U.S. DEPARTMENT OF ENERGY

STRATEGIC PETROLEUM RESERVE

Project Performance Criteria

Level II

December 2023

Approved by:

Project Manager

Strategic Petroleum Reserve

VERSION HISTORY U.S. DEPARTMENT OF ENERGY STRATEGIC PETROLEUM RESERVE PROJECT PERFORMANCE CRITERIA LEVEL II		
VERSION	DESCRIPTION	EFFECTIVE DATE
4.0	Updates document references and distribution terminal names, incorporates Version 3.0 below, and incorporates the following approved ECP: EC-2016-000013, Reduce SPR Authorized Capacity to 713.5 MMBBL. EC-2017-000001, Pipe West Hackberry Cavern 105 to the Sour Crude Oil Header	December 2023
3.0	This document was revised (per EC2015000052, approved 2/16/2016) to: (1) update references (2) to allow DCS operations from the Alternate Operating Location (AOL) (3) incorporate outstanding ECPs below that had accrued since the previous signed version in 2008 VA-M/O-8452, Change Level II Criteria Tolerance Levels for Authorized Cavern Capacity. BH-M/O-5760, Change Authorized Cavern Capacities at Big Hill. VA-M/O-8551, Change Cavern Integrity Testing Criteria. BC-M/O-3788, Cavern Replacement at Bayou Choctaw (BC-102). BC-M/O-3807, Change Authorized Capacities BC Sweet. EC-2013-001361, 1013L093, Change Cavern Integrity Testing. EC-2014-001466, 0103L094, Design Criteria Level II – System Test Exercise.	Not published

VERSION	DESCRIPTION	EFFECTIVE DATE
2.0	This document was revised to incorporate ECPs VA-M/O_8331 on authorized storage capacity and VA-M/O-8353, R1 on vapor pressure criteria, general revision to update references, add new security criteria and delete some detailed design requirements better suited to Level III Design Criteria. VA-M/O-8508, General Revision SPR Project Performance Criteria Level II. VA-M/O-8444, Increase Authorized Capacity of SPR to 727 MMB Level II Change.	8/2008
1.0	Revised document.	12/1999
A	Initial Issue.	11/1985

CONTENTS

PROJECT PERFORMANCE CRITERIA

LEVEL II

1.0 INTRODUCTION

The Strategic Petroleum Reserve (SPR) is operated by the Department of Energy (DOE). This Criteria document, under the authority of the Project Management Office (PMO) of the SPR, establishes the system and operational performance requirements for the SPR.

1.1 Objective

The objective of this Criteria document is to address SPR Project performance criteria. It is intended to provide direction for the physical design, operation, and maintenance of the facilities used to meet the requirements of the Level I Program Performance Criteria.

1.2 Scope

These criteria address the performance requirements of the principal systems of the SPR under its three primary modes of operation: drawdown, fill, and operational readiness, as defined in the Level I Program Performance Criteria. The implementation of these criteria shall be met by the system configuration alternative(s) that meet all criteria, codes, and regulations having the lowest life cycle cost.

2.0 GOVERNING DOCUMENTS AND CONFLICT RESOLUTION

In achieving the performance specifications defined in this Criteria document, the construction, operation, and maintenance of the SPR is subject to compliance with the provisions of the following documents.

2.1 Applicable Documents

2.1.1 SPR Program Performance Criteria - Level I

2.1.2 Conduct of Operations

All SPR operations shall conform to the provisions of *Conduct of Operations (DOE Order 422.1, Chg. 4 and SPRPMO O 420.1E)* (latest revision) in a manner commensurate with the associated risks (environmental, safety, security, and mission).[1]

2.1.3 Guidance Documents

The Assistant Project Managers (APMs) shall have the authority and responsibility for meeting the requirements of this document. In the event of conflict between the guidance documents and any provisions of Federal, State, and local statutes, codes, and regulations having jurisdiction, the governing statutes, codes, and regulations shall have precedence.

2.1.4 Configuration Control

Changes to the Technical criteria contained in this Level II Performance Criteria document shall comply with the change control process prescribed in SPRPMO Order O 410, SPRPMO Configuration Management Program.

Note 1: The latest approved version of all controlled documents applies to these criteria.

3.0 SYSTEM PERFORMANCE REQUIREMENTS

The following section sets forth the system performance requirements for the SPR storage sites under their three modes of operation: drawdown, fill, and operational readiness. Activities under operational readiness status shall be focused to maintain drawdown readiness in conformance with Section 4 of this document, the *Drawdown Readiness Program (SPRPMO Order O 151.2D)* and *Real Property Asset Management (DOE Order 430.1C, Chg. 2)*. Design work shall be performed for a 25-year life cycle expectancy beginning at the time of design. For Systems with obsolescence less than 25 years, the life cycle analysis appropriate to the specific application shall be approved by the Project Manager.

3.1 Crude Oil System

The crude oil system is defined as the pumps, crude oil heat exchangers, piping, valving, tankage, and metering equipment used to collect, convey, and otherwise transfer crude oil between the cavern well pad boundary (up to the cavern isolation valves) and the site boundary.

3.1.1 Site Crude Oil Accountability Metering

Crude oil accountability metering shall conform to the provisions of the *SPR Petroleum Accountability Order O 416.1C*. The accuracy of site crude oil accountability metering systems shall be proved as required (flow demonstrated).

Storage tanks used for custody transfer of SPR specification crude oil shall be strapped in accordance with American Petroleum Institute (API) standards.

Crude oil sampling shall be performed at the site in accordance with API *Manual of Petroleum Measurement Standards.*

3.1.2 Crude Oil Heat Exchangers

The past and on-going geothermal heating of crude oil stored at the SPR sites necessitates a means to cool the oil leaving the site to prevent excessive vapor emissions in storage tanks. Heat Exchangers are used as needed during a drawdown.

3.1.3 Crude Oil Storage Tanks

Crude oil storage tanks shall be built, operated, and maintained in accordance with API standards.

3.2 Raw Water System

The raw water system is defined as the pumps, piping, source, valving, and metering equipment conveying unprocessed water intended for drawdown, cavern maintenance and leach operations from the water source to the cavern well pad boundaries (up to the cavern isolation valves) and from cavern-to-cavern boundaries.

3.2.1 General

The primary function of the raw water system is to supply fluid to displace crude oil from cavern storage during drawdown. During fill/refill and operational readiness, the system also provides process water for cavern string flushing.

The raw water system shall provide a minimum of 3 percent capacity in excess of the site design crude oil drawdown rate as defined in the *Level I Program Performance Criteria* to compensate for the effects of collateral cavern leaching during drawdown.

The raw water system will also be used to support any remedial leach activities at the site to sustain the authorized storage volume.

The raw water system is also used as an adjunct to and back-up for fire protection systems.

Appropriate protection shall be provided to protect raw water piping from corrosion.

3.3 Brine Disposal System

The brine disposal system includes the brine disposal wells and associated surface equipment, including the pumps, piping, valving, metering equipment, holding tanks, and ponds used to convey brine between the cavern well pads and the site boundary.

3.3.1 General

The brine disposal systems are not drawdown critical systems. Brine generated during operation of an SPR storage facility shall be disposed of by sale, by pipeline to the Gulf of Mexico, or by injection into subsurface saline reservoirs. Site-specific operational, environmental, and economic factors shall determine the optimum method or methods.

The site brine disposal systems shall be capable of sustained brine disposal at the crude oil fill/refill rates specified in the Level I Criteria. Activities to ensure this capability shall be performed cost effectively preceding a fill/refill activity. The brine disposal systems shall not allow the discharge of any crude oil entrained in the system into brine disposal areas. A brine disposal capability shall be employed to meet the minimal brine disposal demands of remedial leach and during standby operational readiness.

Appropriate protection shall be provided to protect brine disposal piping from corrosion.

3.3.2 Brine Storage

Brine shall be stored in environmentally safe containment and shall meet or exceed the requirements of *Louisiana Office of Conservation Statewide Order No, 29-B* or *Railroad Commission of Texas Rule 8, Water Protection.*

3.3.3 Disposal Wells

Brine disposal wells for the SPR shall meet or exceed the respective State requirements of *Louisiana Office of Conservation Statewide Order No. 29-B* or *Railroad Commission of Texas Rule 9, Disposal Wells*.

3.4 Cavern System

A cavern is a solution-mined storage volume in an underground salt dome. The cavern system is defined as the cavern itself, the subsurface equipment within the cavern (including all cemented and hanging casing strings), and the surface equipment and piping on the wellheads and the cavern well pad up to and including the cavern isolation valves. The cavern system provides the primary storage volume for crude oil in the SPR.

3.4.1 Cavern Instrumentation and Control

During drawdown the cavern system shall have the capability to meter and control injected raw water and resultant crude oil flow to an accuracy of 2 percent of the volume of liquid transferred. During fill/refill, the cavern system shall be capable of metering the brine produced and the injected crude oil to an accuracy of 2 percent of the volume of liquid transferred. During operational standby conditions the cavern system shall be capable of metering brine produced to maintain cavern pressure to an accuracy of 2 percent of the volume removed.

Caverns should be designed for drawdown rates of at least 150,000 barrels per day. Actual maximum cavern oil discharge rates shall be determined by process evaluations considering all major impacts including piping and equipment vibrations, vapor pressures, and cavern hydraulics.

3.4.2 Storage Cavern Integrity

The integrity of the crude oil storage caverns is of paramount importance. The cavern system shall include instrumentation to continuously assure the integrity, safety, and stability of each storage cavern and associated downhole equipment, and to maintain the storage site in operational readiness status. A cavern integrity monitoring program shall assure long-term stability and safety. The monitoring program shall ensure the continued suitability of the stored crude oil and the storage caverns for drawdown through periodic testing and sampling to determine:

1. The physical integrity of the storage caverns;
2. The temperature of the crude oil stored in the caverns;
3. The interface level;
4. The composition of the crude oil stored in the caverns;
5. Gas re-gain.

The cavern integrity monitoring program shall comply with *Texas Railroad Commission Rule 95*, *Underground Storage of Liquid or Liquefied Hydrocarbons in Salt Formation*, and *Louisiana Statewide Order No. 29-M*, *Regulations for Hydrocarbon Storage in Salt Dome Cavities*.

Surface subsidence shall be monitored throughout the lifetime of the storage site, while under DOE control, to reflect any anomalous changes in surface elevation that could be indicative of possible future cavern collapse or failure.

Cavern system integrity during drawdown shall be monitored by means of surface static and transient pressure measurements. The cavern system shall provide a point for static monitoring of cavern pressures at the surface. Where static monitoring is not possible, the equipment shall permit synthesis of an equivalent static pressure. A positive method shall be available to limit cemented casing seat pressure to prevent damage to the formation or to the well.

3.4.3 Cavern Authorized Storage Capacity

The total authorized storage capacity for the SPR is established in the DOE Level I Criteria.

A deviation is required when a cavern is filled above its authorized oil capacity by an amount greater than its tolerance for overfill. The tolerance for overfill is defined as the lesser of 150 MB or the difference between the authorized oil capacity and the current storage capacity. The current storage capacity is defined as cavern oil capacity from the surface to 10 feet above the bottom of the hanging string.

Note: This will not change compliance criteria to the Level I site required storage capacities.

Appendix B indicates the required crude oil storage capacity by site by stream.

3.5 Electrical System

The electrical system is defined as all equipment associated with distributing normal operating electrical power as well as generating/distributing emergency electrical power throughout the site.

3.5.1 General

The transmission, distribution, control, and utilization of primary (commercial) electrical power and emergency power equipment shall be adequate to meet the kilovolt ampere (kVA) loads and duty cycle of each load, as defined in the National Fire Protection Code 70, National Electrical Code. Ratings of conductors and equipment shall be based on the assigned demand and diversity factors derived from known operating modes. Electrical power system design and associated equipment shall comply with *Departmental Sustainability* (DOE Order O 436.1) and Executive Order 13693, *Planning for Federal Sustainability in*

the Next Decade.

3.5.2 Redundancy

The site substation shall have redundant capability with sufficient capacity to meet all electrical demand requirements. The site substation shall be supplied by redundant primary sources (loop or physically separate incoming lines) [2]. The substation shall be arranged to permit connection to incoming power source(s). Essential loads shall be served from redundant sources where practicable.

Note 2: The redundant primary source requirement does not apply retroactively to Bryan Mound, Bayou Choctaw, or West Hackberry.

Critical loads shall be served by normal commercial power source with emergency backup power. The emergency power system shall be sized to carry all critical loads, including an Uninterruptible Power System (UPS) and shall be capable of supplying power to sequentially shut down the site in a safe and orderly manner. The emergency power system shall be capable of continuous operation at maximum load for 72 hours without refueling or resupply from off-site sources.

UPS support shall be provided for the control system, power monitoring, communications, safety, and security systems. UPS energy storage shall be sized to carry the full load of these systems for a minimum of 60 minutes.

3.5.3 Maintenance

Periodic preventive and predictive maintenance and testing of the site electrical power distribution systems, to include the emergency generator system, shall be conducted to permit maintenance and inspection of all critical electrical power equipment.

3.6 Instrumentation and Control Systems

The instrumentation and control system is defined as the instrumentation, actuators, and automated process control and monitoring equipment associated with the centralized operation of the site processes and the recording of site process and electrical control data.

3.6.1 Control System

Site operations shall be controllable from a Central Control Room (CCR) via a Distributed Control System (DCS) in accordance with the Control System Functional Specification. The DCS shall enable the CCR operator to perform all normal operations required for complete monitoring, control, and safe shutdown of the SPR site.

If the CCR is not available, all site operations from the DCS can be performed from the Alternate Operating Location (AOL).

The DCS shall support an Emergency Shutdown System (ESD) to, at a minimum, shut down all major fluid movement pumps, close cavern isolation valves, pipeline valves, and tank shell valves.

3.7 Site Piping System

There shall be a program for predictive maintenance of site piping.

3.7.1 Cavern String Flush

The site piping system shall permit simultaneous withdrawal of brine and injection of raw water for cavern string flush in different caverns during fill/refill.

3.7.2 Crude Oil Piping

At sites requiring the simultaneous delivery of crude oil through two or more pipelines, the site piping system shall provide segregation of crude oil headers by crude type. The site piping system shall support simultaneous capability for cavern pressure maintenance and drawdown. Intra-site crude oil transfers shall be capable of routing through the site metering system to support cavern crude oil meter calibration.

3.7.3 Raw Water Piping

Drawdown critical raw water headers and piping shall be maintained when the site is in operational readiness status.

3.7.4 Maintenance Header Piping

The site piping system shall incorporate raw water and crude oil maintenance headers to permit low rate or low volume fluid transfers. The water maintenance header shall provide the capability to deliver raw water to the cavern well pad to be used for cavern string flush. The crude oil maintenance header shall provide the capability for inter-cavern crude oil transfers.

3.8 Pipeline Systems

Pipeline systems are defined as the equipment used to convey raw water from the intake structure to the main site; crude oil between the site and its point of custody transfer; brine from the site to its point of disposal.

3.8.1 Pipeline Pigging

All pipeline systems (with the exception of internally lined or coated raw water or brine pipelines) shall incorporate facilities to enable them to be pigged before commissioning and during operation. All pipeline pigging facilities shall include provisions to launch/receive and handle scraper devices.

3.8.2 Regulatory Compliance

Crude Oil pipelines shall be designed, operated, and maintained to meet or exceed the requirements of 49 CFR 195.

3.9 Potable and Wastewater Systems

The potable water system is defined as the system supplying treated water for domestic uses, and process applications when required. The wastewater system is defined as the treatment and disposal of domestic wastewater.

3.9.1 General

Potable water shall be obtained from municipal sources whenever economically feasible. When not available from municipal sources, potable water shall be provided by the most economical means available. Wastewater systems shall comply with Federal, state, and local environmental requirements.

3.10 Fire Protection Systems

Fire protection systems must provide a level of safety sufficient to fulfill the requirements for a highly protected risk. Fire protection strategies must prevent loss of safety functions and maintained safety systems as determined by prior safety analysis and provide defense with depth. All construction and fire protection systems must meet or exceed all applicable building codes for the region and NFPA codes and standards.

3.11 Physical Protection Security Systems

Security systems are defined as the equipment and personnel that limit and control access to the site detect, assess, and respond to unauthorized penetrations of the site boundary, and on-site security areas; and provides protection of SPR facilities, buildings, property, employees, and national security interests [redacted]. Detailed technical requirements for DOE Physical Protection Security Systems are maintained in DOE Order O 473.1A, Physical Protection Program and DOE Order O 473.2A, Protection Force Operations.

The SPR security systems shall be designed to provide reasonable assurance that threats are deterred, detected, delayed, assessed, interrupted, and neutralized in a manner that limits the damage caused by unauthorized penetration of the site boundary and on-site controlled areas.

The first objective of SPR security systems is to deter actions by adversaries that would disrupt the drawdown capabilities of the SPR during periods of national emergencies. If deterrence fails, however a second objective is to detect any adversarial actions in sufficient time for the SPR Protective Force to respond to interrupt and neutralize the threat to the SPR.

3.11.1 General

The physical protection system, which is the integration of the physical security systems and the protection force, shall have the ability to deter, detect, delay, assess, and respond to hostile threats against the SPR.

Security systems shall not be incorporated into other facility monitoring systems in any manner that might lower the system reliability or availability.

3.11.2 Security Areas

Security Areas include the following:

"Property Protection Areas" (PPAs) – security areas that are established to protect employees and Government buildings, facilities and property. The general requirements for PPAs shall be configured to protect Government-owned property and equipment against damage, destruction, or theft and shall provide a means to control public access. Protection includes physical barriers, access control systems, biometric systems, protective personnel or persons assigned administrative or authorized security duties, intrusion detection systems, locks and keys. PPA protection measures shall be designated, described and documented within the Site Security Plan.

"Exclusion Areas" (EAs) – are security areas that are established to protect classified matter where an individual's mere presence may result in access to classified matter. EAs shall be protected by physical barriers signs and access controls.

"Special Designated Security Areas (SDSA)" – are areas with access restrictions. SDSA include Central Alarm Stations (CAS), secure communications centers and automated information system centers. SDSA also include buildings housing pumps required during drawdown, including all areas containing equipment associated with the sites' ability to conduct or support a drawdown. Such equipment may include raw water pumps and motors, crude oil pumps and motors, associated motor control centers, switchgear, SPR-owned electrical substations, and transformers.

3.11.3 Intrusion Detection

A Critical Area is defined as any area within the Property Protection Area that contains equipment, the loss of which would have an immediate, significant impact upon drawdown. An Intrusion Detection System (IDS) and access control shall be provided to augment security protection of Critical Areas. The system shall be designed to detect all attempts of unauthorized entry into the area and to track approved access through the Central Alarm Station. All unmanned exits from controlled areas shall be equipped with IDS.

Both on- and off-site permanent property storage warehouse facilities shall be located within a Security Perimeter. A Security Perimeter is defined as the outermost security deterrent, detection, and assessment system internal to or coincident with the Site Property Boundary; the Security Perimeter shall

provide the first-line physical security barrier against unauthorized intrusion into an SPR Property Protection Area. A minimum of single level of alarm coverage shall be installed on all entry/exit doors and monitored at the alarm panel located in the security operations center (SOC) or alarm stations. Off-site warehouses containing consolidated critical system equipment components shall be equipped with a alarmed perimeter which shall be monitored at a central alarm station by an off-site provider.

3.11.4 Firearms Safety Area

An area containing facilities for the safe clearing of weapons shall be provided within a permanent facility or covered area. The area shall ensure wind or weather does not affect the safe loading and unloading process.

3.12 Communications Systems

Communications systems are defined as the equipment employed to transmit site operational status and process data. Communications systems include radios, public address systems, telephones, and other transmitting and receiving devices.

3.12.1 Connectivity

All SPR sites shall be linked with the Program Office and the PMO Operations Control Center (OCC) for transmission of voice and data communications. Each communications system shall be able to operate from a UPS and the emergency power source. Communications from the Project Office and DOE Headquarters to the site shall be through the OCC, Emergency Command Vehicle (ECV), and related communications.

Communications equipment must be provided to facilitate reliable information exchanges between protective force personnel. Security system transmission lines and data must be protected in a graded manner from tampering and substitution.

3.12.2 Data Required

The OCC shall receive and display site configuration data, including equipment alarms and status indications of operational equipment. Minimum data to be

received and processed shall be: all oil flows (by cavern and by site), oil inventories by site, raw water and brine flow rates (by cavern and by site), facility operating modes, e.g., semiautomatic mode, upset conditions, security and safety/fire problems, and metering statuses. Continuous surveillance of all communications and computerized control functions shall be enacted when a site is in drawdown mode.

3.12.3 Site Communications

Sites shall have redundant communications interfaces with the terminal and pipeline access locations within their respective complexes (refer to Level I Criteria, Appendix B) and with local governmental agencies for emergency and security purposes.

Each site shall be equipped with an alert system for use in emergencies. This public address system shall be capable of notifying personnel at the site extremities and personnel in close proximity of operating equipment.
Each oil storage site also has secure communications capabilities with a Secure Telephone Unit, Type III (STU-III) which is maintained and operated in accordance with the SPR wide Secure Telephone Units (STU- III).

4.0 OPERATIONAL PERFORMANCE REQUIREMENTS

The following sections set forth the operational performance requirements for the SPR storage sites under the four modes of operation: Drawdown, Fill, Leach, and Operational Readiness. Activities under operational readiness status shall be focused to maintain drawdown readiness in conformance with the Drawdown Readiness Program *(SPRPMO Order 151.2D)* and the *Real Property Asset Management (DOE Order O 430.1C, Chg. 2)*.

4.1 Drawdown System Test

A drawdown readiness program in accordance with *SPRPMO Order 151.2D* shall be implemented to demonstrate maximum rate drawdown capability as directed by DOE.

4.2 Drawdown Readiness

The drawdown systems shall be maintained and supported to perform the drawdown capabilities shown in Appendix A within 13 days of receiving such direction, which assumes a 90-day drawdown duration. The crude oil system and raw water system shall be capable of performing equipment tests and exercises to permit performance capability verification,

equipment trending analysis, and Predictive Maintenance. The performance data derived from equipment tests shall be used with analytical modeling to demonstrate drawdown readiness between System Test Exercises (STE).

4.2.1 Drawdown Tests

Maximum and less than maximum rate drawdown STEs shall be scheduled and conducted as directed by the SPRPMO Project Manager to demonstrate the SPR's ability to meet drawdown rates in Appendix A. Maximum rate drawdown exercises shall be conducted after a major configuration change that materially affects drawdown rates. Effects on caverns, budget, and equipment shall be considered when STEs are planned and conducted. Every effort should be taken to demonstrate SPR capabilities when conducting drawdowns, emergency exchanges, and operational oil movements. Equipment and subsystem testing and administrative/tabletop exercises will be the basis for demonstration of SPR capabilities when other factors prohibit dynamic STEs. Less than maximum rate exercises shall be conducted annually to test the drawdown critical systems.

4.2.2 Administrative Exercises/Training

In addition to oil movement tests, administrative actions shall be performed to test the competency of the SPR drawdown processes and personnel. These exercises shall involve checks on the critical drawdown modeling computer programs. Training to support all drawdown emergency response activities shall also be implemented. *(Reference Drawdown and Distribution Management Manual for the SPR, DDMM Rev 6 dated Apr 2005.*

4.2.3 Drawdown Recovery Systems

The drawdown systems shall be recoverable as described in the *Recovery Program SPRPMO Order O 434.1D* and associated Plan.

4.3 Environmental, Safety and Health

Environmental, Safety and Health (ES&H) shall be managed in accordance with the *SPRPMO* ES&H Manual.

4.3.1 Integrated Safety Management System

The SPR shall implement *Integrated Safety Management System Policy DOE P 450.4A, Chg. 1*, to systematically integrate safety into management and work practices at all levels, so that missions are accomplished while protecting the public, the worker, and the environment.

4.4 Systems Assurance

4.4.1 Systems Effectiveness

4.4.1.1 Reliability

A quarterly assessment of the predictive availability of all SPR storage sites shall be performed. The assessment shall meet the requirements of *SPRPMO Order 430.1C, SPRPMO Reliability, Availability, Maintainability (RAM) Program* and analytically demonstrate whether the Level I availability requirement of 0.95 is met for all sites. The assessment shall utilize the validated and baselined availability models considering the then-current site conditions, Level I required drawdown rates, and location and operability of drawdown-critical must-operate items.

4.4.1.2 Maintenance

4.4.1.2.1 Integrated Logistics Support (ILS)

A logistics support system shall be maintained to ensure the operational integrity of all systems equipment and minimize the life cycle costs over the operational life of the SPR. The ILS for the SPR shall meet the requirements stated in *SPRPMO Order 430.1C, Reliability, Availability, Maintainability (RAM) Program* to include supply support, test and support equipment, technical data, and logistic support management database.

4.4.1.2.2 Maintenance Management

A maintenance management program shall be

established in accordance with *Maintenance Management Program (SPRPMO Order O 433.1B, Chg. 1)* to promote cost-effective maintenance. The maintenance program shall ensure that equipment and facilities meet or exceed their designed life requirements. It shall specify performance indicators and criteria to measure workload, equipment, systems, and personnel performance and efficiency. The maintenance backlog shall be controlled to assure operational readiness and the capability to complete essential maintenance on all drawdown-critical equipment within 13 days; essential maintenance requirements which exceed 15 days shall have a capability for acceleration or workaround in the event of a drawdown requirement. The maintenance program shall include a review and analysis capability for evaluation of maintenance performance and effectiveness.

4.4.1.2.3 Sparing

SPRPMO Order 430.1C, Reliability, Availability, Maintainability (RAM) Program shall govern the requirements for the identification of items critical to the drawdown of the SPR. The following sparing requirements shall be met in support of *SPRPMO Order 430.1C.*

1. Drawdown Critical Items: Each component or system critical to mission success shall have at a minimum, the sparing level or the inherent reliability to support a Stock-Out-Protection Level (SOPL) of 0.90.

2. Drawdown Piece Part Stockage: For each type of equipment spared at the piece part level, an inventory of parts shall be stocked in the appropriate location to support on-site repairs and off-site vendor repairs/rebuilds. Required stock levels shall be determined to support a SOPL of 0.90.

3. Level of Repair: The level of repair supported by the piece part stockage for drawdown critical equipment shall be established with consideration for the capability of repair on site, cost, availability of replacements, and procurement lead times.

4.4.1.3 Process Safety Management

The SPR shall prevent or minimize the consequences of catastrophic releases by complying with the requirements of *29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals*.

4.4.2 Testing and Certification

4.4.2.1 Construction Testing

All facilities and equipment acquired for the SPR shall be tested and turned over to the Management and Operating contractor in the orderly process described in SPRPMO Order 432.1C, *Facilities/Equipment Turnover and Startup Procedure.*

4.4.2.2 Cavern Testing

The cavern and well integrity monitoring program shall comply with criteria specified in *Texas Railroad Commission Rule 95, Underground Storage of Liquid or Liquefied Hydrocarbons in Salt Formation,* and *Louisiana Statewide Order No. 29-M, Regulations for Hydrocarbon Storage in Salt Dome Cavities*, or other method approved by the respective state.

Oil quality testing and sampling shall comply with criteria specified in *SPRPMO Order O 413.3B, Strategic Petroleum Reserve Crude Oil Quality Program and Test Criteria.*

Cavern temperature and oil/brine interface monitoring shall be performed, as required, to determine cavern volume changes due to thermal effects and cavern creep, respectively. In addition, estimated volumes between specific depth intervals can be determined from interface surveys.

4.4.2.3 Cavern Certification

Each cavern to be used for long-term storage of crude oil shall be certified for that purpose.

After drawdown of greater than 50 percent of storage capacity of a cavern, a sonar survey and analysis shall be performed to determine cavern suitability for refill.

Cavern performance shall be evaluated, during all operational modes, when the transfer or removal of a cumulative volume of oil exceeds 10 percent of the cavern volume.

Re-certification of cavern wells using the nitrogen technique shall be subject to the following test criteria:

A Mechanical Integrity Test (MIT) is successful if the calculated leak rate is less than the Minimum Detectable Leak Rate (MDLR) and the test conditions (pressure, wellbore temperature, and interface location) have the characteristics of a cavern that displays mechanical integrity; there is no known leak rate. The MDLR shall not exceed the equivalent volume of 750 barrels per year of nitrogen in accordance with Rule 95 of the Texas Railroad Commission and Rule 29-M of the Louisiana Department of Natural Resources. For any calculated leak rate greater than the MDLR or caverns that do not display mechanical integrity, enhanced monitoring will be performed to determine the location of the leak.

4.4.3 Quality Assurance

Quality Assurance (QA) activities shall be conducted in accordance with the requirements of *Quality Assurance Program (SPRPMO Order O 414.1D)*.

4.4.4 Training and Certification of Personnel

All SPR personnel, including DOE and contractor personnel, shall receive sufficient training and, as applicable, formal qualification to ensure the most efficient utilization of resources and the safe, reliable, and environmentally responsible operations and maintenance of the physical system. The SPR shall

utilize a systematic approach to training to develop and implement performance-based training programs. The SPR shall identify and designate critical positions for certification.

4.5 Vapor Pressure

For all oil movements, the SPR Property Line shall be defined as the limit of contiguous DOE Property. The Property Line includes the terminal point of DOE owned pipelines originating a DOE owned crude oil storage site.

4.5.1 For a Presidentially Ordered Drawdown at SPR Level I, Appendix 1, Sustained Rates:

4.5.1.1 The maximum allowable volume of gasses evolving from the crude oil at atmospheric pressure shall not be greater than 0.6 standard cubic feet per barrel (GOR) at the SPR property line or any on-site crude oil storage tanks open to the atmosphere, at temperature.

4.5.1.2 Scavenging shall be used to limit the evolution of H_2S to within state and federal regulatory limits for all streams with a GOR>0 at the SPR property line or any on-site storage tanks open to the atmosphere.

4.5.2 For all Other Oil Movements:

4.5.2.1 The calculated maximum true vapor pressure (TVP) of the crude oil as defined by API 2517 shall be 11.0 pounds per square inch absolute (psia) or less, at temperature, at the point of custody transfer or any crude oil storage tanks open to the atmosphere.

4.5.2.2 The calculated maximum bubble point of the crude oil shall be 14.7 psia or less at temperature, at the point of custody transfer or any crude oil storage tanks open to the atmosphere.

4.5.2.3 The SPRPMO shall be notified of the conditions in writing for any transfer above 14.7 psia maximum bubble point at the SPR property line.

Appendix A

SPR Drawdown Capabilities*

Storage Complex	Crude Oil Characteristics	Drawdown Rates (MBD) SOUR	SWEET
Seaway Group			
Bryan Mound	SPR Level I Criteria Crude Oil	1,500 (933 to Texas City)	1,400 (740 to Texas City)
	Simultaneous Level I	1,000 (Texas City)	500 (Freeport/Jones Creek)
	Simultaneous Level I	600 (Freeport/Jones Creek)	900 (Texas City)
Texoma Group			
Big Hill	Level I	1,100	1,000
West Hackberry	Level I	1,300 (1,000 to Sun)	1,300 (1,000 to Sun)
Capline Group			
Bayou Choctaw	Level I Crude Oil	515	300
Totals	Level I Crude Oil	**4415 MBD**	**4000 MBD**

* Assumes sufficient site oil inventory and distribution within caverns to allow rates shown.

Appendix B

Cavern Authorized Storage Capacity

Table B-1

BAYOU CHOCTAW SITE		
CAVERN	**TYPE**	**AUTHORIZED OIL STORAGE CAPACITY[1] (000)**
18	Sweet	
102	Sweet	
Subtotal	**Sweet**	**24,000**
15	Sour	
17	Sour	
19	Sour	
101	Sour	
Subtotal	**Sour**	**52,000**
SITE TOTAL		**76,000**

Note 1: The sum of the crude oil storage capacity for all caverns at a site shall be greater than or equal to the total required oil storage capacity for that site as established by DOE Level I Criteria.

Note 2: For actual cavern volumes, refer to the Cavern Capacity Charts.

Appendix B

Cavern Authorized Storage Capacity
Table B-2

WEST HACKBERRY SITE		
CAVERN	**TYPE**	**AUTHORIZED OIL STORAGE CAPACITY[1] (000)**
7	Sweet	
101	Sweet	
102	Sweet	
103	Sweet	
104	Sweet	
107	Sweet	
108	Sweet	
110	Sweet	
113	Sweet	
116	Sweet	
Subtotal	**Sweet**	**108,120**
6	Sour	
8	Sour	
9	Sour	
11	Sour	
105	Sour	
106	Sour	
109	Sour	
111	Sour	
112	Sour	
114	Sour	
115	Sour	
117	Sour	
Subtotal	**Sour**	**112,280**
SITE TOTAL		**220,400**

Note 1: The sum of the crude oil storage capacity for all caverns at a site shall be greater than or equal to the total required oil storage capacity for that site as established by DOE Level I Criteria..

Note 2: For actual cavern volumes, refer to the Cavern Capacity Charts.

Appendix B

Cavern Authorized Storage Capacity

Table B-3

BIG HILL SITE		
CAVERN	**TYPE**	**AUTHORIZED OIL STORAGE CAPACITY[1] (000)**
101	Sweet	
102	Sweet	
103	Sweet	
104	Sweet	
105	Sweet	
114	Sweet	
Subtotal	**Sweet**	**72,000**
106	Sour	
107	Sour	
108	Sour	
109	Sour	
110	Sour	
111	Sour	
112	Sour	
113	Sour	
Subtotal	**Sour**	**98,000**
SITE TOTAL		**170,000**

Note 1: The sum of the crude oil storage capacity for all caverns at a site shall be greater than or equal to the total required oil storage capacity for that site as established by DOE Level I Criteria..

Note 2: For actual cavern volumes, refer to the Cavern Capacity Charts.

Appendix B

Cavern Authorized Storage Capacity

Table B-4

BRYAN MOUND SITE		
CAVERN	**TYPE**	**AUTHORIZED OIL STORAGE CAPACITY[1] (000)**
2	Sweet	
4	Sweet	
106	Sweet	
113	Sweet	
114	Sweet	
115	Sweet	
116	Sweet	
Subtotal	**Sweet**	**70,700**
1	Sour	
5	Sour	
101	Sour	
102	Sour	
103	Sour	
104	Sour	
105	Sour	
107	Sour	
108	Sour	
109	Sour	
110	Sour	
111	Sour	
112	Sour	
Subtotal	**Sour**	**176,400**
SITE TOTAL		**247,100**

Note 1: The sum of the crude oil storage capacity for all caverns at a site shall be greater than or equal to the total required oil storage capacity for that site as established by DOE Level I Criteria..

Note 2: For actual cavern volumes, refer to the Cavern Capacity Charts.