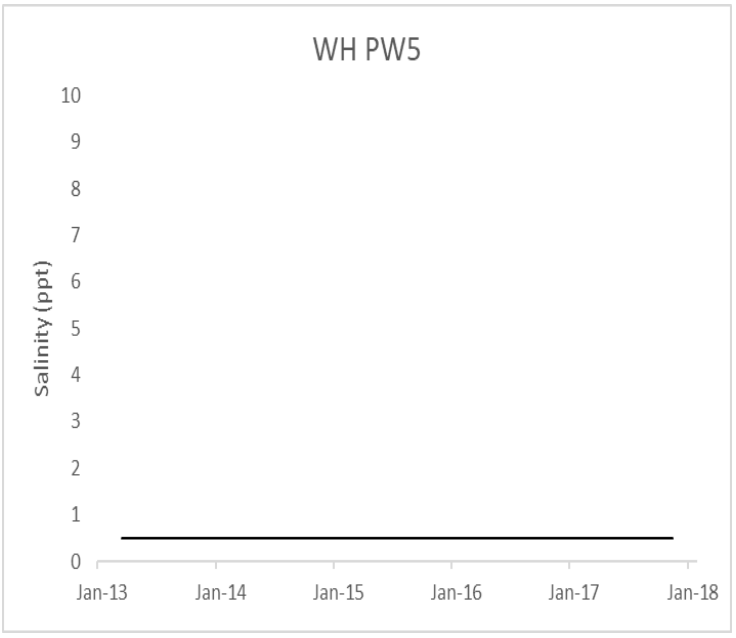
Figure C-14. West Hackberry Monitoring Well Salinities

Figure C-14. West Hackberry Monitoring Well Salinities

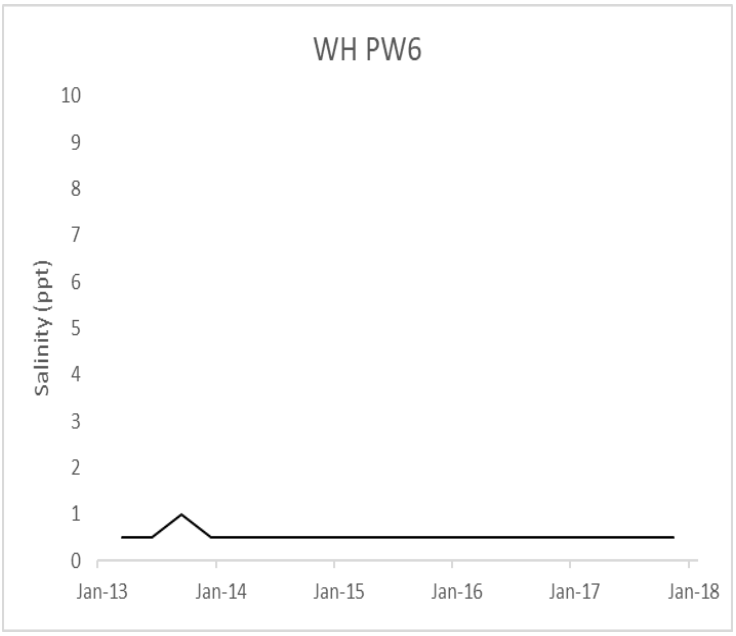
PW4S	Mar-13	3
PW4S	Jun-13	3
PW4S	Sep-13	4
PW4S	Dec-13	3.2
PW4S	Mar-14	3
PW4S	Jun-14	2.9
PW4S	Sep-14	3.1
PW4S	Dec-14	3.1
PW4S	Mar-15	2.8
PW4S	Jun-15	2.8
PW4S	Aug-15	2.8
PW4S	Nov-15	3
PW4S	Mar-16	2.9
PW4S	Jun-16	2.8
PW4S	Sep-16	2.8
PW4S	Dec-16	2.9
PW4S	Jun-17	3
PW4S	Sep-17	3.1
PW4S	Nov-17	3.2
	Average	**3.02**



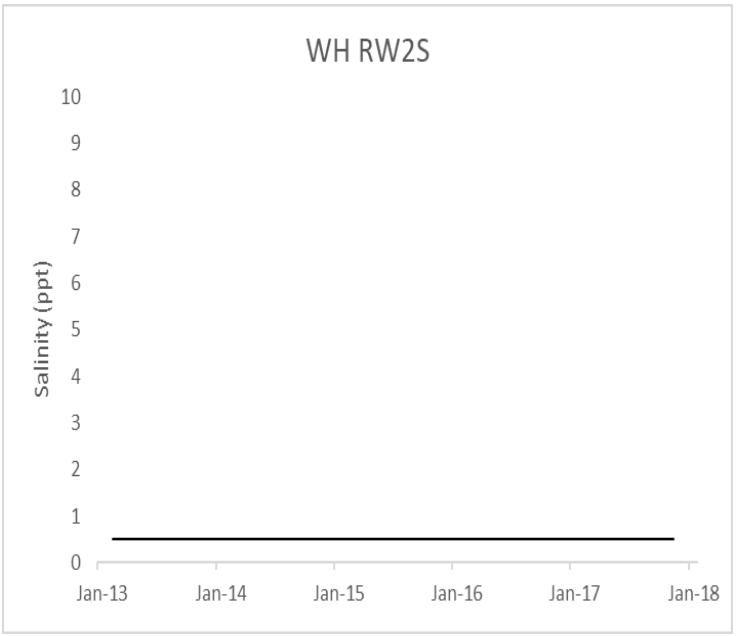
PW5	Mar-13	0.5
PW5	Jun-13	0.5
PW5	Sep-13	0.5
PW5	Dec-13	0.5
PW5	Mar-14	0.5
PW5	Jun-14	0.5
PW5	Sep-14	0.5
PW5	Dec-14	0.5
PW5	Mar-15	0.5
PW5	Jun-15	0.5
PW5	Aug-15	0.5
PW5	Nov-15	0.5
PW5	Mar-16	0.5
PW5	Jun-16	0.5
PW5	Sep-16	0.5
PW5	Dec-16	0.5
PW5	Jun-17	0.5
PW5	Sep-17	0.5
PW5	Nov-17	0.5
	Average	**0.5**



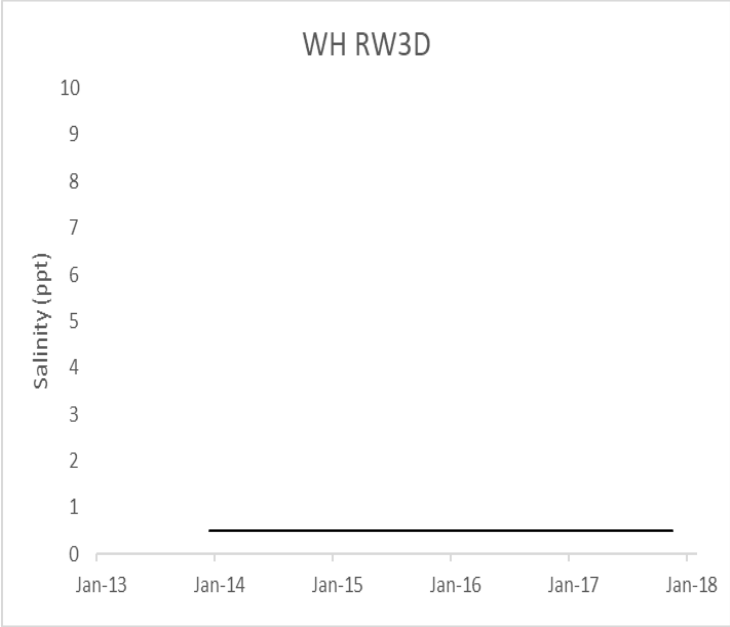
PW6	Mar-13	0.5
PW6	Jun-13	0.5
PW6	Sep-13	1
PW6	Dec-13	0.5
PW6	Mar-14	0.5
PW6	Jun-14	0.5
PW6	Sep-14	0.5
PW6	Dec-14	0.5
PW6	Mar-15	0.5
PW6	Jun-15	0.5
PW6	Aug-15	0.5
PW6	Nov-15	0.5
PW6	Mar-16	0.5
PW6	Jun-16	0.5
PW6	Sep-16	0.5
PW6	Dec-16	0.5
PW6	Jun-17	0.5
PW6	Sep-17	0.5
PW6	Nov-17	0.5
	Average	**0.53**



RW2S	Feb-13	0.5
RW2S	May-13	0.5
RW2S	Sep-13	0.5
RW2S	Dec-13	0.5
RW2S	Mar-14	0.5
RW2S	Jun-14	0.5
RW2S	Sep-14	0.5
RW2S	Dec-14	0.5
RW2S	Mar-15	0.5
RW2S	May-15	0.5
RW2S	Aug-15	0.5
RW2S	Nov-15	0.5
RW2S	Feb-16	0.5
RW2S	Jun-16	0.5
RW2S	Sep-16	0.5
RW2S	Nov-16	0.5
RW2S	Jun-17	0.5
RW2S	Sep-17	0.5
RW2S	Nov-17	0.5
	Average	**0.5**



RW3D	Dec-13	0.5
RW3D	Dec-14	0.5
RW3D	Dec-15	0.5
RW3D	Nov-16	0.5
RW3D	Nov-17	0.5
	Average	**0.5**



RW4D	Feb-13	1.8
RW4D	May-13	1.5
RW4D	Sep-13	0.5
RW4D	Dec-13	1.5
RW4D	Mar-14	1.6
RW4D	Jun-14	1.6
RW4D	Sep-14	1.9
RW4D	Dec-14	1.9
RW4D	Mar-15	5
RW4D	May-15	2
RW4D	Aug-15	2.1
RW4D	Dec-15	1
RW4D	Mar-16	2.2
RW4D	Jun-16	2.3
RW4D	Sep-16	2.4
RW4D	Nov-16	2.5
RW4D	Jun-17	2.9
RW4D	Sep-17	3.1
RW4D	Nov-17	3
	Average	**2.15**

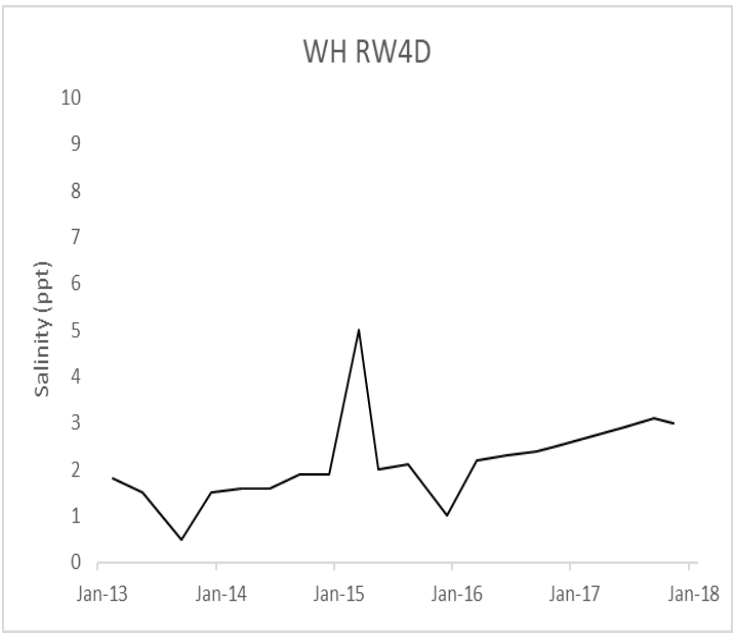
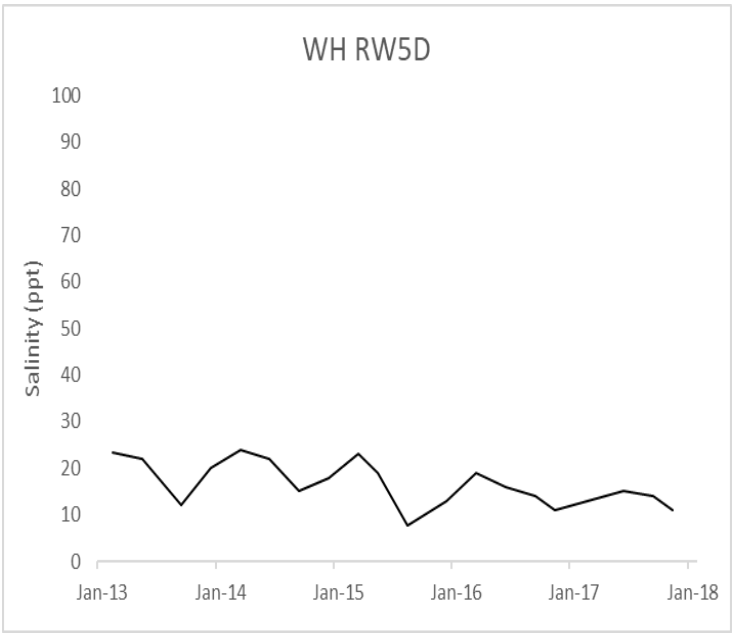


Figure C-14. West Hackberry Monitoring Well Salinities

RW5D	Feb-13	23.4
RW5D	May-13	22
RW5D	Sep-13	12
RW5D	Dec-13	20
RW5D	Mar-14	24
RW5D	Jun-14	22
RW5D	Sep-14	15
RW5D	Dec-14	18
RW5D	Mar-15	23
RW5D	May-15	19
RW5D	Aug-15	7.7
RW5D	Dec-15	13
RW5D	Mar-16	19
RW5D	Jun-16	16
RW5D	Sep-16	14
RW5D	Nov-16	11
RW5D	Jun-17	15
RW5D	Sep-17	14
RW5D	Nov-17	11
	Average	**16.79**



RWIS TS	Jan-13	0.5
RWIS TS	Apr-13	0.5
RWIS TS	Jul-13	0.5
RWIS TS	Oct-13	0.5
RWIS TS	Jan-14	0.5
RWIS TS	Apr-14	0.5
RWIS TS	Jul-14	0.5
RWIS TS	Oct-14	0.5
RWIS TS	Jan-15	0.5
RWIS TS	Apr-15	0.5
RWIS TS	Jul-15	1
RWIS TS	Oct-15	0.5
RWIS TS	Jan-16	0.5
RWIS TS	Apr-16	0.5
RWIS TS	Jul-16	0.5
RWIS TS	Nov-16	0.5
RWIS TS	Jul-17	0.5
RWIS TS	Oct-17	0.5
	Average	**0.53**

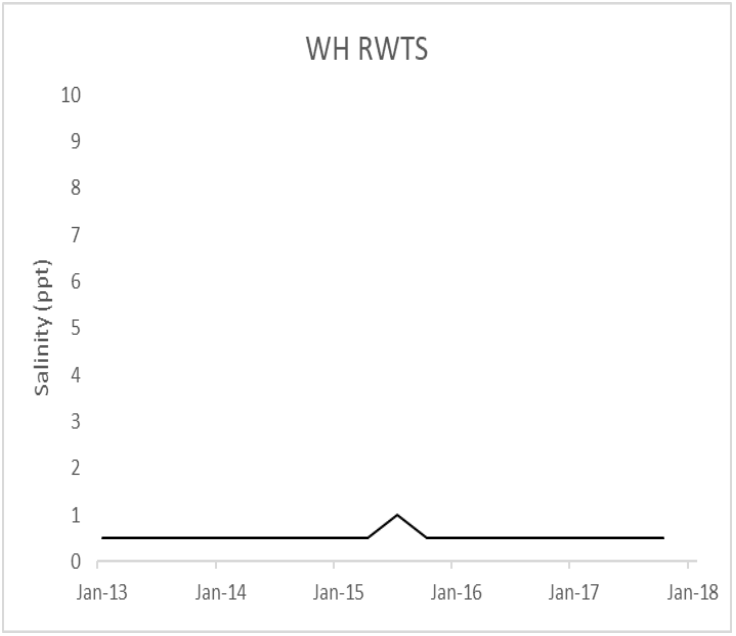
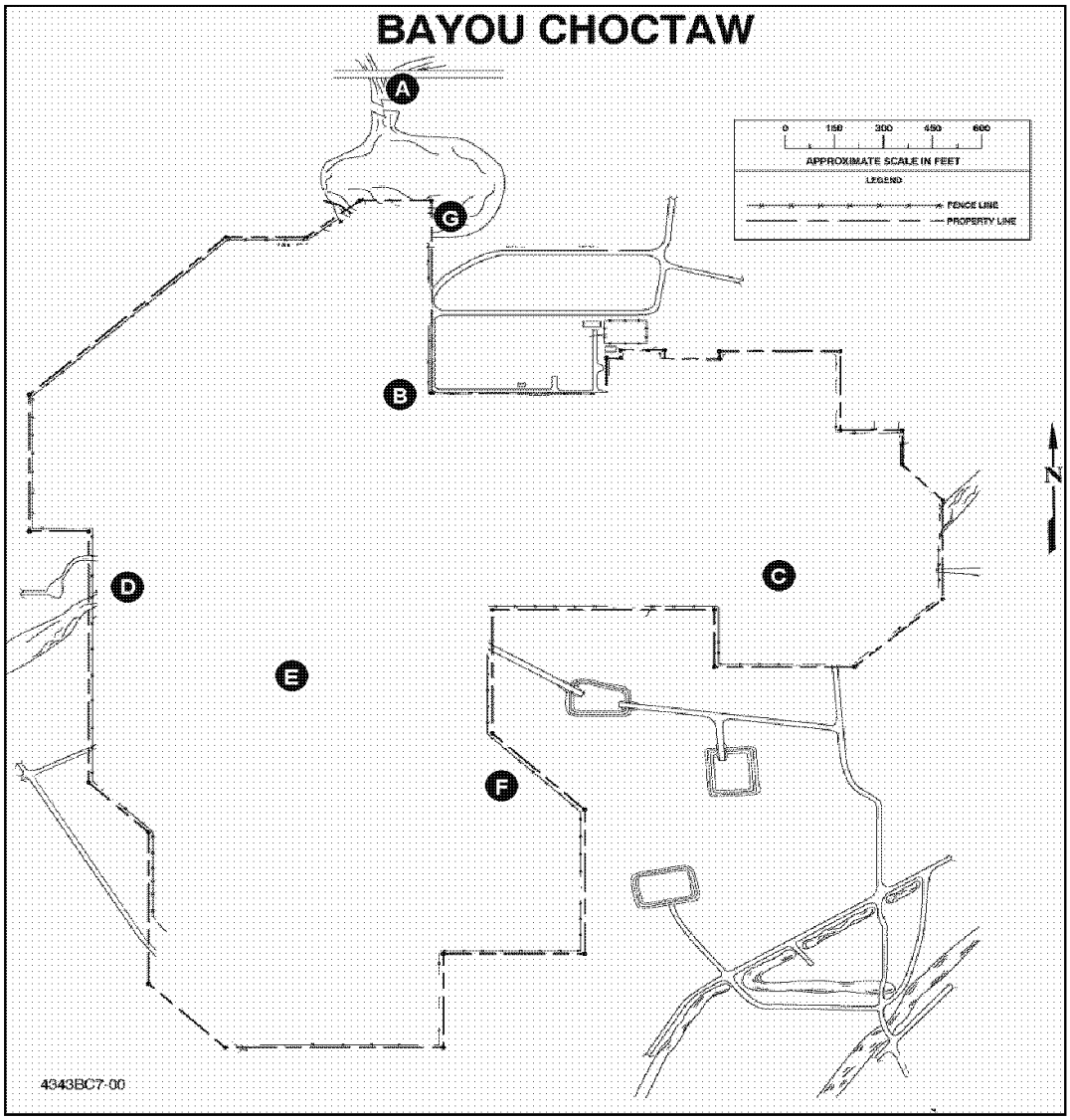


Figure C-14. West Hackberry Monitoring Well Salinities

Appendix D

SURFACE WATER QUALITY SURVEILLANCE MONITORING

DURING 2017



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
E Wetland Area
F Wetland Area
G Near Raw Water Intake

Figure D-1 Bayou Choctaw Environmental Monitoring Stations

Table D-1 2017 Data Summary for Bayou Choctaw Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	11	NV	0
	Maximum	13.1	2.5	8.2	0.5	27.8	35.9
	Minimum	2.4	2.5	7.0	0.5	14.3	12.8
	Mean	7.5	2.5	7.6	0.5	21.2	24.2
	Median	8.0	2.5	7.6	0.5	20.2	25.8
	Standard Deviation	3.6	0.0	NV	0.0	4.4	7.0
	Coefficient of Variation	48.0	0.0	NV	0.0	20.8	28.9
B	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	10	NV	0
	Maximum	14.0	2.5	8.1	0.5	26.9	67.1
	Minimum	2.2	2.5	7.0	0.5	13.1	19.6
	Mean	7.6	2.5	7.5	0.5	21.2	39.2
	Median	7.4	2.5	7.4	0.5	20.5	31.7
	Standard Deviation	4.4	0.0	NV	0.0	3.8	17.4
	Coefficient of Variation	57.9	0.0	NV	0.0	17.9	44.4
C	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	11	NV	0
	Maximum	20.4	2.5	8.5	0.5	28.4	33.6
	Minimum	1.9	2.5	6.7	0.5	11.0	12.7
	Mean	8.3	2.5	7.4	0.5	20.9	22.6
	Median	8.5	2.5	7.4	0.5	20.7	22.1
	Standard Deviation	5.2	0.0	NV	0.0	5.4	6.3
	Coefficient of Variation	62.7	0.0	NV	0.0	25.8	27.9
D	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	11	NV	0
	Maximum	16.1	2.5	8.6	0.5	29.1	31.4
	Minimum	2.2	2.5	6.8	0.5	14.6	13.4
	Mean	7.7	2.5	7.5	0.5	21.6	21.1
	Median	7.2	2.5	7.5	0.5	21.0	20.8
	Standard Deviation	4.3	0.0	NV	0.0	4.5	6.0
	Coefficient of Variation	55.8	0.0	NV	0.0	20.8	28.4
E	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	11	NV	0
	Maximum	16.5	2.5	8.5	0.5	27.6	31.5
	Minimum	2.7	2.5	6.7	0.5	12.8	12.0
	Mean	8.6	2.5	7.5	0.5	21.1	24.6
	Median	7.5	2.5	7.5	0.5	20.1	25.0
	Standard Deviation	4.7	0.0	NV	0.0	4.8	5.7
	Coefficient of Variation	54.7	0.0	NV	0.0	22.7	23.2

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

Table D-1 2017 Data Summary for Bayou Choctaw Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
F	Sample Size	12	4	12	12	12	11
	Number of BDL	0	4	NV	10	NV	0
	Maximum	15.4	2.5	8.9	0.5	28.3	27.4
	Minimum	2.4	2.5	6.0	0.5	11.9	14.6
	Mean	8.3	2.5	7.6	0.5	21.0	21.1
	Median	7.8	2.5	7.9	0.5	20.1	21.8
	Standard Deviation	4.4	0.0	NV	0.0	4.8	4.0
	Coefficient of Variation	53.0	0.0	NV	0.0	22.9	19.0
G	Sample Size	12	4	12	12	12	11
	Number of BDL	0	3	NV	11	NV	0
	Maximum	13.2	2.5	8.1	0.5	29.4	33.5
	Minimum	2.2	2.5	7.0	0.5	15.6	13.6
	Mean	7.6	2.5	7.7	0.5	22.1	24.4
	Median	7.3	2.5	7.7	0.5	21.6	26.3
	Standard Deviation	4.2	0.0	NV	0.0	4.4	6.9
	Coefficient of Variation	55.3	0.0	NV	0.0	19.9	28.3

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

Table D-2 6-Year Trending Data for Bayou Choctaw Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2012	2.7	3.7	7.2	0.5	16.8	7.7
	2013	2.7	2.5	7.3	0.5	18.3	6.8
	2014	2.9	2.5	7.3	0.5	18.5	10.8
	2015	4.7	2.5	7.4	0.5	23.2	21.1
	2016	5.5	2.5	7.6	0.8	21.7	26.4
	2017	7.5	2.5	7.6	0.5	21.2	24.2
B	2012	3.4	3.7	7.3	0.7	17.2	6.6
	2013	2.8	3.8	7.3	0.5	20.5	6.4
	2014	3.4	3.7	8	0.5	20.8	9.9
	2015	4.7	2.5	7.4	0.5	21.2	37.7
	2016	5.5	2.5	7.6	0.8	21.1	51.2
	2017	7.6	2.5	7.5	0.5	21.2	39.2
C	2012	3.4	5.2	7.2	0.9	17.2	7.3
	2013	2.8	2.5	7.4	0.5	18.4	7.3
	2014	2.8	2.5	7.3	0.5	18.4	9.7
	2015	4	2.5	7.3	0.5	22.7	22.6
	2016	4.9	2.5	7.6	0.9	21.8	29.4
	2017	8.3	2.5	7.4	0.5	20.9	22.6
D	2012	3.1	5.2	7.3	0.6	17.2	7.6
	2013	2.8	3.4	7.4	0.5	18.0	6.3
	2014	2.6	2.5	7.5	0.5	18.1	9.9
	2015	4.4	2.5	7.3	0.5	23.1	22
	2016	4.8	2.5	7.6	0.8	22.1	28.1
	2017	7.7	2.5	7.5	0.5	21.6	21.1
E	2012	2.8	5.2	7.3	0.5	17.1	7.2
	2013	2.6	3.4	7.5	0.5	18.2	5.6
	2014	2.4	3.7	7.5	0.5	18.6	12.2
	2015	3.4	2.5	7.2	0.5	22.7	23.9
	2016	4.7	2.5	7.4	0.9	20.9	30.4
	2017	8.6	2.5	7.5	0.5	21.1	24.6
F	2012	3.8	3.7	7.3	0.6	16.7	8.0
	2013	2.9	3.1	7.4	0.5	18.3	6.0
	2014	2	2.5	7.5	0.7	18.6	10.3
	2015	3.9	2.5	7.3	0.5	22.2	25
	2016	6.1	2.5	7.4	0.9	20.8	30.3
	2017	8.3	2.5	7.6	0.5	21	21.1
G	2012	4.1	3.7	7.4	0.5	17.1	8.9
	2013	3.6	4.3	7.6	0.5	18.6	9.1
	2014	4.7	2.5	7.6	0.5	18	10.3
	2015	4.3	2.5	7.5	0.5	22.5	22.4
	2016	5.5	2.5	7.5	0.9	21.6	26.9
	2017	7.6	2.5	7.7	0.5	22.1	24.4

Figure D-2 6-Year Trending Data for Bayou Choctaw Environmental Monitoring Stations

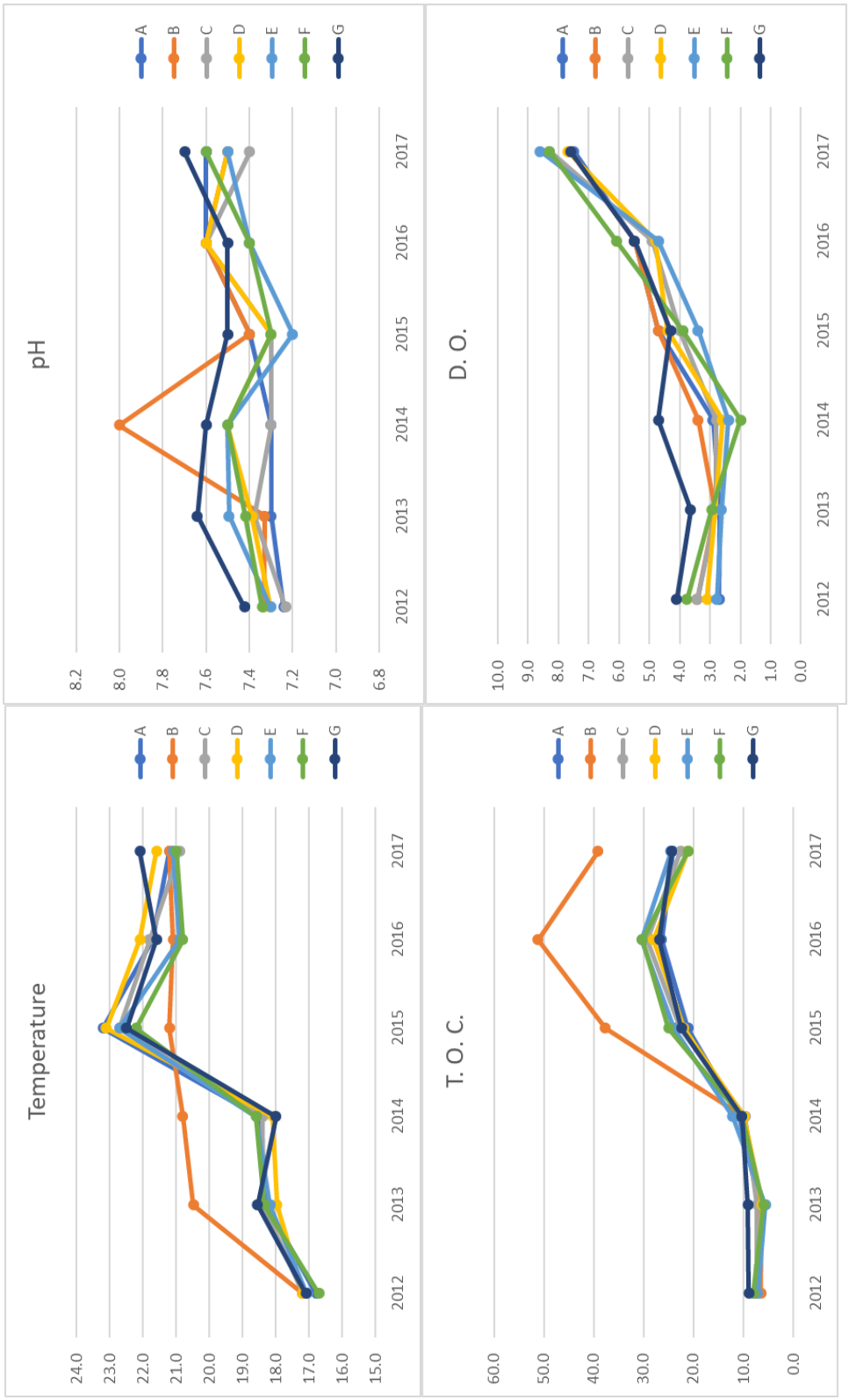
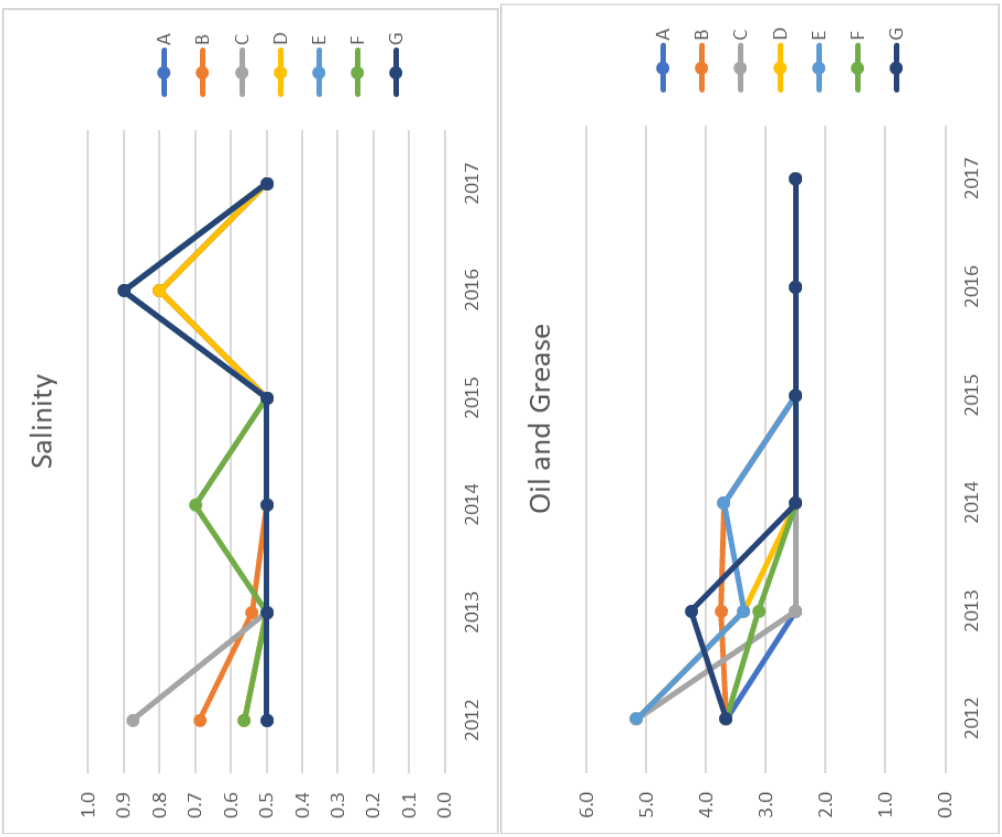
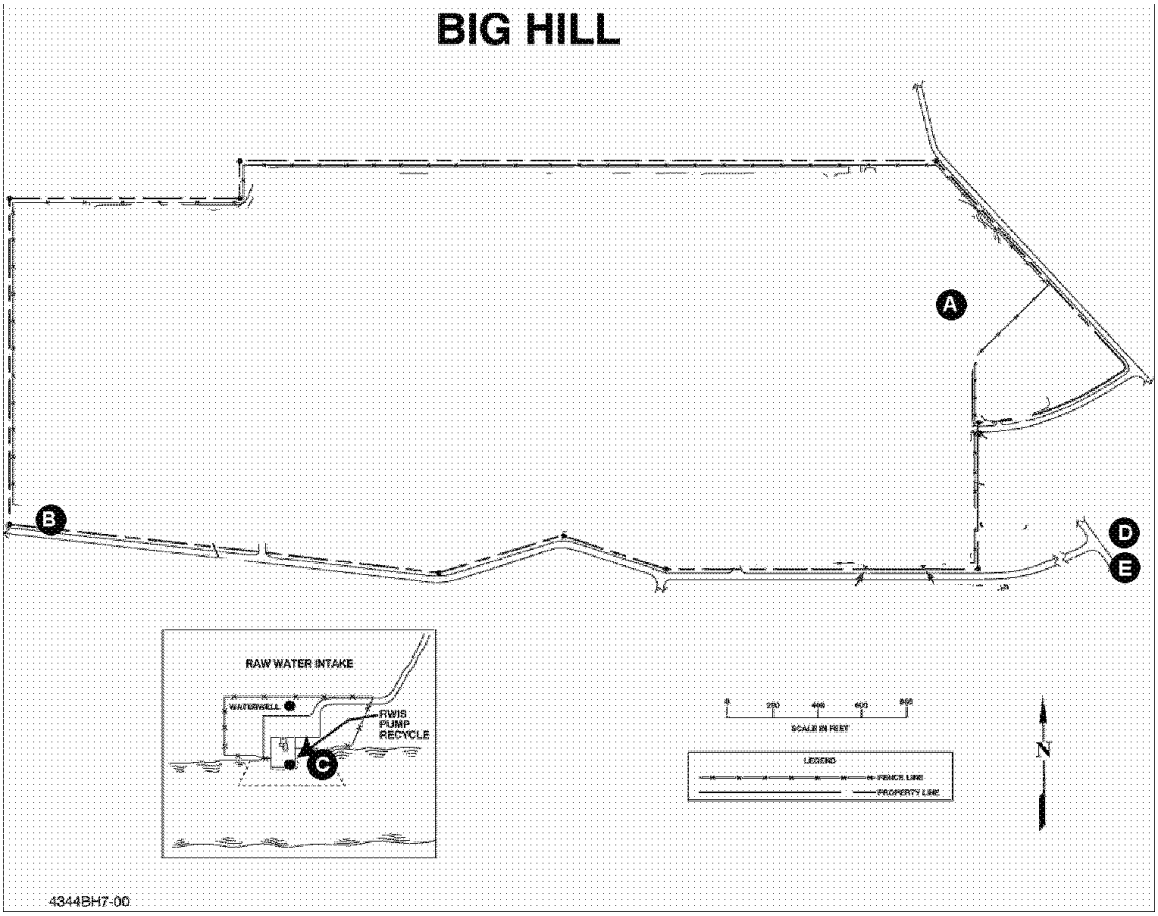


Figure D-2 6- Year Trending Data for Bayou Choctaw Environmental Monitoring Stations(continued)





Water Quality Monitoring Stations

A Pond receiving effluent from site sewage treatment plant (STP)
B Wilbur 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 D-3 Big Hill Environmental Monitoring Stations

Table D-3 2017 Data Summary for Big Hill Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	0	0	0	0	0	0
	Number of BDL	ND	ND	ND	ND	ND	ND
	Maximum	ND	ND	ND	ND	ND	ND
	Minimum	ND	ND	ND	ND	ND	ND
	Mean	ND	ND	ND	ND	ND	ND
	Median	ND	ND	ND	ND	ND	ND
	Standard Deviation	ND	ND	ND	ND	ND	ND
	Coefficient of Variation	ND	ND	ND	ND	ND	ND
B	Sample Size	12	4	12	12	12	12
	Number of BDL	1	4	NV	7	NV	0
	Maximum	7.8	2.5	7.3	3.4	31.0	18.6
	Minimum	0.1	2.5	6.6	0.5	13.0	8.7
	Mean	4.3	2.5	NV	1.1	23.8	13.5
	Median	5.9	2.5	7.0	0.5	24.5	14.1
	Standard Deviation	2.7	0.0	NV	0.9	5.7	2.9
	Coefficient of Variation	62.8	0.0	NV	81.8	23.9	21.5
C	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	4	NV	0
	Maximum	8.2	2.5	7.6	16.6	31.0	11.8
	Minimum	3.6	2.5	6.9	0.5	13.0	4.8
	Mean	6.0	2.5	NV	4.4	24.1	8.5
	Median	6.0	2.5	7.3	3.2	24.5	8.9
	Standard Deviation	1.6	0.0	NV	4.8	6.1	2.3
	Coefficient of Variation	26.7	0.0	NV	109.1	25.3	27.1
D	Sample Size	12	4	12	12	12	12
	Number of BDL	1	4	NV	12	NV	0
	Maximum	11.9	2.5	8.4	0.5	31.0	19.0
	Minimum	0.1	2.5	6.4	0.5	14.0	8.2
	Mean	6.3	2.5	NV	0.5	24.3	14.0
	Median	6.9	2.5	6.9	0.5	25.5	14.4
	Standard Deviation	3.7	0.0	NV	0.0	5.0	3.8
	Coefficient of Variation	58.7	0.0	NV	0.0	20.6	27.1
E	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	7	NV	0
	Maximum	12.5	2.5	7.1	2.3	30.0	21.5
	Minimum	0.7	2.5	6.4	0.5	12.0	6.0
	Mean	5.2	2.5	NV	1.0	24.0	13.7
	Median	4.2	2.5	6.6	0.5	25.5	14.1
	Standard Deviation	4.2	0.0	NV	0.6	5.8	4.7
	Coefficient of Variation	80.8	0.0	NV	60.0	24.2	34.3

Note: BDL = Number of samples that were below the detectable limit.
ND = No data, unable to obtain samples for testing
NV = Not a valid number or statistically meaningful.

Table D-4 6- Year Trending Data for Big Hill Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2012	4.04	2.50	7.18	0.50	24.50	22.46
	2013	3.17	3.83	7.02	0.50	21.50	13.12
	2014	N/A	N/A	N/A	N/A	N/A	N/A
	2015	N/A	N/A	N/A	N/A	N/A	N/A
	2016	N/A	N/A	N/A	N/A	N/A	N/A
	2017	N/A	N/A	N/A	N/A	N/A	N/A
B	2012	5.05	2.50	7.41	0.81	21.50	15.21
	2013	5.58	2.50	7.19	1.26	21.58	16.53
	2014	6.10	2.50	7.30	1.40	21.30	13.40
	2015	5.2	2.5	7.2	0.7	22.3	13.5
	2016	4.30	2.50	7.00	1.10	23.80	13.50
	2017	4.3	2.5	7.1	0.9	23.5	11.3
C	2012	6.04	4.20	7.55	13.32	23.25	11.31
	2013	7.4	2.5	7.6	11.6	22.7	8.0
	2014	7.2	2.5	7.5	9.2	22.2	8.1
	2015	6.4	2.5	7.4	5.2	23.2	9.8
	2016	6	2.5	7.3	4.4	24.1	8.5
	2017	5.2	2.5	7.3	7	24.3	7.8
D	2012	5.24	2.50	7.44	2.16	21.55	24.65
	2013	5.81	2.50	7.40	1.17	21.33	18.36
	2014	5.80	2.50	7.20	0.90	21.50	18.10
	2015	5.30	2.50	7.10	0.80	22.80	15.60
	2016	6.30	2.50	7.10	0.50	24.30	14.00
	2017	5.20	2.50	7.10	0.50	23.90	10.40
E	2012	4.37	3.60	7.33	3.57	22.00	24.76
	2013	5.73	2.50	7.30	3.46	22.02	20.88
	2014	6.10	5.20	7.00	2.50	22.00	19.60
	2015	4.40	2.50	6.60	0.70	22.30	17.30
	2016	5.20	2.50	6.70	1.00	24.00	13.70
	2017	3.00	2.50	6.70	2.00	23.80	12.50

Figure D-4 6- Year Trending Data for Big Hill Environmental Monitoring Stations

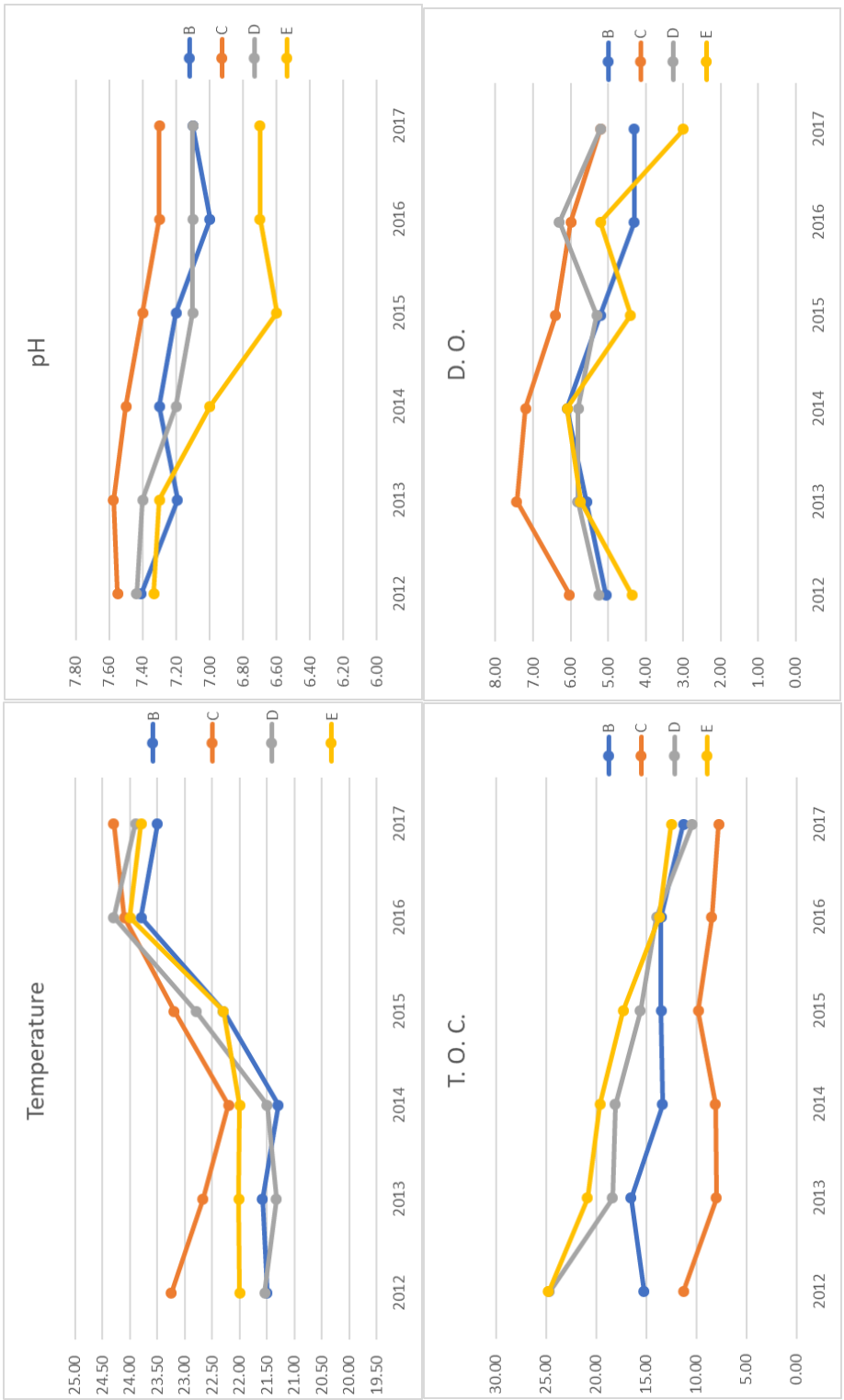
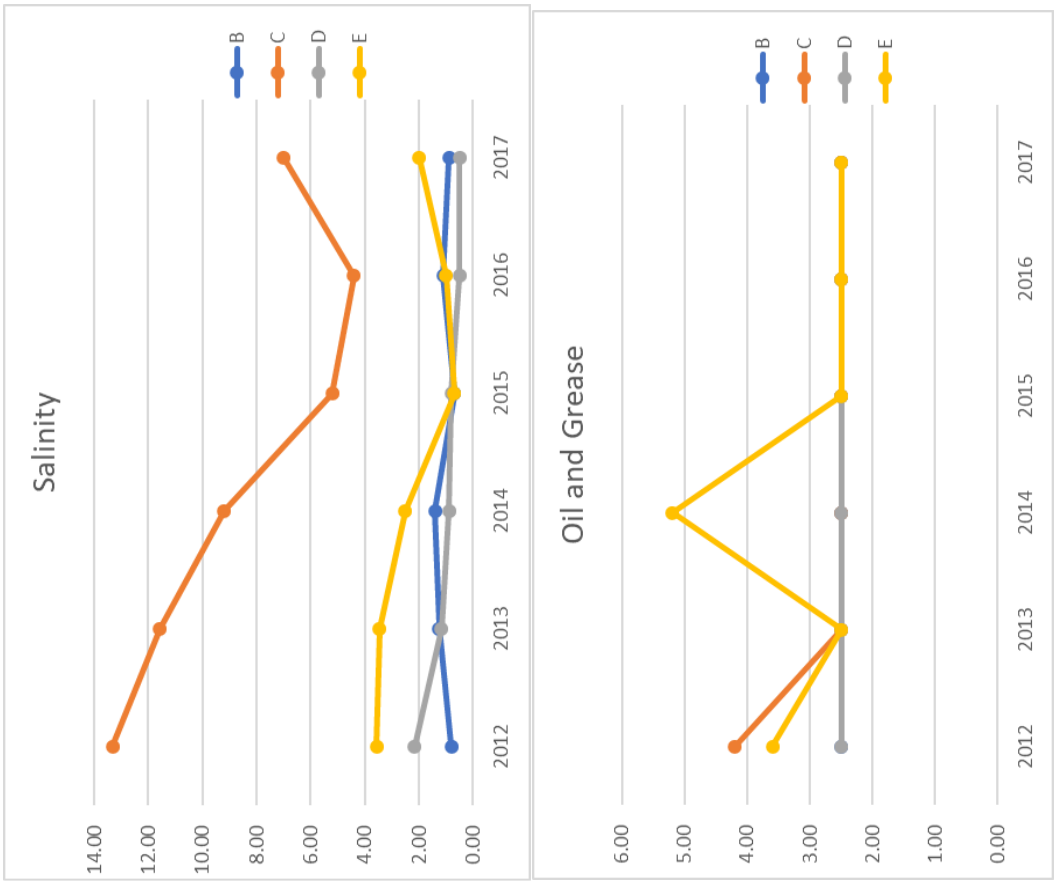
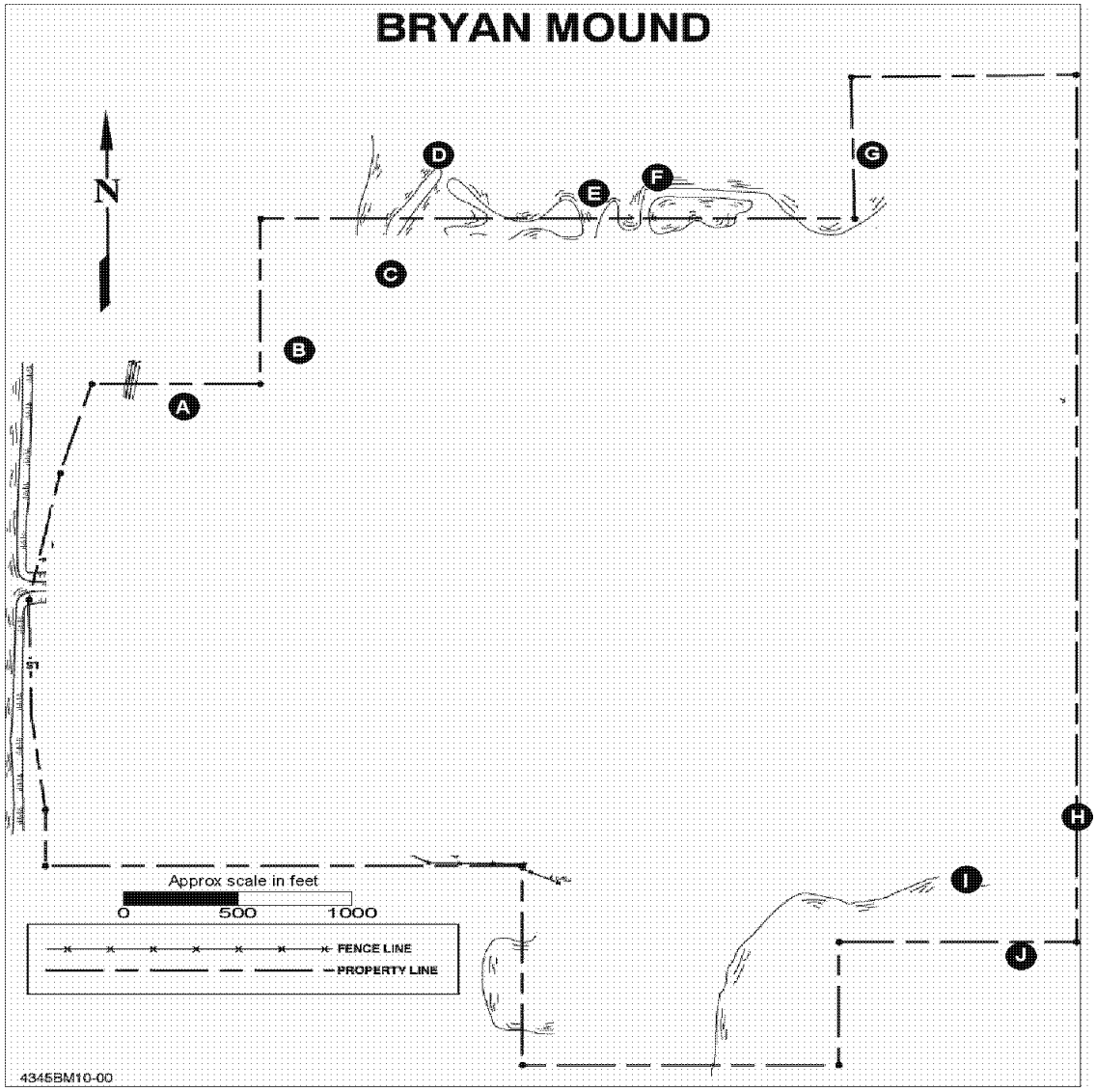


Figure D-4 6- Year Trending Data for Big Hill Environmental Monitoring Stations(continued)





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 D-5 Bryan Mound Environmental Monitoring Stations

Table D-5 2017 Data Summary for Bryan Mound Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	4	2	5	5	5	5
	Number of BDL	0	3	NV	1	NV	0
	Maximum	13.1	2.5	8.4	3.3	25.6	33.6
	Minimum	10.1	2.5	7.2	0.3	20.1	9.8
	Mean	11.1	2.5	7.7	1.7	22.4	24.1
	Median	10.6	2.5	7.6	1.4	22.2	25.1
	Standard Deviation	1.4	0.0	NV	1.3	2.3	8.8
	Coefficient of Variation	12.6	0.0	NV	76.5	10.3	36.5
B	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	1	NV	0
	Maximum	13.9	2.5	8.3	3.3	25.6	38.4
	Minimum	10.5	2.5	7.3	0.3	20.1	9.6
	Mean	11.8	2.5	7.6	1.7	22.4	25.6
	Median	11.4	2.5	7.4	1.4	22.2	26.9
	Standard Deviation	1.5	0.0	NV	1.3	2.3	10.8
	Coefficient of Variation	12.7	0.0	NV	76.5	10.3	42.2
C	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	1	NV	0
	Maximum	13.1	2.5	7.9	3.1	25.7	35.8
	Minimum	9.9	2.5	7.6	0.3	20.1	9.0
	Mean	11.2	2.5	7.7	1.7	22.4	24.8
	Median	10.9	2.5	7.6	1.4	22.2	26.4
	Standard Deviation	1.4	0.0	NV	1.2	2.4	10.5
	Coefficient of Variation	12.5	0.0	NV	70.6	10.7	42.3
D	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	1	NV	0
	Maximum	13.6	2.5	7.9	3.3	26.1	33.3
	Minimum	10.2	2.5	7.1	0.3	20.1	9.3
	Mean	11.4	2.5	7.4	1.7	22.5	24.6
	Median	11.0	2.5	7.5	1.4	22.2	28.0
	Standard Deviation	1.5	0.0	NV	1.3	2.5	9.5
	Coefficient of Variation	13.2	0.0	NV	76.5	11.1	38.6
E	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	0	NV	0
	Maximum	13.4	2.5	7.6	3.3	26.0	33.9
	Minimum	10.4	2.5	7.2	0.3	20.2	9.3
	Mean	11.6	2.5	7.5	1.7	22.5	23.6
	Median	11.3	2.5	7.6	1.4	22.2	23.6
	Standard Deviation	1.4	0.0	NV	1.3	2.4	9.1
	Coefficient of Variation	12.1	0.0	NV	76.5	10.7	38.6

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

Table D-5 2017 Data Summary for Bryan Mound Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
F	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	1	NV	0
	Maximum	13.3	2.5	7.9	3.3	25.7	31.9
	Minimum	10.1	2.5	7.5	0.3	20.1	9.4
	Mean	11.2	2.5	7.7	1.7	22.5	23.0
	Median	10.7	2.5	7.7	1.4	22.3	22.7
	Standard Deviation	1.5	0.0	NV	1.3	2.3	8.8
	Coefficient of Variation	13.4	0.0	NV	76.5	10.2	38.3
G	Sample Size	4	2	5	5	5	5
	Number of BDL	0	4	NV	1	NV	0
	Maximum	13.6	2.5	8.7	21.3	25.7	32.4
	Minimum	10.4	2.5	7.1	0.3	20.1	9.0
	Mean	11.5	2.5	7.6	5.3	22.4	22.8
	Median	11.0	2.5	7.5	1.4	22.2	22.8
	Standard Deviation	1.4	0.0	NV	9.0	2.4	8.9
	Coefficient of Variation	12.2	0.0	NV	169.8	10.7	39.0
H	Sample Size	6	5	6	6	6	6
	Number of BDL	0	4	NV	1	NV	0
	Maximum	15.6	2.5	7.8	21.1	30.9	34.7
	Minimum	3.8	2.5	6.7	0.5	20.8	9.3
	Mean	10.1	2.5	7.1	12.1	25.1	21.4
	Median	11.0	2.5	7.0	12.8	25.0	21.1
	Standard Deviation	4.7	0.0	NV	7.5	4.2	10.5
	Coefficient of Variation	46.5	0.0	NV	62.0	16.7	49.1
I	Sample Size	6	5	7	7	7	7
	Number of BDL	0	4	NV	1	NV	0
	Maximum	15.8	2.5	8.4	21.3	30.9	32.2
	Minimum	5.4	2.5	6.8	0.5	20.8	8.8
	Mean	10.4	2.5	7.5	13.4	24.8	18.6
	Median	10.9	2.5	7.6	15.4	24.2	16.2
	Standard Deviation	4.3	0.0	NV	7.7	3.8	8.6
	Coefficient of Variation	41.3	0.0	NV	57.5	15.3	46.2
J	Sample Size	6	5	7	7	7	7
	Number of BDL	0	4	NV	1	NV	0
	Maximum	15.4	2.5	8.5	21.3	30.9	31.7
	Minimum	6.1	2.5	6.8	0.5	20.8	8.6
	Mean	10.6	2.5	7.4	13.4	24.8	17.8
	Median	10.9	2.5	7.2	15.3	24.2	13.2
	Standard Deviation	4.1	0.0	NV	7.7	3.8	8.8
	Coefficient of Variation	38.7	0.0	NV	57.5	15.3	49.4

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

Table D-6 6- Year Trending Data for Bryan Mound Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2012	9.0	2.5	7.1	5.4	26.8	27.5
	2013	11.9	2.5	6.8	9.1	21.5	30.9
	2014	7.4	2.5	7.3	9.8	21.6	33.8
	2015	6	2.5	7.1	5.3	23.3	22.3
	2016	7.3	4	7.3	2.5	22.3	24.1
	2017	11.1	2.5	7.7	1.7	22.4	24.1
B	2012	10.8	2.5	7.2	5.4	26.8	27.3
	2013	12.9	2.5	6.9	9.2	21.4	31.1
	2014	7.7	2.5	7.4	10.1	21.5	35.6
	2015	5.9	2.5	7.1	5.3	23.3	21.7
	2016	7.4	2.5	7.4	2.5	22.3	22.8
	2017	11.8	2.5	7.6	1.7	22.4	25.6
C	2012	10.6	2.5	7.3	5.5	26.9	26.9
	2013	13.4	2.5	7.1	9.3	21.3	30.7
	2014	7.8	2.5	7.6	10.1	21.6	34.9
	2015	5.9	2.5	7.2	5.3	23.3	21.6
	2016	7.4	2.5	7.4	2.5	22.3	23.7
	2017	11.2	2.5	7.7	1.7	22.4	24.8
D	2012	10.4	2.5	7.3	5.5	27.1	25.1
	2013	13.1	2.5	7.1	9.2	21.5	29.3
	2014	8.1	2.5	7.6	10	21.7	35.1
	2015	5.8	2.5	7.2	5.3	23.2	21.6
	2016	7.1	2.5	7.4	2.5	22.3	21.8
	2017	11.4	2.5	7.4	1.7	22.5	24.6
E	2012	10.8	2.5	7.3	5.4	27.0	25.1
	2013	12.5	2.5	7.2	9.1	21.6	29.7
	2014	7.9	2.5	7.6	10.1	21.8	34.8
	2015	5.9	2.5	7.2	7.9	23.3	18.9
	2016	7.3	2.5	7.5	2.5	22.3	21.4
	2017	11.6	2.5	7.5	1.7	22.5	23.6
F	2012	10.6	2.5	7.3	5.4	27.1	24.9
	2013	13.0	2.5	7.2	9.2	21.6	29.7
	2014	7.9	2.5	7.5	10.1	21.7	35.1
	2015	5.7	2.5	7.1	5.2	23.5	20.4
	2016	7.4	2.5	7.4	2.5	22.3	21.5
	2017	11.2	2.5	7.7	1.7	22.5	23

Table D-6 6- Year Trending Data for Bryan Mound Monitoring Stations (continued)

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
G	2012	10.6	2.5	7.4	5.5	27.2	24.5
	2013	13.2	2.5	7.1	9.3	21.5	29.8
	2014	7.9	2.5	7.7	11.8	21.8	34.4
	2015	5.8	2.5	7.2	5.2	23.5	20.8
	2016	7.8	2.5	7.4	2.5	22.3	21
	2017	11.5	2.5	7.6	5.3	22.4	22.8
H	2012	6.3	2.5	7.2	21.8	27.2	14.9
	2013	13.1	2.5	7.0	23.6	21.5	13.7
	2014	7.3	2.5	7.3	21.5	23.5	16.6
	2015	5.7	2.5	7.3	5.9	22.4	16.4
	2016	11.2	2.5	7.1	5.3	22.6	23.8
	2017	10.1	2.5	7.1	12.1	25.1	21.4
I	2012	6.1	2.5	7.3	21.9	26.8	14.7
	2013	13.3	2.5	7.1	23.7	21.6	13.3
	2014	7.4	2.5	7.4	21.5	23.4	15.6
	2015	5.6	2.5	7.3	5.6	22.5	16.2
	2016	11.3	2.5	7.1	5.3	22.6	23.6
	2017	10.4	2.5	7.5	13.4	24.8	18.6
J	2012	6.3	2.5	7.2	21.8	27.1	13.5
	2013	13.1	2.5	7.1	24.4	21.6	13.3
	2014	7.4	2.5	7.4	21.5	23.4	15.2
	2015	5.9	2.5	7.3	6	22.5	16
	2016	11	2.5	7	5.3	21.3	23.1
	2017	10.6	2.5	7.4	13.4	24.8	17.8

Figure D-6 6- Year Trending Data for Bryan Mound Environmental Monitoring Stations

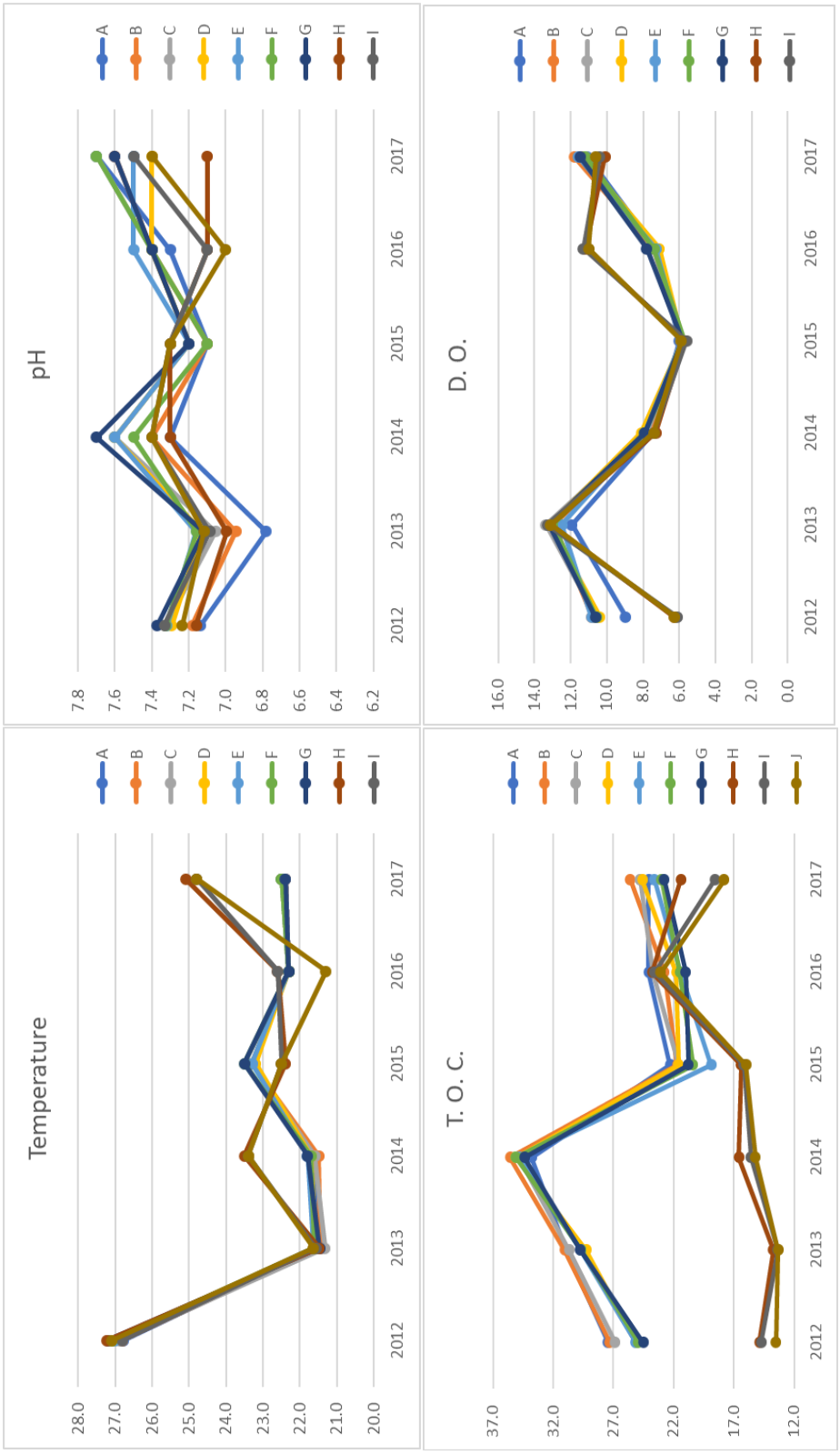
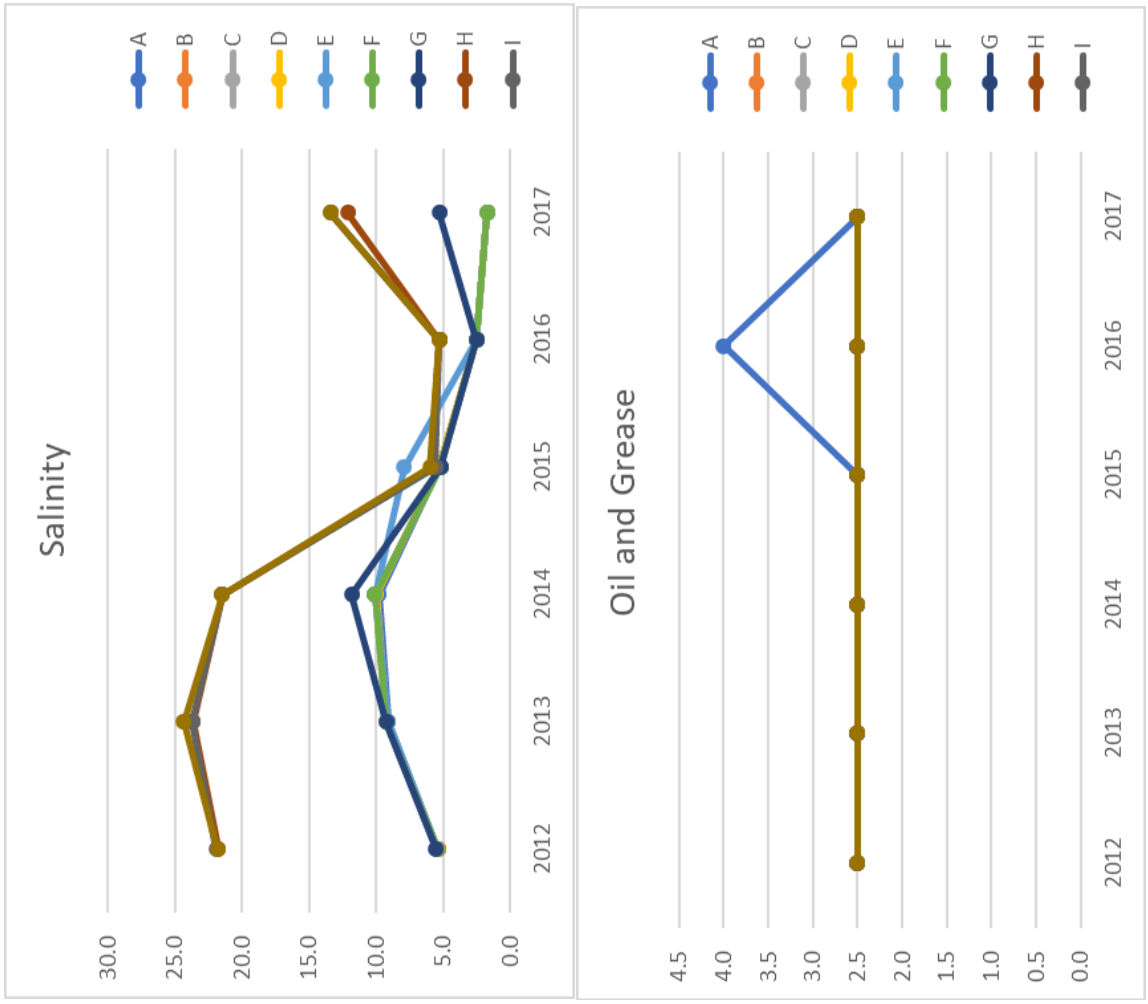
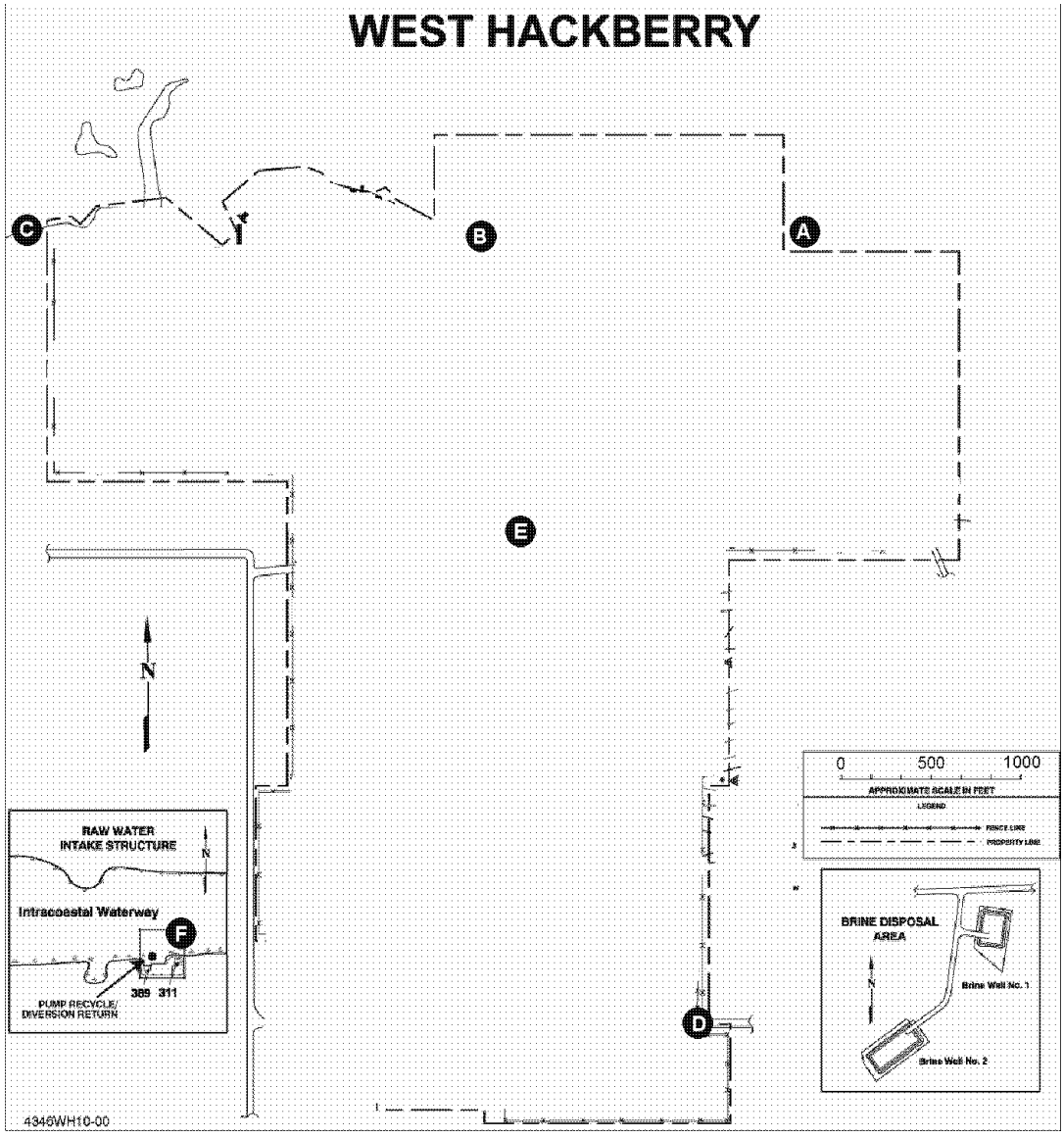


Figure D-6 6- Year Trending Data for Big Hill Environmental Monitoring Stations (continued)





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 D-7 West Hackberry Environmental Monitoring Stations

Table D-7 2017 Data Summary for West Hackberry Monitoring Stations

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	0	NV	0
	Maximum	11.4	2.5	8.2	13.0	29.0	8.1
	Minimum	6.1	2.5	7.5	2.8	7.0	5.0
	Mean	8.1	2.5	7.8	7.4	21.8	7.0
	Median	7.5	2.5	7.8	6.4	23.5	7.1
	Standard Deviation	1.7	0.0	NV	3.4	7.2	0.9
	Coefficient of Variation	21.0	0.0	NV	45.9	33.0	12.9
B	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	0	NV	0
	Maximum	11.6	2.5	8.2	12.0	29.0	8.6
	Minimum	6.1	2.5	7.5	2.8	7.0	5.1
	Mean	8.1	2.5	7.8	7.3	21.9	7.1
	Median	7.6	2.5	7.9	6.4	23.5	7.2
	Standard Deviation	1.7	0.0	NV	3.1	7.1	0.9
	Coefficient of Variation	21.0	0.0	NV	42.5	32.4	12.7
C	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	0	NV	0
	Maximum	11.8	2.5	8.3	12.0	29.0	8.5
	Minimum	6.6	2.5	7.6	2.8	7.0	5.1
	Mean	8.3	2.5	7.9	6.8	22.1	7.2
	Median	7.7	2.5	7.9	6.4	24.0	7.2
	Standard Deviation	1.8	0.0	NV	2.9	7.1	0.9
	Coefficient of Variation	21.7	0.0	NV	42.6	32.1	12.5
D	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	12	NV	0
	Maximum	11.0	2.5	8.5	1.2	30.0	10.2
	Minimum	4.3	2.5	7.4	0.5	9.0	2.4
	Mean	7.8	2.5	7.9	0.7	22.3	5.8
	Median	7.4	2.5	7.9	0.5	22.5	5.7
	Standard Deviation	1.9	0.0	NV	0.3	6.2	2.0
	Coefficient of Variation	24.4	0.0	NV	42.9	27.8	34.5

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

Table D-7 2017 Data Summary for West Hackberry Monitoring Stations (continued)

Station	Statistical Parameters	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
E	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	10	NV	0
	Maximum	11.6	2.5	8.6	1.9	31.0	7.0
	Minimum	3.7	2.5	7.1	0.5	9.0	2.0
	Mean	8.0	2.5	7.9	0.7	22.5	3.9
	Median	8.4	2.5	7.8	0.5	22.5	3.8
	Standard Deviation	2.6	0.0	NV	0.4	6.4	1.5
	Coefficient of Variation	32.5	0.0	NV	57.1	28.4	38.5
F	Sample Size	12	4	12	12	12	12
	Number of BDL	0	4	NV	6	NV	0
	Maximum	11.0	2.5	8.2	14.0	32.0	9.6
	Minimum	4.6	2.5	7.0	0.5	9.0	4.7
	Mean	7.3	2.5	7.5	4.8	22.8	7.8
	Median	6.7	2.5	7.3	2.6	24.5	8.0
	Standard Deviation	2.0	0.0	NV	4.6	7.3	1.4
	Coefficient of Variation	27.4	0.0	NV	95.8	32.0	17.9

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

Table D-8 6- Year Trending Data for West Hackbery Monitoring Stations

Station	Year	Dissolved Oxygen (mg/L)	Oil & Grease (mg/L)	pH (s.u.)	Salinity (ppt)	Temperature (°C)	Total Organic Carbon (mg/L)
A	2012	7.40	2.50	7.34	12.75	23.58	8.38
	2013	8.43	2.50	7.56	12.63	22.92	7.11
	2014	8.20	2.50	7.80	13.50	22.30	7.10
	2015	8.00	2.50	7.70	7.80	22.40	7.80
	2016	8.40	2.50	7.90	5.90	23.40	7.50
	2017	8.10	2.50	7.80	7.40	21.80	7.00
B	2012	7.29	2.50	7.27	12.54	23.67	8.56
	2013	8.55	2.50	7.56	12.25	22.83	7.18
	2014	8.40	2.50	7.70	13.10	22.30	7.20
	2015	8.2	2.5	7.7	7.6	22.3	7.7
	2016	8.40	2.50	7.90	5.70	23.30	7.60
	2017	8.10	2.50	7.80	7.30	21.90	7.10
C	2012	7.33	2.50	7.26	12.38	23.67	8.54
	2013	8.39	2.50	7.51	12.12	22.83	7.19
	2014	8.4	2.5	7.7	12.7	22.3	7.2
	2015	8.1	2.5	7.7	7.5	22.3	7.9
	2016	8.6	2.5	7.9	5.6	23.8	7.6
	2017	8.3	2.5	7.9	6.8	22.1	7.2
D	2012	9.76	2.50	8.00	0.50	23.08	9.09
	2013	11.70	2.50	8.01	0.50	24.67	7.70
	2014	8.60	30.40	7.90	0.50	21.90	7.10
	2015	7.60	2.50	7.60	0.50	21.70	6.00
	2016	8.10	2.50	7.70	0.50	23.50	6.10
	2017	7.80	2.50	7.90	0.70	22.30	5.80
E	2012	6.96	2.50	7.61	0.50	23.08	4.32
	2013	8.73	2.50	7.82	0.83	23.92	5.54
	2014	7.50	2.50	7.90	0.60	22.00	4.60
	2015	7.10	2.50	7.80	0.50	22.50	4.10
	2016	8.10	2.50	7.90	0.50	23.00	4.10
	2017	8.00	2.50	7.90	0.70	22.50	3.90
F	2012	6.71	2.50	7.13	8.88	23.75	8.70
	2013	7.55	2.50	7.28	8.27	22.50	8.55
	2014	7.4	2.5	7.4	8.3	22.5	8.0
	2015	7.4	2.5	7	3.4	22.5	7.8
	2016	7.5	2.5	7.2	3	23.3	8.2
	2017	7.3	2.5	7.5	4.8	22.8	7.8

Figure D-8 6- Year Trending Data for West Hackbery Monitoring Stations

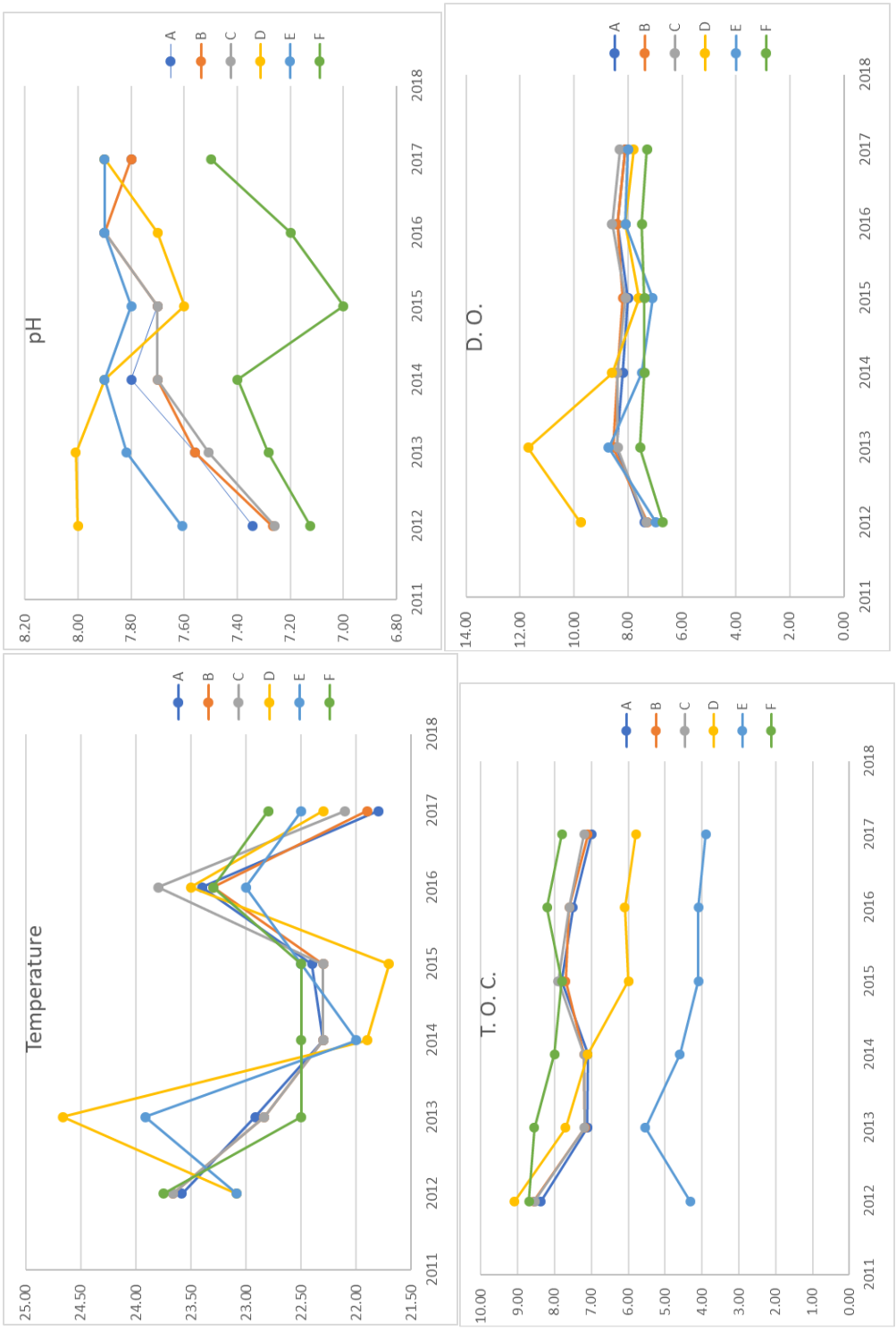
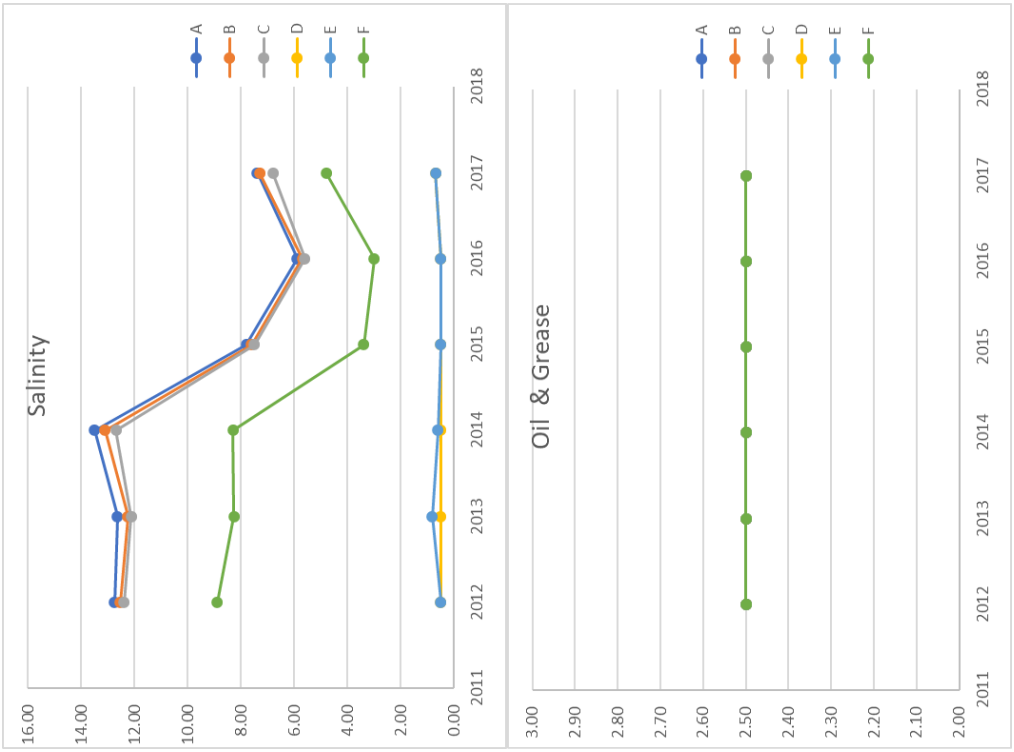


Figure D-8 6- Year Trending Data for West Hackbery Monitoring Stations



End of Appendix

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Appendix E

QUALITY ASSURANCE AUDITS

DURING 2017

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	N/A
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	N/A
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	
13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits	MSI7000.133 version 3.0,	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

	the incorrect entry to remain legible?	Section 7.1.1		
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☒	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☒	
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory	MSI7000.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

	coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum	MSI7000.133 version 3.0, Appendix A	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1-17-17** **AUDITOR: Paul Veillon**

	convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI700.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000 version 2.0 section 3.1.5 Sample Labeling	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI700.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI700.133 version 3.0, Section 2.1.3.2	☒	Hard copies on file & data entered into COSMOS
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI700.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI700.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI700.133 version 3.0, Section 3.2 & 3.2.1	☒	N/A - Automatic Pipettors used for dispensing macro (.5ml)
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI700.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI700.133 version 3.0, Section 3.4	☒	Initial certification with hydrometer / inspected and verified before each use
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI700.133 version 3.0, Section 3.6	☒	Standard # 92323 / digital units included annual M&TE PM
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI700.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI700.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI700.133 version 3.0, Section 7.1.1	☒	
13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits	MSI700.133 version 3.0,	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

	the incorrect entry to remain legible?	Section 7.1.1		
14.	Is a chemical inventory (listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI700.133 version 2.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI700.133 version 3.0, Section 7.1.1	☒	Entered into ESS database
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI700.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI700.133 version 3.0, Section 7.3	☒	Form HW004E no longer used.(HW003E – weekly, & HW005E – monthly) Entered into ESS database.
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears ass well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory	MSI700.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

	coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum	MSI700.133 version 3.0, Appendix A	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 1/26/17** **AUDITOR: Beecher Adams**

	convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.Sample example on Lab refrigerator
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	Checked sample bottles in oil lab

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	No Hydrometer in Lab; all hydrometers are kept in M&TE area and calibrated annually
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	
13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits	MSI7000.133 version 3.0,	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

	the incorrect entry to remain legible?	Section 7.1.1		
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☒	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☒	No longer use Form #HW004E; yes there is evidence of inventories
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory	MSI7000.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

	coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum	MSI7000.133 version 3.0, Appendix A	☒	Yes to rules

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01/25/2016** **AUDITOR: Angela Coale**

	convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE:** **01-31-17** **AUDITOR: Jake Norwood**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 01-31-17** **AUDITOR: Jake Norwood**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	Oven and refrigerators only appliances being used

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE:** **01-31-17** **AUDITOR: Jake Norwood**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	n/a use densitometer for API or Specific Gravity
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE:** **01-31-17** **AUDITOR: Jake Norwood**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☒	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☒	
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE:** **01-31-17** **AUDITOR: Jake Norwood**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE:** **01-31-17** **AUDITOR: Jake Norwood**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	Does not use Automatic Pipettors, Jude uses Manual
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	Does not use Hydrometers
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	**JM Test certifies every October**
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	
13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits	MSI7000.133 version 3.0,	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

	the incorrect entry to remain legible?	Section 7.1.1		
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☒	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☒	
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory	MSI7000.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

	coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum	MSI7000.133 version 3.0, Appendix A	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☒ BH ☐ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 8-9-2017** **AUDITOR: Paul Veillon**

	convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI700.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **NGMS,** vendor lab, date the minimum	ASI7000 version 2.0 section 3.1.5 Sample Labeling	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

	retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI700.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI700.133 version 3.0, Section 2.1.3.2	☒	Hard copies on file & data entered into COSMOS
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI700.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI700.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI700.133 version 3.0, Section 3.2 & 3.2.1	☒	N/A - Automatic Pipettors used for dispensing macro (.5ml)
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI700.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI700.133 version 3.0, Section 3.4	☒	Initial certification with hydrometer / inspected and verified before each use
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI700.133 version 3.0, Section 3.6	☒	Standard # 92323 / digital units included annual M&TE PM
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI700.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI700.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI700.133 version 3.0, Section 7.1.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI700.133 version 3.0, Section 7.1.1	☒	
14.	Is a chemical inventory (listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI700.133 version 2.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI700.133 version 3.0, Section 7.1.1	☒	Entered into ESS database
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI700.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI700.133 version 3.0, Section 7.3	☒	Form HW004E no longer used.(HW003E – weekly, & HW005E – monthly) Entered into ESS database.
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears ass well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI700.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI700.133 version 3.0, Appendix A	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☒ WH ☐ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and Procedures Manual" and ASI7000.12 Version 2.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 7/24/17** **AUDITOR: Beecher Adams**

	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Reviewed 3 samples that was label from OPS
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	Checked sample bottles in the oil lab

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☒	No hydrometers in lab. All hydormeters are kept in I/E and calibrated annually with M&TE
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	
13.	Are erroneous entries crossed through once, initialed and dated in a manner that permits	MSI7000.133 version 3.0,	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

	the incorrect entry to remain legible?	Section 7.1.1		
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☐	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☐	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☐	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☒	No longer use form #HW004E Yes, there is evidence of inventories
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use. • Rubberized laboratory apron or a chemical and fire-resistant laboratory	MSI7000.133 version 3.0, Section 10.2.1	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

	coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts necessary for daily operation. The container size shall be the minimum	MSI7000.133 version 3.0, Appendix A	☒	

Laboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☐ BM ☒**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/2017** **AUDITOR: Angela Coale**

	convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/17** **AUDITOR: Jake Norwood**

	CRITERIA	DOCUMENT NO.	ACC	FINDING
1.	**Environmental Samples** Does the following information appear on sample bottle labels: • Unique sample identifier (Sample Number) • Sample point name/location/description • Date of sample collection • Name or initial of personnel collecting the sample • Type of analysis to be performed	MSI7000.133 version 3.0 section 2.1.1.1 Environmental Samples	☒	Click here to enter text.
2.	**Crude Oil Samples** Does the following information appear on sample bottle labels • Sample Number:Site (BC, BM) year (02,03 etc.) month (01-12), day (01-31) and chronological sequence (001-999) • Sample From: (in line sampler, beginning, middle, end, grab, etc.) and Cav. 118, Tank 12A if applicable) • Date: Date and time sample was collected • Type of Crude: (Sweet, sour, slop) and Brent, Bingo Bongo, etc. if applicable) • Name of personnel who collected the sample • Disposition: Example (Retention, Site Lab analysis, Ship to **DOE contract lab,** vendor lab, date the	ASI7000.12 version 3.0 section 3.1.5 Sample Labeling	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/17** **AUDITOR: Jake Norwood**

	minimum retention period expires and sample can be returned to the crude oil stream.			
	CRITERIA	**DOCUMENT NO.**	**ACC**	**FINDING**
2.	**Environmental Media Chain of Custody** Is the "Environmental Chain of Custody Procedure, ASI7000.115 available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.1	☒	
3.	**Crude Oil Chain of Custody** Is the "Crude Oil Quality and Quality Control Procedures Manual" (ASI7000.12) available and followed in the laboratory?	MSI7000.133 version 3.0, Section 2.1.3.2	☒	
4.	Are routine calibration checks, in the range of interest using a set of class "1" weights, performed daily when an Analytical Balance is being used?	MSI7000.133 version 3.0, Section 3.1	☒	
5.	Is the "true weight" and "observed weight" noted and documented in the laboratory's balance log book?	MSI7000.133 version 3.0, Section 3.1	☒	
6.	Are Automatic Pipettors calibrated and checked every 6 months and recorded in the laboratory's maintenance log book?	MSI7000.133 version 3.0, Section 3.2 & 3.2.1	☐	n/a
7.	Are ovens, water baths, refrigerators and incubators monitored by using NIST traceable certified thermometers and temperatures documented daily in the laboratory appliance log?	MSI7000.133 version 3.0, Section 3.3	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/17** **AUDITOR: Jake Norwood**

8.	Are Hydrometers examined for damage and verified by comparison to a primary standard NIST certified hydrometer before initial use?	MSI7000.133 version 3.0, Section 3.4	☐	n/a
9.	Are Thermometers certified against a NIST traceable primary standard before initial use and annually thereafter?	MSI7000.133 version 3.0, Section 3.6	☒	
10	Are Volumetric Ware used for volumetric measurements rated as Class A or conform to Class A standards (NBC Circular 434 or ATM Special Publication 148-H)	MSI7000.133 version 3.0, Section 3.7	☒	
11.	When standards, chemicals, materials, or reagents are received into the laboratory are the following actions accomplished: • Date of receipt written on the bottle or container label and documented into the appropriate log book? • Is the material name, manufacture, lot number, and expiration date recorded in the appropriate logbook? • Once the container is opened and placed into service the date and expiration date is recorded on the container label and in the appropriate logbook?	MSI7000.133 version 3.0, Section 6.2	☒	
12.	Is laboratory data recorded in ink in a bound notebook with sequentially numbered pages, initialed and dated by the applicable analysts?	MSI7000.133 version 3.0, Section 7.1.1	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/17** **AUDITOR: Jake Norwood**

13.	Are <u>erroneous entries</u> crossed through once, initialed and dated in a manner that permits the incorrect entry to remain legible?	MSI7000.133 version 3.0, Section 7.1.1	☒	
14.	Is a chemical inventory(listing all chemicals stored and or used in or by the laboratory that "belongs" to the laboratory) completed quarterly?	MSI7000.133 version 3.0, Section 7.3.1	☒	
15.	Does the chemical inventory list the quantities, container type and location?	MSI7000.133 version 3.0, Section 7.1.1	☒	
16.	Is the chemical inventory provided to the site ES&H department and a copy printed and filed with laboratory MSDS file, and is the copy updated on a quarterly basis within the MSDS file?	MSI7000.133 version 3.0, Section 7.1.1	☒	
17.	Is there evidence of weekly inspections when needed and monthly inventories?	MSI7000.133 version 3.0, Section 7.3	☐	n/a
18.	Is the following Protective Equipment used • Goggles such as G, H or I when working with more than 100ml of corrosive liquid. • Face Shield, type N, large enough to protect the chin, neck and ears as well as the face when handling • More than one gallon of corrosive • liquid. • Gloves made of a material known to be resistant to permeation by the corrosive liquid and the gloves tested for leaks prior to use.	MSI7000.133 version 3.0, Section 10.2.1	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
Performance Objective: *Ensure that requirements of MSI7000.133 Version 3.0 "Laboratory Programs and 6Manual" and ASI7000.12 Version 3.0, Crude Oil Quality And Quantity Control Procedures," are being implemented and ensures compliance with permits , DOE Orders or other imposed requirements.*	**DATE: 07/25/17** **AUDITOR: Jake Norwood**

	• Rubberized laboratory apron or a chemical and fire-resistant laboratory coat when mixing, or handling more than one liter of corrosive liquid.			
19.	Are the following Chemical Hygiene Plan general rules followed: • No eating, drinking, smoking or applying cosmetics in the laboratory and in chemical storage or use areas? • No storing, handling, or consuming food or beverages in storage areas, refrigerators, glassware, or utensils that are used for lab operations? • Do not use mouth suction for pipetting or starting a siphon? • Confine long hair and loose clothing? • Know the location of fire extinguishers, showers, exits, and eyewash fountains/stations? • Do not use or handle any chemical until you have read and understood the label and MSDS for that chemical? • Wash areas of exposed skin with soap and water upon any instance of chemical contact. Do not wash with solvents? • Limit chemicals stored at the lab bench or other work areas to those amounts	MSI7000.133 version 3.0, Appendix A	☒	

xLaboratory Programs and Procedures Manual Implementation	**SITE: BC ☐ BH ☐ WH ☒ BM ☐**
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	necessary for daily operation. The container size shall be the minimum convenient? • Avoid skin contact with all chemicals. • Avoid inhalation of chemicals; do not perform "sniff" tests? • Use all laboratory equipment only for its intended purpose? • Floors, aisles, and exits shall be kept clean, dry, and free of obstructions. • Fire extinguishing equipment, eyewashes, showers, electrical disconnects, and other emergency equipment shall remain unobstructed • Never work alone in a laboratory or chemical storage area if at all possible If not possible, arrange to have someone within earshot or to check on you on a periodic and frequent basis When working with flammable chemicals, arrange the work area such that no sources of ignition are near enough to cause a fire or explosion, in case of a vapor release or liquid spill?			

End of Appendix