PART I – THE SCHEDULE

SECTION C – PERFORMANCE WORK STATEMENT

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C.0 Savannah River Site Liquid Waste Contract Overview and Objectives

C.0.1 Background

The Department of Energy (DOE) Savannah River Site (SRS) is located in western South Carolina, covering 310 square miles in Aiken, Allendale and Barnwell counties. SRS was constructed during the early 1950s to produce basic materials used in fabrication of nuclear weapons, primarily tritium and plutonium-239, in support of our nation's defense programs.

The SRS cleanup strategy is to eliminate or minimize nuclear materials, spent nuclear fuel (SNF), and waste through safe stabilization, treatment, and/or disposition; reduce costs of continuing operations and surveillance and maintenance; and decommissioning facilities, as well as remediate surface water, groundwater and contaminated soils consistent with regulatory agreements and permits. The Department's completion strategy provides a comprehensive risk-based methodology to the legacy cleanup project, such as dispositioning radioactive liquid waste (LW) through vitrification of high activity waste constituents at the site's Defense Waste Processing Facility (DWPF), using existing SRS facilities to receive, store, and disposition aluminum-clad SNF, and decommissioning all facilities not required for continuing missions.

Major activities at SRS include radioactive liquid waste stabilization and disposition projects to safely and effectively store, treat, stabilize, and dispose of approximately 36 million gallons of legacy radioactive waste currently stored in more than 40 underground storage tanks.

C.0.2 Contract Purpose and Objectives

The purpose of this Contract is to achieve measureable progress toward completion of the DOE Environmental Management (EM) mission at SRS to process and stabilize high level waste into borosilicate glass and low activity waste into cementitious material in accordance with the requirements of a regulatory framework that includes: 1) Section 3116 of the Ronald W. Reagan National Defense Authorization Act (NDAA) for Fiscal Year 2005 *;* 2) the Federal Facilities Agreement (FFA); 3) permits and requirements issued by the South Carolina Department of Health and Environmental Control (SCDHEC); and 4) applicable DOE Orders and federal regulations.

The liquid waste system is divided by function into four operational sub-systems: (1) waste storage, retrieval, sludge pretreatment, salt batch preparation, and closure of underground LW

storage tanks/systems in the F-Area and H-Area Tank Farms (Tank Farms[1]); (2) salt waste treatment in processing facilities; (3) high activity waste treatment by vitrification in the DWPF with onsite glass storage until a disposal facility is available; and (4) stabilization of low level liquid waste in the Saltstone Production Facility (SPF) with permanent disposition as grout in Saltstone disposal units. The Contract scope includes the future operation and maintenance of the Salt Waste Processing Facility (SWPF), currently being commissioned under another contract that also includes an initial operational period of one year.

EM mission completion at SRS involves the safe stabilization, treatment, and disposal of radioactive liquid wastes presently stored in more than 40 underground radioactive waste storage tanks as well as future radioactive liquid waste resulting from planned nuclear materials stabilization activities; operational closure of underground waste storage tanks; and deactivation of major facilities and equipment that comprise the radioactive liquid waste system. An overview diagram of the liquid waste system process is included in Attachment 1. An aerial view of the liquid waste facilities is illustrated in Attachment 2.

The major objectives of this Contract during the base and option period of performance include the following:

- Safely operate and optimize the liquid waste system. Identify, develop, and implement improved supplemental, or replacement processes, approaches, and technologies for waste treatment, waste removal, tank closure, and waste disposal that reduce program lifecycle costs, accelerate radioactive liquid waste disposition schedules, or otherwise optimize system performance.

- Support timely completion, startup and initial operation of the SWPF by fulfilling all interface responsibilities, e.g. waste transfer infrastructure, delivery of qualified salt batches from waste removal operations as feed for SWPF, and receipt from SWPF of (a) two high-activity feed streams for processing at DWPF and (b) a low-activity feed stream for processing and disposal at the Saltstone Facility.

- After the transfer of operational responsibility, operate and maintain the SWPF to process salt waste at SWPF to yield two high-activity salt streams which meet waste feed acceptance criteria for processing at DWPF and a low-activity salt stream which

[1] The official facility nomenclature for the “Tank Farms” is the Concentration, Storage, and Transfer Facilities (CSTF). This document uses various terms including Tank Farms, F-Tank Farm, H-Tank Farm, etc… to refer to the CSTF.

meets waste feed acceptance criteria for processing and disposal at the Saltstone Facility.

- Operate Tank Farms to maintain a constant source of waste feed to Liquid Waste processing facilities in keeping with each facility's capability to receive and process waste. This will include planning and staging to support a continued and uninterrupted source of waste feed to Liquid Waste processing facilities to include:
    - Receive liquid radioactive waste from H Canyon nuclear material stabilization activities.
    - Deliver salt waste feed, fully conforming with the SWPF waste acceptance criteria, to SWPF for processing.
    - Operate and maintain the Actinide Removal Process (ARP) and the Modular Caustic Side Solvent Extraction Unit (MCU) pending the start of SWPF operations to process salt waste from waste removal operations into two high-activity feed streams for processing at DWPF and a low-activity feed stream for processing and disposal at the Saltstone Facility.
    - Deliver sludge waste feed, fully conforming with DWPF waste acceptance criteria, to DWPF for processing.
- Operate and maintain the DWPF to produce DWPF canisters at optimal sludge and salt waste loadings.
- Operate and maintain Glass Waste Storage Building (GWSB) #1 and #2 to store the vitrified waste canisters produced by DWPF.
- Operate and maintain the Saltstone Facility consisting of the SPF and the Saltstone Disposal Facility (SDF) to process and dispose of low-level waste.
- Construct SDUs to support the continued and uninterrupted disposal of low-level waste at the SDF.
- Operationally close liquid radioactive waste storage tanks and associated facilities in support of the FFA and State approved plans.
- Operate and maintain the Effluent Treatment Facility (ETF) (also known as Effluent Treatment Project) to process aqueous waste streams from Liquid Waste system operations and from other site operations into a form suitable for (a) release to a permitted outfall or (b) processing and disposal at the Saltstone Facility.
- Maintain an interactive program/system planning process for Liquid Waste program milestones and execution schedules including comprehensive salt and sludge batch planning.

C.0.3 Description of Performance Requirements

This Contract reflects application of performance-based contracting approaches and techniques emphasizing measurable results/outcomes. The Contractor has responsibility for total performance under the Contract, including determining specific methods and approaches for accomplishing work.

All activities at SRS are managed by DOE EM site leadership. The Contractor shall be required to coordinate some of its activities by participating in a government-managed site integration process (including Government Furnished Services & Items (GFS&I)) to the extent necessary to ensure safe conduct of all site activities and completion of Contract requirements.

The Contractor has responsibility for managing, integrating, and executing work described in this Performance Work Statement (PWS). The Contractor shall assure that all activities are conducted in compliance with applicable environmental laws and regulations and within the parameters set forth in the following National Environmental Policy Act documents and associated Records of Decision.

- DWPF Final Environmental Impact Statement (FEIS) (DOE/EIS-0082)
- Supplement Analysis Salt Processing Alternatives (DOE/EIS-0082-SA-01)
- Final Waste Management Programmatic Environmental Impact Statement (PEIS) (DOE/EIS-0200-F)
- SRS Waste Management Final Environmental Impact Statement (EIS) (DOE/EIS-0217)
- Interim Management of Nuclear Materials EIS (DOE/EIS-0220)
- SRS High-Level Waste Tank Closure Final EIS (DOE/EIS-0303) and its two supplement analyses (DOE/EIS-0303-SA-01 and DOE/EIS-0303-SA-02)
- Environmental Assessment (EA) for the Closure of the HLW Tanks in F- and H-Areas at SRS (DOE/EA-1164)
- SRS Salt Processing Alternatives Final Supplemental Environmental Impact Statement (SEIS) (DOE/EIS-0082-S2)

During conduct of authorized work scope, the Contractor shall also comply with applicable provisions of all other Comprehensive Environmental Response, Compensation and Liability Act of 1980 decision documents in effect for the site.

The PWS scope contains both operational and capital asset acquisition activities which shall be identified as subprojects. The Contract scope shall be managed using a formal decision/approval process consistent with program and project management principles. The Contractor shall be responsible for integration and management of Contract and subproject scope. Scope performance must clearly link funding to cost reporting. A Work Breakdown Structure (WBS) that breaks down the work scope to levels below the WBS provided in this document as Section J, Attachment J-3 shall be developed to provide for efficient program and cost management. All work is subject to the development and implementation of an Earned Value Management System (EVMS). The Contractor shall be responsible for developing a compliant EVMS consistent with DOE-H-2024. The Contractor's participation in the DOE

Project Assessment and Reporting System is required for capital asset project performance reporting.

The Contractor must comply with DOE and site requirements. Requirements that have been incorporated into the Contract remain in effect throughout the term of the Contract unless, and until, the Contract or regulatory commitment is modified to either eliminate requirements that are no longer applicable or substitute a new set of requirements.

This PWS is structured such that required actions are shown directly under each section header and WBS element. Subheadings entitled “Supplemental Information” provide varying levels of detailed information on the work scope that bidders may find useful in developing proposals. Supplemental information shall not be construed as providing work scope requirements or defining the only acceptable approach to operating a facility, system, or process.

Listed below are the performance requirement metrics for this contract during the base period of performance and during the option period.

Table 1: Contract Performance Requirements

Performance Metric	Salt Waste Processed (gallons)	Bulk Waste Removal (tanks)	Tank Closures (tanks)
Base Contract Period	42,000,000	8	5
Option Period	26,000,000	2	2
Total Contract Term	68,000,000	10	7

C.0.4 Transition

The duration of contract transition shall be 90 calendar days. The Contractor shall transition all on-going work scope from the incumbent including existing Service Level Agreements (SLAs); assign applicable subcontract work from the incumbent to continue under an existing subcontract; and complete workforce transition in accordance with the requirements of the Contract. All Government-owned real and personal property currently accountable to the incumbent contractor for contract performance will be provided to the Contractor. During the contract transition period an inventory record of such property in the DOE Facilities Information Management System (FIMS) and incumbent contractor’s personal property databases will be provided to the Contractor.

The Contractor shall establish the necessary logistical support to execute transition and shall ensure all necessary personnel, including key personnel for the Contractor, are on-site during the transition period.

At the end of the transition phase, the Contractor shall notify the Contracting Officer (CO) in writing that it is ready to assume full responsibility for the scope of the Contract.

C.0.4.1 Key Scope and Requirements

Sections C.0.4.1.1 through C.0.4.1.9 below identify major elements necessary for transition of the Contract.

C.0.4.1.1 Transition Plan

The Contractor shall submit a Transition Plan that provides a description of all necessary transition activities, involved organizations, and transition schedule. The objectives of the Transition Plan are to prepare for implementation of the Contract and minimize the impacts on continuity of operations. The Contractor is responsible for performing due diligence to ensure that all transition activities are identified and completed during the Transition Period. The Transition Plan shall be submitted within 14 calendar days after issuance of the Notice to Proceed (NTP).

C.0.4.1.2 Service Level Agreements

During the Contract Transition period, the LW Contractor shall review the existing Service Level Agreements (SLAs) and determine whether the agreements should be revised, cancelled, or continued unchanged as required for Contract performance. Revision or cancellation of SLAs during the transition process is by mutual agreement with the M&O contractor and subject to DOE approval.

C.0.4.1.3 Contract Performance Baseline

The Contractor shall submit a Contract Performance Baseline (CPB), including an EVMS description, for the Contract Base Period of Performance that details the work activities to be performed. The Contractor shall develop the initial CPB based on the Department of Energy Savannah River (DOE-SR) WBS (Section J, Attachment J-3), and in accordance with the Section H clause entitled “Integrated Work Control Systems and Reporting Requirements.”

C.0.4.1.4 Status Reports-Transition Activities

The Contractor shall provide a weekly status report of transition activities to DOE. The Contractor shall establish routine status meetings with DOE and affected contractors to review transition activities and issues.

C.0.4.1.5 Government-Owned Property

The Contractor shall conduct a joint reconciliation of the Government property inventory with the incumbent contractor. The incumbent contractor will provide an inventory record at the inception of the Transition Period of all real and personal property for which they are accountable. The incumbent contractor and the Contractor shall perform a joint physical inventory of all LW assets during the Transition Period, after which the Contractor shall report any discrepancies to the CO and the DOE Property Manager. This information shall be used to provide a baseline for this Contract as well as information to close out the incumbent contract.

C.0.4.1.6 DOE Safeguards and Security Survey

During the Contract transition period and prior to assuming control and responsibility for Safeguards and Security (SAS) responsibilities, the Contractor shall be subject to a DOE SAS initial survey conducted in accordance with U.S. DOE Order 470.4B, Safeguards and Security Program. The results of the survey shall be documented and shall form the basis for DOE authorization to assume SAS responsibilities. Upon DOE authorization, the Contractor shall assume responsibility for all applicable SAS resources, materials, facilities, documents, and equipment.

C.0.4.1.7 Identification of Material Differences

During the Transition Period, the Contractor shall identify any material differences in the systems, facilities, waste sites, property and services described in this PWS and actual conditions at the end of the transition period. The Contractor shall prepare and submit a Statement of Material Differences within 45 days of the NTP. If the Material Differences require revisions to the Contract, the Contractor shall submit a change proposal to reconcile the material differences with the Contract by the end of the contract transition period.

C.0.4.1.8 Stakeholder Engagement

During the Transition Period, the Contractor shall brief workers, Federal staff and stakeholders on the Contractor's approach and commitments for accomplishing the PWS. The timing and frequency of these briefings shall be agreed to by DOE and the Contractor within 5 business days of the NTP.

Within 72 hours following a NTP, the Contractor shall release on its own website a brief Executive Summary of its offer including the following elements:

- Name of Contractor including the identification of any Teaming Partners and Major Subcontractors and a description of the experience that each brings to the project.
- Summary/Description of Contractor's Technical Approach
- Organizational Structure and Identification of Key Personnel
- Commitments to the Community for the Period of Performance
- Total Contract Value Commitment to Small Business Subcontracting
- Contractor Performance Commitments
- Brief overview of Contractor's Work on Similar Projects

The purpose of this Executive Summary is to provide immediate release of relevant information to stakeholders and the public at large.

C.0.4.1.9 Implementation of Contractor Human Resources Management Requirements

The Contractor's Transition Plan required above in Section C.0.4.1.1 shall include a description of the Contractor's implementation of human resources management consistent with Workforce

Transition and Contractor Human Resources Management requirements as described in Section H, Clauses H.4 through H.7, including:

(a) Expected workforce composition and any immediate or anticipated workforce restructuring;
(b) Identification of any existing issues under the National Labor Relations Act (NLRA) and its plan for engaging with any labor representatives;
(c) A schedule for preparation and submission of any bargaining parameters requests;
(d) Identification of any prevailing wage requirements, including any requirements under section 4(c) of the Service Contract Labor Standards statute as well as any NLRA requirements with respect to determination of wages and benefits;
(e) Description of process for handling labor standards determinations for work packages;
(f) Define any obligations with respect to pension and post-retirement benefit plans;
(g) A plan for identification and resolution of any legal issues regarding any of the above; including the Contractor's plan for engaging outside counsel, if needed; and
(h) A plan for communicating with DOE on these matters.

C.1 Liquid Waste Operations (WBS: 01)

The mission of LW Operations is to receive, store, treat, and dispose of radioactive liquid waste. The LW Operations are highly integrated involving safely storing liquid radioactive waste in underground storage tanks; removing, treating, and dispositioning the low activity waste fraction in concrete SDUs; vitrifying the higher activity waste at DWPF; and storing the vitrified waste in stainless steel canisters until permanent disposition.

The Contractor shall initially adopt the incumbent Contractor's programs and implementing procedures (e.g., Documented Safety Analysis (DSA), Technical Safety Requirements (TSRs), nuclear safety operating procedures, Performance Assessments, etc.) to facilitate continuity of operations and accomplishment of work. To ensure compliance with Contract requirements, current regulatory requirements, DOE directives and Contractor organizational roles and responsibilities, the Contractor is responsible to perform its own compliance verification of these programs and the implementing procedures. The Contractor, with DOE acceptance as appropriate, shall revise programs and implementing procedures it deems necessary to accommodate its technical approach, while maintaining compliance.

The Contractor shall maintain compliance with site-wide Manuals governing operations and maintenance requirements. These activities include routine operations, predictive, preventive and corrective maintenance, and infrastructure activities needed to support LW facilities and any facility improvements including general plant projects, major modifications, temporary modifications, and line item projects needed to sustain facility operations. Facilities shall be operated and maintained in a condition to ensure operability as designed beyond the end of the contract period of performance.

DOE maintains a comprehensive Master Infrastructure List of critical facility and infrastructure needs. Infrastructure for the purpose of this work scope includes all facility support structures; operational equipment; fire protection; electrical systems; plumbing; heating, ventilation and air conditioning equipment; superstructures; interior and exterior enclosures; roofing; foundations; basement construction; conveying systems; stairs; and furnishings. The areas of consideration include the Tank Farms and associated systems, structures and components, S-Area, Z-Area, ETF, and SWPF in J-Area, once the SWPF is transitioned to the Contractor. It also includes the office trailers and other supporting facilities in areas B, E, G and T-Areas (see Attachment J-12, Appendix A - LW Facilities). The Contractor shall provide to DOE quarterly maintenance updates including a list of maintenance activities for these areas that were completed during the preceding quarter, a prioritized list of maintenance activities that are scheduled to be performed, and newly identified maintenance activities. The maintenance activities shall be prioritized and risks associated with non-performance of the maintenance activities shall be identified and described with respect to safety and continued operations.

Supplemental information included in Section C is provided to aid in understanding the requirements and does not add any additional requirements.

C.1.1 Tank Farms (WBS: 01.01)

Tank Farms operation includes multiple facilities and processes, including the ARP/MCU, waste tank system transfers, evaporator operations, space management, salt and sludge feed batch retrieval and preparation of waste for transfer to other LW facilities, waste disposition, and, ultimately, tank closure.

C.1.1.1 Actinide Removal Process/Modular Caustic Side Solvent Extraction Unit (WBS: 01.01.01)

The Contractor shall manage and optimize interim salt processing and disposition of radioactive salt waste using the integrated ARP/MCU system, strategically reducing inventory and recovering tank space. The Contractor shall deliver a low-activity clarified salt solution waste stream (i.e., treated to remove strontium and actinides, if necessary, and cesium) as feed to the SPF for processing and to derive a high-activity concentrated radioactive cesium stream and possibly an actinide/strontium stream as feed for processing at the DWPF.

ARP/MCU shall be shut down and isolated 30 days prior to SWPF radioactive tie-ins to the liquid waste system. The Contractor shall maintain the ARP/MCU processes and facilities in a lay-up status with waste having been flushed from all vessels, transfer lines, coalescers, contactors, instrument lines, ventilation system reheaters and condensers, cells, sumps, and all locations exposed to radioactive or chemical waste, to the maximum extent practicable until such time as SWPF has transitioned to the Contractor for continued operation. Lay-up includes separation of all transfer lines and capping/blanking the lines. Ventilation system filters will continue to be maintained to ensure any residual contamination may not be released from the facilities.

Alternately, the Contractor may, with DOE approval, re-purpose the ARP/MCU systems as part of the system optimization activities for accomplishment of the PWS consistent with applicable requirements.

<u>Supplemental Information</u>

Attachment 3 provides a schematic diagram of the ARP/MCU process. Lower activity salt waste is currently processed through ARP/MCU. The ARP decontaminates salt solution via adsorption of strontium-90 (Sr-90) and actinide radionuclides onto Monosodium Titanate (MST), followed by filtration or settling of the MST and entrained sludge solids in the salt solution. The high activity waste stream is transferred to DWPF for vitrification and the remaining clarified salt solution is transferred to the MCU process. The MCU process extracts cesium-137 (Cs-137) from the clarified salt solution using Caustic Side Solvent Extraction (CSSX) chemistry. The low Cs-137/low actinide Decontaminated Salt Solution (DSS) is subsequently transferred to Tank 50H for feed to the SPF, and the cesium containing Strip Effluent (SE) solution from the CSSX process is transferred to the DWPF for vitrification. In combination with evaporation, the operation of ARP/MCU reclaims valuable space in the F-Area and H-Area waste storage tanks and supports continued DWPF operations. ARP/MCU treatment will be replaced in the future

by the SWPF, which is in non-radioactive (i.e., cold) commissioning. SWPF will process significantly larger amounts of salt waste that are also higher in radioactivity.

The ARP/MCU is currently projected to operate at a rate of 4-8 gallons per minute (gpm) until the facility is shut down for SWPF tie-ins approximately four weeks prior to the start of radioactive (i.e., hot) operations. Nominally ARP/MCU produces:

- For each gallon processed, approximately 1.2 gallons of DSS for SPF
- For each gallon processed, approximately 0.08 gallon of SE for DWPF
- For each gallon processed, approximately 0.02 gallon of MST solids/sludge for DWPF

Note: actual operating experience in ARP/MCU since beginning Next Generation Solvent (NGS) processing may vary slightly from these assumptions as data is collected and analyzed.

Actions taken since startup of ARP/MCU have demonstrated an increased processing rate from the original design of 1 million gallons per year to approximately 1.5 million gallons per year. Enhancements and improvements include chemistry adjustments at Tank 49H, reduced cycle times, and redesign and replacement of the secondary filter at facility 512-S.

Efforts continue to improve equipment reliability, reducing unexpected downtime to improve overall attainment. In addition to equipment and processing upgrades, alternative system planning is being done to more efficiently qualify subsequent salt batches to reduce downtime between batches.

Operation of ARP/MCU with NGS has resulted in more efficient removal of cesium from the treated salt solution than the original solvent formula. This increased cesium removal efficiency (decontamination factor or DF) allows ARP/MCU to produce a DSS stream with a residual cesium concentration much less than previously achieved.

C.1.1.2 Tank Farm Operations (WBS: 01.01.02)

The Contractor shall operate the Tank Farms to receive, concentrate, and store liquid radioactive wastes in support of ongoing site activities and ensure the continued operability and structural integrity of the liquid radioactive waste tanks and ancillary structures. The Contractor shall be responsible for effective Tank Space Management, Salt Feed Preparation, Sludge Feed Preparation, bulk waste removal/retrieval, and management of the ETF. The Contractor shall maintain a comprehensive tank inspection program that is compliant with the requirements specified in the SRS Federal Facility Agreement (FFA). Mercury monitoring/sampling and chemical analysis throughout the LW systems will continue to be performed. Mercury shall be managed consistent with the Safety Basis and in a manner that does not inhibit the flow sheet and production expectations.

The Contractor shall ensure the Tank Farms have the capacity to receive up to 300,000 gallons of waste from H-Canyon processing operations annually through FY 2025.

Supplemental Information

The radioactive liquid waste contained in the underground storage tanks is in the form of saltcake, salt supernate, or insoluble sludge solids. The functions of the underground storage tanks are:

- Receipt and storage of radioactive liquid waste and by-products generated by operation of the chemical separations processing and research facilities.
- Prevention of potentially harmful exposure from radiation to site worker and members of the public.
- Prevention of potentially harmful quantities of radionuclides and chemicals from escaping to the environment.
- Maintaining safe storage of the liquid radioactive waste.
- Preparing batches of liquid radioactive waste for treatment into a more stable form (solidification) for final disposition.

The F-Area Tank Farm (FTF) is a 22 acre site containing eight Type I, two Type III, eight Type IIIA, and four Type IV storage tanks. Six tanks in FTF have been operationally closed. In addition, FTF also includes supporting ancillary structures such as two evaporator systems, transfer pipelines, diversion boxes, a concentrate transfer system, a catch tank, and three pump pits. The H-Area Tank Farm (HTF) is a 45 acre site containing four Type I, four Type II, four Type III, thirteen Type IIIA, and four Type IV tanks. Two tanks in H-Tank Farm have been operationally closed. In addition, HTF includes supporting ancillary structures such as three evaporators, eight diversion boxes, ten pump pits, pump tanks, transfer valve boxes, and transfer piping. Also located in HTF is the ARP/MCU processing system. The twenty-four Type I, II, and IV tanks do not meet the secondary containment standards in the SRS Federal Facility Agreement. Eight of these tanks have been operationally closed. Out of these sixteen tanks that remain in service, eight tanks have leaked waste through the primary tank wall into their respective secondary containment (i.e. annulus space) and four of these tanks have completed bulk waste removal efforts (tanks 4F, 7F, 8F, and 11H). Execution of waste retrieval in Type I and II tanks that have leak sites may reactivate these leak sites or expose new leak sites.

C.1.1.2.1 Tank Space Management (WBS: 01.01.02.01)

The Contractor shall maintain usable working tank storage capacity (space) to support waste retrieval and treatment operations (e.g., preparation of sludge and salt feed and receipt of waste from DWPF, ETF, and H-Canyon). The Contractor shall implement effective supplemental space management initiatives as necessary, including the operation of evaporator systems.

The 3H evaporator system is currently non-operational due to an evaporator pot leak into the secondary containment cell. The Contractor shall return the evaporator to service following pot replacement by the end of the second quarter of FY 2019.

Supplemental Information

Since 1951, the Tank Farms have received over 160 Mgal of liquid waste, of which most have been evaporated and/or treated, leaving approximately 36.2 Mgal in the storage tanks. Available storage space is used for waste receipts, waste retrieval, and processing operations. A contingency amount of 1.3 Mgal is not included as working space and is reserved for the unlikely event of a full tank failure. Waste receipts and transfers are normal Tank Farm activities as the Tank Farms receive new or "fresh" waste from the H-Canyon stabilization program, a low activity waste stream from DWPF processing (typically referred to as "DWPF recycle"), wash water from sludge washing, and very small amount of concentrate from ETF. The Tank Farms also make routine transfers to and from waste tanks and evaporators. The two evaporator systems, the 2H and 3H systems, support space management with volume reduction of 2 – 3 million gallons per year of liquids produced by sludge batch washing and DWPF recycle receipts. Both systems are experiencing operational issues. The 2H system operation is impaired by chromate cooling water leaks in the feed and drop tanks. The 3H system is inoperable due to a leak in the 3H evaporator pot into the secondary containment cell. Corrective actions to restore both systems to operation are under way.

The Type III/IIIA tanks are used to: (1) retrieve waste from and clean older style (Type I, II, and IV) tanks; (2) prepare, qualify, and treat sludge waste for disposal; (3) prepare, qualify, and treat salt waste; and (4) support nuclear materials stabilization and disposal through H-Canyon. The four Type IV tanks in HTF support immobilization and disposition of high-level waste. The Tank Farm space management strategy in the Liquid Waste System Plan (http://www.srs.gov/general/pubs/srr-lw-systemplan.pdf) is based on projections of DWPF canister production rates, salt waste processing rates, influent stream volumes, Tank Farm evaporator performance, and space gain initiative implementation.

Tank Farm Operations support:

- Salt processing – salt retrieval, batching, and qualification
- Sludge processing – sludge retrieval, batching, and qualification
- H-Canyon waste receipts
- Continued safe storage of radioactive liquid waste
- Defense in depth operational control
- Maintain contingency space for recovery in the event of full loss of containment of a tank
- Working space for evaporator operations

C.1.1.2.2 Salt Feed Preparation (WBS: 01.01.02.02)

The Contractor shall be responsible for operation and maintenance of equipment necessary to dissolve, batch, and adjust salt waste from various tanks to serve as feed for ARP/MCU and SWPF. Salt batches shall meet the waste acceptance criteria (WAC) of the facility it will be transferred to. For each salt batch prepared, the Contractor shall provide to DOE a Salt Batch Preparation/Qualification Report.

Tank Farm feed preparation infrastructure modifications required to support SWPF processing rates include:

- H-Tank Farm Blend tanks readiness for salt batch preparation
- Tank 49H readiness as SWPF feed tank
- Mixing capabilities
- Enhanced transfer capabilities
- Transfer routes provided to blend/feed tank(s)

For the purposes of meeting the Contract Performance Requirements in Table 1 for salt waste processing, the following applies:

1. Salt waste feed prepared for and processed via the following sources shall be counted:
   - ARP/MCU;
   - SWPF (during 1st year of operations);
   - SWPF (post-transition); and
   - TCCR.

2. Quantities of salt waste feed will be measured as follows:
   - ARP/MCU – Quantity of salt waste fed from Tank 49H (or other feed tanks) to SWPF at a nominal 6.44 M Na concentration.
   - TCCR – Quantity of salt waste available for transfer to Tank 50H after cesium removal.

3. Sodium Molarity: If a facility or process (e.g., SWPF) can receive and process salt waste at sodium molarities other than the nominal 6.44 M Na concentration, an adjustment factor shall be applied to the volumes to account for the higher or lower concentration as appropriate. Processing of salt waste at sodium concentrations other than 6.44 M Na must be fully evaluated such that the impacts to the balance of the LW system are mitigated.

<u>Supplemental Information</u>

Salt feed preparation includes development of salt batches from various waste tanks for feed to salt treatment processes including ARP/MCU and SWPF. Salt Feed Preparation for each batch currently requires three months for sampling, analysis, and transfer into the batch feed tank. SWPF is planned to process the majority of this salt solution waste. Salt preparation capability is currently limited by the number of blend tanks available to prepare salt batches. Currently, a single tank is capable of preparing 3 to 4 Mgal/yr. Only one blend tank is expected to be available upon SWPF startup. A second blend tank is expected to be available for use in the first quarter of FY 2020; however a third tank will likely be needed to enable the Tank Farms to feed SWPF at 9 Mgal/yr.

Factors that impact salt feed preparation include:

- Blend Tank availability

- SE & MST processing in DWPF at optimum throughput rates
- DSS processing in SPF at optimum throughput rates and availability of SDUs

Future salt treatment technology demonstration of the at-tank cesium removal is under investigation. Refer to Section C.2.6.2 for additional information.

C.1.1.2.3 Sludge Feed Preparation (WBS: 01.01.02.03)

The Contractor shall be responsible for operation of equipment and conducting treatment processes used to prepare sludge waste feed to sustain DWPF vitrification operations. The Contractor shall effectively couple tank waste removal operations with sludge waste feed preparation operations to provide sludge waste: 1) within compositional ranges that support sludge waste blending and preparation into batches that meet DWPF prescribed feed specifications; and 2) with sufficient volume to ensure the continuous availability of sludge waste feed to DWPF. For each sludge batch prepared, the Contractor shall provide to DOE a Sludge Batch Preparation/Qualification Report. The Contractor shall also model sludge waste feed preparation activities and execute activities necessary to ensure that DWPF vitrification operations can be sustained beyond the Contract period of performance.

Supplemental Information

The basic steps for sludge processing are: 1) Sludge removal from tanks; 2) Optional Low-Temperature Aluminum Dissolution; 3) Blending and washing of sludge; and 4) Sludge feeding to the DWPF. Currently a single tank (Tank 51H) is the sole DWPF feed preparation tank (see Figure 1).

Sludge preparation is paced by available canister storage, bulk waste retrieval, and by tank storage space to prepare sludge batches. Sludge batch planning uses the estimated mass and composition of sludge and known processing capabilities to optimize processing sequences. The planned sludge batches are identified in the approved Liquid Waste System Plan.

Differences in sludge batch sequencing, total number canisters produced, and batch end dates is an effort to balance the end of salt processing more closely with the end of sludge processing, reducing the necessity for supplemental chemical additions. The projected canister pour rate is balanced to be appropriate for salt processing support.

Waste generated from processing of spent nuclear fuel and targets in H-Canyon has resulted in high amounts of aluminum solids as gibbsite or boehmite. Much of this aluminum can be removed from the sludge by dissolution of the aluminum and subsequent removal by decanting of the liquid phase. This reduces the number of canisters needed to disposition the sludge, due to the lowered sludge solids mass and improved waste loading in the glass. Dissolution is achieved by adding caustic, elevating temperature, mixing, and sufficient reaction time.

Sodium and other soluble salts (e.g., sulfates, nitrates, nitrites) in DWPF feed are reduced through sludge washing. Sludge washing is performed by adding water to the sludge batch, mixing with slurry pumps, securing the pumps to allow gravity settling of washed solids, and

decanting the sodium-rich supernate to an evaporator system for concentration. This cycle is repeated until the desired molarity (typically 1.25 M Na) is reached. Some types of sludge settle slowly, extending wash cycles. Sludge settling and washing typically constitutes ~75% of batch preparation time. The total number of washes performed and volume of wash water used are minimized to conserve tank space. Sludge batch size and wash volumes are also limited by the hydrogen generation rate associated with radiolysis of water. Tank contents are mixed on a periodic frequency to release hydrogen retained within the sludge layer, resulting in a limited window within operating constraints for gravity settling.

C.1.1.2.4 Bulk Waste Retrieval/Removal (WBS 01.01.02.04)

Note: In this document, the terms “bulk waste retrieval” and “bulk waste removal” may be used interchangeably and signify the same set of activities.

The Contractor shall retrieve and remove sufficient waste from older style and compliant tanks to ensure adequate support of salt and sludge batch preparations. Preference should be given to retrieval and removal from older style tanks that are within or beneath the water table (Type I and II tanks in H-Area Tank Farm). Eight tanks shall be completed during the base contract period of performance and two tanks shall be completed during the option period of performance.

The Contractor shall be responsible for design, procurement, installation and operation of equipment for conducting bulk waste retrieval/removal of salt and sludge from the liquid waste storage tanks. The Contractor shall prepare and treat waste to meet the Waste Acceptance Criteria of downstream facilities, including ARP, MCU, Tank 50H, the Saltstone Facility, DWPF, and the Salt Waste Processing Facility. Old style tanks include Types I, II, and IV are shown in Figures 2.4-1, 2.4-2, and 2.4-4 in WSRC-SA-2002-00007-VOL-1-DSA-ES, Ch 1, 2 Rev 17, provided in the Document Library. Completion of bulk waste retrieval/removal activities is defined as DOE concurrence on the Contractor provided detailed presentation of the specified tank’s completion of bulk waste removal efforts with conclusive evidence. Future work scope for the specific tank transitions to the Tank Closure process (C.2.4) if closure is the next step or to Tank Space Management (C.1.1.2) if the tank will continue in service.

<u>Supplemental Information</u>

Bulk Waste Retrieval/Removal is currently conducted by adding liquid (e.g., dilute supernate, DWPF recycle water) to waste tanks with sufficient mild agitation that the saltcake material is dissolved for transfer to the appropriate waste treatment tank where chemistry or other waste properties may be adjusted in order to meet the requirements for additional processing. Following the actinide and cesium removal processes, the resulting low activity salt solution is transferred to Tank 50H for ultimate disposal into Saltstone Disposal Units at the Saltstone Facility while the actinides/Sr bearing monosodium titanate sludge/solids and cesium laden acidic solutions are transferred to DWPF for ultimate disposal into glass canisters. Currently, dissolution of one 1.3 million gallon tank full of saltcake results in the generation of 4 million gallons of dissolved salt solution, which is equivalent to approximately 3 to 4 full tanks of

dissolved salt. Retrieval/removal of sludge waste also includes addition of liquid (e.g., supernate, water) to sludge (non-soluble) material, agitation by mixer pumps, and transfer to a receipt tank for preparation of the sludge feed to DWPF. Similarly, slurrying of one gallon of settled sludge increases the volume of sludge waste to 1.3 gallons of slurried sludge.

C.1.1.2.5 Effluent Treatment Facility (WBS: 01.01.02.05)

The Contractor shall be responsible for operation of the ETF in compliance with environmental regulations associated with the Resource Conservation and Recovery Act (RCRA) and the National Pollutant Discharge Elimination System (NPDES) under the Clean Water Act. The ETF operator in charge shall be certified by the South Carolina Environmental Certification Board and hold an “A” Physical/Chemical Wastewater Certificate.

The Contractor shall maintain the facilities in a ready-to-serve status, function as a service provider for other site contractors, and coordinate with waste generators to develop annual waste volume projections for DOE-SR review.

Supplemental Information

The ETF is classified as an “A” Level physical/chemical wastewater treatment facility by the SCDHEC. The ETF treats low-level radioactive wastewater from the F and H Area separations and waste management facilities, F/H Laboratory, the Savannah River National Laboratory, H Tank Farm evaporator overheads and miscellaneous sources, such as Soil and Groundwater Closure Projects well purge water. The ETF removes chemical and radioactive contaminants before releasing the water into Upper Three Runs Creek, a Savannah River Site (SRS) stream that flows to the Savannah River. ETF non-radiological effluents are discharged within limits of permits issued by SCDHEC.

The ETF is designed and constructed to allow SRS to meet all environmental regulations associated with the Resource Conservation and Recovery Act and the National Pollutant Discharge Elimination System under the Clean Water Act. The ETF is designed to operate at an average capacity of 165 gpm and with a “sprint” capability of 300 gpm for short durations. The maximum permitted facility capacity is 430,000 gallons per day. The ETF encompasses wastewater collection and treatment operations that were modified for radioactive use. It was designed to remove heavy metals, organic chemicals and corrosive chemicals, as well as cesium and other radiological contaminants from the site’s waste water. Because the Savannah River water eventually flows into municipal drinking water facilities, radiological effluents are governed by the Federal Clean Water Act.

C.1.2 Waste Vitrification (WBS: 01.02)

Waste Vitrification operations includes the DWPF and the two existing GWSBs.

C.1.2.1 Defense Waste Processing Facility (WBS: 01.02.01)

The Contractor shall operate the DWPF to optimize the processing of the sludge and high activity feed streams from salt processing into a vitrified waste form that meets or exceeds all requirements for interim storage at SRS and all requirements regarding the acceptability of the vitrified waste form for disposal in a licensed Federal Repository. The Contractor shall avoid sludge feed breaks to DWPF. Mercury shall be managed consistent with the Safety Basis and in a manner that does not inhibit the flow sheet and production expectations. The Contractor shall ensure the availability of a spare melter to effect a timely replacement of an operational melter in the event of its failure. (Note: This requirement begins upon availability of Melter #4). The Contractor shall maintain a concentration limit of 897 g/m^3 of fissile material in the glass and a canister heat load of less than 792 watts per canister. The Contractor shall also provide for safe storage of failed melters on site by constructing failed melter boxes and Failed Equipment Storage Vaults (FESV). The Contractor shall procure canisters for use in DWPF as necessary to ensure continued operations. DWPF canister production shall continue to meet the requirements of DOE/RW-0333P, Quality Assurance Requirements and Description, until and unless directed otherwise by DOE.

<u>Supplemental Information</u>

DWPF Canister Production

The DWPF facility receives and combines washed sludge and high activity waste from salt processing with glass frit for vitrification and pouring into canisters. Tank Farm sludge waste feed preparation has supported canister production of over 275 canisters per year while feed preparation systems internal to DWPF have demonstrated a capacity of greater than 325 canisters per year. The total canister production is expected to vary during the Contract period commensurate with the receipt of high activity streams from SWPF.

To support higher glass throughput, the DWPF melter was retrofitted with four bubbler systems and the melter off-gas system was optimized in September 2010. Additional process improvements may be necessary in order to support SWPF operations at a feed rate up to 9 Mgal per year, including:

- Implementation of an alternate reductant
- Processing of cesium SE in the Slurry Mix Evaporator (SME)
- Streamlining the melter feed preparation system
- Reduction in the volume of the high activity waste streams to be received from SWPF

Based on the current Liquid Waste System Plan, canister production schedules include two one-week outages every year to allow for routine planned maintenance and another two weeks for the site-wide steam outage each year. A four-month melter outage is assumed every eight years of processing. Actual melter replacement is determined by melter performance. The performance of the current melter and impacts from a future outage should be considered in determining whether or not to replace the current melter during the SWPF tie-in outage.

Canister production and sludge batch need dates were projected in the current Liquid Waste System Plan based on:

- During the SWPF tie-in outage, DWPF plans to implement productivity enhancements to support increased influents from SWPF. Actual outage time will be coordinated with the Salt Waste Processing Project Office to align with SWPF start-up.
- DWPF recycle is beneficially reused.
- Pu discards from H-Canyon will be supported to the extent allowable without negatively impacting planned canister waste loadings while continuing to comply with the canister fissile material concentration limits.

DWPF Feed and Recycle

Sludge processing through the DWPF removes the highest risk material from the tanks. However, for every 1.0 gallon of sludge processed, 1.3 gallons of salt waste is formed due to sludge washing and DWPF processing operations to return the resulting low hazard salt waste to the Tank Farm. Similarly, salt waste retrieval/removal, preparation, and batching typically require the use of about three gallons of tank space per gallon of salt cake dissolved.

Sludge processing is paced by available canister storage and by tank storage space to prepare sludge batches. DWPF Recycle is the largest influent stream received by the Tank Farm. Volume reduction of the recycle stream is handled through evaporation by the 2H Evaporator System. The DWPF recycle rate is expected to remain between 1.5 and 1.9 Mgal/yr prior to SWPF operations.

Failed Equipment Storage Vaults (FESVs) and Melter Storage Boxes (MSBs)

Construction/fabrication of Failed Equipment Storage Vaults (FESVs) and Melter Storage Boxes (MSBs) are repetitive activities required to sustain ongoing DWPF operation by providing interim storage of failed DWPF melters. Currently there is one FESV constructed, containing two vaults. Each vault was designed to store one failed melter inside an MSB.

FESV is available for storage of Melter #2 as Melter #1 is already stored in one of the vaults. MSB #2 is currently stored in FESV #1 awaiting use during the Melter #2 replacement outage. Space has been reserved for construction of up to ten FESVs, if needed. The need date for the next FESV and MSB will be dependent on the need for Melter #3.

Large contaminated failed equipment is currently stored in the 221-S Canyon.

C.1.2.2 Glass Waste Storage Buildings (WBS: 01.02.02)

The Contractor shall operate and maintain GWSB #1 and #2 to store glass waste canisters produced at the DWPF on an interim basis pending shipment for offsite disposal at a licensed Federal Repository. The Contractor shall continue on-going canister double-stacking activities in GWSB #1 to increase the total number of storage locations for standard canisters to 4,508.

Supplemental Information

The canisters of vitrified High Level Waste (HLW) produced by DWPF are currently stored on-site in two dedicated interim GWSBs. A Shielded Canister Transporter (SCT) moves one canister at a time from the Vitrification Building to a GWSB. Both GWSBs are qualified to meet or exceed a Performance Category 2 design basis earthquake.

GWSB #1 consists of a below-grade seismically qualified concrete vault containing support frames for vertical storage of 2,286 storage positions although there are only 2,251 standard canister positions in use storing radioactive canisters. GWSB #2, with a similar design to GWSB #1, has 2,340 standard storage locations and is currently being filled with radioactive canisters as they are produced. There are also approximately 20 locations in DWPF available for canister storage pending transfer to a GWSB.

The GWSB #1 storage structure and services consist of four storage compartments with four foot thick concrete shield plugs, an SCT operating floor, air inlet and exhaust shafts, and attached building support facilities. Based on preliminary projections of the radiological composition of the next several sludge batches, the storage capacity of GWSB #1 can be expanded to double the capacity to 4,502 canisters by “double stacking” the canisters one on top of the other. The steps necessary to double stack the canisters are currently ongoing.

C.1.3 Low Activity Waste Disposal (WBS: 01.03)

The Low Activity Waste Disposal is conducted by transferring DSS from Tank 50H to the Saltstone Production Facility (SPF) where it is mixed with dry feed materials to form a grout matrix and then pumped to the Saltstone Disposal Facility (SDF). The low-activity salt waste stream sent to the Saltstone Facility from Tank 50H and/or SWPF shall comply with the SPF WAC.

C.1.3.1 Saltstone Production Facility (WBS: 01.03.01)

The Contractor shall operate and optimize the SPF to support processing of low activity liquid waste, including DSS, for disposal in the SDF. The Contractor shall process up to 12 million gallons per year of low activity waste from Tank 50H and/or SWPF. SPF shall be operated to ensure compliance with Section 3116 Determination for Salt Waste Disposal at the Savannah River Site, Basis for Section 3116 Determination for Salt Waste Disposal at the Savannah River Site, DOE M 435.1, applicable SCDHEC permits, and the Site Treatment Plan (STP).

Supplemental Information

The SPF processes DSS for permanent disposal of this low-level radioactive waste into SDUs. SPF and its companion facility, Saltstone Disposal Facility (SDF), are low risk for radioactive hazards and moderate risk for chemical hazards.

Dry feeds (slag, fly ash, and cement) are weighed into batches continuously and fed into the process room mixer where the DSS is also added at a controlled rate, transferring the dry

feeds/DSS mixture (saltstone grout) through the SPF process room equipment and pumping the saltstone grout through transfer lines into one of several SDUs at the Saltstone Disposal Facility (SDF) for final disposal. Receipt of DSS is a controlled process, with operator interaction from Tank 50H (Saltstone feed tank) and is continuous while processing DSS (feed and bleed). DSS and dry feeds are approximately a one-to-one ratio; that is, one gallon of DSS combined and mixed with dry feeds produces approximately 1.76 gallons of saltstone grout. Drain water is pumped back from the SDUs to the SPF on a daily basis during operation.

Saltstone grout has historically been produced and poured in daily batches containing approximately 35,000 gallons of DSS but it is anticipated that a significant increase in the production of saltstone grout will be required once the Salt Waste Processing Facility (SWPF) is fully operational and the Saltstone Facility may be in continuous operation (24 hours/7 days per week), except during planned outages. The annual processing requirement of 12 million gallons includes contributions from the ETF and H-Canyon of up to 500,000 gallons.

C.1.3.2 Saltstone Disposal Facility (WBS: 01.03.02)

The Contractor shall operate and maintain SDF readiness to receive saltstone grout at all times except during a planned outage. Operations includes filling the SDUs, maintaining the saltstone grout and transfer lines operational, maintenance and repair/replacement of valves, and maintaining the SDU available for operations. As each SDU is completed, the Contractor shall conduct acceptance testing prior to turn over of the SDU for SDF operations. Once an SDU is operationally filled, the Contractor shall maintain the SDUs in a safe condition and meet the applicable requirements of the Saltstone DSA and the state issued landfill permit. The Contractor shall perform modeling (in coordination with salt batch planning) for the inventory and concentrations of significant radionuclides placed in an SDU, in order to maximize emplacement while ensuring compliance with applicable performance objectives of the disposal facility, consistent with the SDF Performance Assessment.

SDU #6 will be construction complete and turned over to operations at the start of the contract period of performance.

<u>Supplemental Information</u>

The SDF currently consists of eight concrete low-level waste disposal units. Two of the SDUs (SDU #1 and SDU #4) are above grade and no longer receive waste (but will require operational surveillance and maintenance activity). Two back-filled 2.9 million gallon SDUs (2A & 2B) are operationally full (filled to the limiting height allowed by the Safety Basis). Four back-filled 2.9 million gallon SDUs (3A, 3B, 5A, and 5B) are in active operation. One above grade 32 million gallon SDU (6) is under construction.

C.1.4 Salt Waste Processing Facility Operations (post transition) (WBS: 01.04)

Salt Waste Processing Facility (SWPF) operations will transition to this contract after the completion of one year of radioactive (i.e., hot) operations. This transition date is currently

scheduled for March 1, 2020. The Contractor shall maintain awareness of the actual SWPF schedule and shall have the flexibility to assume operation of SWPF earlier or later depending on the operational status of the facility. Following transition of operations, the Contractor shall operate and maintain the SWPF to process the salt waste feed stream resulting from tank waste removal operations to produce: two high-activity waste feed streams for processing at the DWPF which meet all DWPF waste acceptance criteria and a low-activity waste feed stream to the SPF, which meets all SPF waste acceptance criteria.

The Contractor shall maximize SWPF waste throughput. In addition, the Contractor shall implement the NGS into SWPF (see C.2.6.1) during the Contract period to ensure compliance with minimum salt waste processing requirements. The implementation of NGS shall occur at the end of the 2nd year of hot operations.

Supplemental Information

Waste from the Tank Farms will be pumped to a blending tank for blending to meet the SWPF feed specifications. Approximately 1 Mgal of waste will be prepared at a time. After sampling to ascertain that the blended waste meets feed specifications, the waste will be pumped to a staging tank from where individual batches of 23,200 gallons will be delivered to the SWPF for treatment.

The SWPF treats salt waste in three successive basic unit operations: Alpha Strike Process (ASP), Caustic-Side Solvent Extraction (CSSX), and Alpha Finishing Process (AFP). These processes separate the radioactive elements (primarily Sr and actinides (Sr/actinides), and Cs) from the bulk salt waste and concentrate them into a relatively small volume. This small volume is then transferred to the DWPF for vitrification. The remaining low-activity clarified salt solution waste stream contains only low levels of radioactive materials and is sent to the Saltstone Production Facility (SPF) for incorporation into grout. The ASP occurs first and is used to separate Sr/actinides from the waste feed by MST adsorption and filtration. The CSSX process follows the ASP and is used to remove Cs from the ASP filtrate by solvent extraction. The AFP is a process step that mimics the ASP and is used as necessary for multi strikes which provide additional Sr/actinide removal downstream of the CSSX process.

The ASP is operated as a batch process. Each batch of salt waste received in the SWPF is chemically adjusted and MST is added. The tank contents are mixed to allow the MST to adsorb the Sr and actinides (12 hours for single strike and 6 hours each for multiple strikes). The resulting MST slurry is filtered to produce a: 1) concentrated MST/sludge slurry; and 2) Clarified Salt Solution (CSS) filtrate. The concentrated MST/sludge slurry is washed to reduce the sodium ion (Na+) concentration and transferred to DWPF, while the CSS is routed to the CSSX process.

The second SWPF processing stage is CSSX, which is a continuous flow process utilizing 36 contactor stages for extraction, scrubbing, stripping, and washing of aqueous and organic streams. The Cs is removed by contacting the CSS (aqueous phase) with an engineered solvent (organic phase) in the extraction stage contactors. The Cs-depleted aqueous outlet

stream is sent to the AFP for sampling and analysis prior to transfer to the SPF or for another Sr/actinide removal operation. Following extraction, the Cs-enriched solvent is scrubbed to remove impurities (primarily sodium and potassium). The solvent is then contacted with a dilute nitric acid strip solution in the stripping stages, where the Cs is transferred to the aqueous SE. The SE (containing a high concentration of Cs) is sent to DWPF for vitrification.

If the Sr/actinide concentration in the CSS sent to the CSSX process is sufficiently low, the aqueous raffinate from the extraction stages (DSS) is sent to the SPF to be solidified with a cementitious grout mixture. If the Sr/actinide concentration in the CSS is too high, the aqueous raffinate from the extraction stages (referred to as Cesium-depleted CSS [CDCSS]) is sent to the AFP for a second MST strike.

The AFP, which is located downstream of the CSSX process, is the third SWPF processing stage. When the SWPF is operated in single-strike mode, DSS from the CSSX process is sent to the AFP for confirmatory sampling and staging prior to transfer to the SPF. If the Sr/actinide content of the waste feed is sufficiently high that a single MST strike cannot reduce the concentrations low enough for the CDCSS to meet the Saltstone Facility WAC limits, the CDCSS will be sent to the AFP to perform a second MST strike within the AFP.

SWPF will go through a series of performance testing during the non-radioactive (i.e., cold) commissioning phase of the project to demonstrate the facility meets the following performance acceptance criteria in Table 2:

Table 2 – Cold Commissioning Performance Plan

Test	Purpose	Performance Test Acceptance Criteria
Alpha Strike Performance	Demonstrate satisfactory MST performance	• Alpha Strike Throughput ≥ 7.3 Mgal/yr • AST-A (TK-101) filtered sample Sr < detection limit or DF ≥ 20
CFF Performance	Demonstrate seven (7) sequence CFF concentration cycles	• Filtration throughput ≥ 7.3Mgal/yr • SSFT (TK-109) Total Insoluble Solids (TIS) < 100 NTU by process in-line turbidity instrumentation and confirmation < 15 milligrams per liter (mg/l) TIS by laboratory
CSSX Performance	Demonstrate Cs mass transfer performance and CSSX solvent recovery at ≥7.3 Mgal/yr SWPF throughput equivalent	DSS • CSSX throughput equivalent ≥ 7.3 Mgal/yr • Non-radioactive Cs < detection limit or DF ≥ 40,000 • DSS Isopar L ≤ 87.5 parts per million (ppm)

		SE • Non-radioactive Cs CF ≥ 12 • Strip Effluent Isopar L ≤ 87 ppm
Design Capacity Throughput is Single Strike	Demonstrate parallel operation of Alpha Strike, Filtration, and CSSX	• SWPF throughput ≥ 7.3 Mgal/yr
Sludge Washing Performance	Demonstrate a nominal 5 wt% sludge batch washing and mixing in SSRT (TK-104)	• Solids concentration nominal 6 wt% • Na concentration ≤ 0.7M • Isopar L ≤ 87 ppm

The SWPF feed chemistry is per SWPF Feed Specification Radionuclide Limits of the SWPF WAC. During operations, SWPF is designed to process 7.3 Mgal/yr of salt solution and produce the following quantities for each gallon of salt waste processing:

- ~1.28 gal of DSS for SPF;
- ~0.08 gal of SE for DWPF; and
- ~0.02 gal of MST solids/sludge for DWPF.

The boundaries between SWPF and other liquid waste facilities as described in the SWPF Preliminary Documented Safety Analysis are as follows:

- DWPF Interface - SWPF responsibility ends at seal plate outside of SWPF Waste Transfer Enclosure.
- HTF Interface - SWPF responsibility ends at seal plate outside of SWPF Waste Transfer Enclosure.
- SPF Interface - SWPF responsibility ends at seal plate outside of DSS Hold Tank/Filter Feed Tank-B of AFF

C.2 Liquid Waste Operations Support (WBS: 02)

Liquid Waste Operations Support scope consists of SDU Construction, SWPF Integration, SWPF Transition, Tank Closures, DOE-3009-2014 Implementation, Technology Development and Deployment, Production Enhancements, and Additional GWS Capability. All capital asset projects and major capital asset modifications conducted under this WBS element shall comply with DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*, as applicable. The SDU construction activity is the only currently identified capital asset project in the PWS.

C.2.1 Saltstone Disposal Unit Construction (WBS: 02.01)

The Contractor shall assume responsibility for the completion of SDU #7 and is responsible for the construction of future SDUs. The SDU #7 project will be ongoing at contract turnover and is required to be operational no later than September 30, 2020. SDU #7 will be a 32 Mgal pre-stressed concrete tank similar in design to SDU #6. Based on required salt waste processing volumes, approximately 20 Mgal of disposal volume for saltstone grout is required annually. Beginning with SDU #8, the Contractor shall determine the exact quantity of SDUs needed, determine the size of each SDU, design of the SDUs, and determine the construction schedule and completion of each SDU.

The key performance parameters (KPPs) for each SDU structure include but are not limited to: 1) the SDU is free of leaks as demonstrated by leak testing, 2) provides saltstone grout containment, 3) provides infrastructure capable of receiving saltstone grout at a minimum of 100 gallons per minute, and 4) has a leak detection system in accordance with the Z-Area Industrial Solid Waste Landfill Permit requirements. Additional KPPs are identified during the conceptual design process and approved with the project performance baseline at Critical Decision 2 (CD-2). The volume and the delivery schedule for SDUs must align with salt waste processing activities.

The Contractor shall conduct Performance Assessment analysis as necessary to maintain compliance as required by DOE O 435.1 for each SDU. Scope under this PWS element is considered to be complete for each SDU constructed upon declaration of CD-4 approval and turnover to operations including all balance of plant activities to support operations.

<u>Supplemental Information</u>

The Saltstone Facility permanently disposes of low level waste in the form of saltstone grout into SDUs. The grout constituents are DSS, slag, flyash, and cement. Saltstone grout is produced in the SPF and pumped via transfer lines to the SDU. The saltstone grout sets (hardens) in less than 24 hours and is no longer flowable. Due to constituents contained in the saltstone grout, radiological hazards are low but chemical consequences are moderate. As salt dissolution progresses, the chemical constituents from the various waste tanks containing saltcake may vary and may require re-evaluation of the concrete matrix and protective coating.

SDU #6 is a commercial 32 million gallon pre-stressed concrete tank enhanced to meet the requirements for permanent storage of low level radioactive grout. These concrete tanks will require multiple pour spouts for depositing the grout uniformly and multiple drain water columns with submersible pumps to allow for return of excess water (drain water) that accumulates during the setting of the saltstone. The drain water is pumped back from the SDUs to the SPF each day to the maximum extent practicable. The SDUs have a network of piping on the tank top to direct saltstone grout to the selected pour spout and return drain water; instrumentation/equipment to monitor the temperature of the grout; and High Efficiency Particulate Air filtered vents to allow for air displacement as grout is deposited and to allow atmospheric breathing to prevent the accumulation of flammable vapors.

For calculation purposes, the following multiplication factors may be used:

> For every 1.0 gallon of salt solution at 6.44 M Na transferred to SWPF, 1.28 gallons of DSS is produced.
>
> For every 1.0 gallon of DSS transferred to SPF, when combined with the dry materials to form saltstone, 1.76 gallons of saltstone is formed for disposal in the SDUs.

C.2.2 Salt Waste Processing Facility Integration (WBS: 02.02)

In accordance with the Liquid Waste SWPF Integration Schedule, the Contractor shall perform actions necessary to complete SWPF tie-in activities to support the introduction of salt waste feed to SWPF by December 1, 2018. Scope under this PWS element shall be completed no later than the date the Contractor assumes operational responsibility for SWPF under PWS element C.1.4. Completion of hot tie-ins is not required prior to completion of the DOE Operational Readiness Review.

The activities noted below represent the current plan for accomplishing the scope associated with tie-in of the SWPF to the LW system. The Contractor shall determine the exact sequence and timing for each activity as part of the work planning effort.

FY2017

- Install and connect Raw Salt Solution (RSS) transfer line section near MCU to the Tank 49H B5 riser
- Install and cap additional section (approx. 100 ft) of RSS piping from the bottom of the east rock bank to SWPF Feed Line piping north of MCU
- Maintain excavation at Feed Line tie-in point with shielded covers
- Fabricate and install Tank 21H transfer line shielding as required to protect workers by end of the 3rd quarter of FY 2017
- Complete 511-S modification to add nitrogen purge on the Safety Class instruments
- Complete Consolidated Hazards Analyses (CHAs) and DSAs for continued MCU Operation by the 4th quarter of FY 2017 (DWPF 511-S, Tank Farms, 512-S and MCU)

- Complete pre-dig piping fabrications for transfer lines from SWPF (MST/Sludge Tank, Strip Effluent Tank, and Tank 49H Feed Tank) up to the 511-S Low Point Pump Pit (LPPP) wall nozzles
- Secure operations at MCU and DWPF and drain and flush necessary lines to reduce radiation doses to the workers
- Install sections of transfer lines from the SWPF (MST/Sludge Tank, Strip Effluent Tank, and Tank 49H) up to the 511-S LPPP wall nozzles and install dummy Hanford connectors to isolate SWPF until Authorization To Operate (ATO)
- Terminate and cap Strip Effluent transfer line upstream (from the SEHT) and downstream of the 511-S Sludge Tank cell (adjacent to the 511-S Sludge Tank cell)
- Complete fabrication of and install two jumpers for 511-S to allow flow of strip effluent from MCU to DWPF

FY2018

- Implement CHAs and DSAs for continued MCU Operation (DWPF 511-S, Tank Farms 512-S and MCU) at the close of the tie-in outage 1st quarter of FY 2018
- Complete fabrication of three jumpers for 511-S to allow final tie-in of SWPF to be performed using jumpers versus excavation by the end of 2nd quarter FY 2018
- Finalize Tank 49H B5 riser modifications
- Following SWPF receipt of ATO, secure operations at MCU, DWPF, and Saltstone
- Drain and flush transfer lines as necessary to protect workers
- Terminate and cap MCU SEHT line

FY2019 (1QFY19)

- Install jumpers in 511-S
- Complete final tie-in of SWPF Decontaminated Salt Solution to the Tank 50H to Saltstone Interarea Line
- Final tie-in of the new RSS feed piping from Tank 49H to SWPF via the 511-S Recycle Tank

The LW Contractor shall provide integration support to the DOE SWPF Project Office and the SWPF construction contractor consistent with the SWPF Interface Control Documents (ICDs). This integration support includes but is not limited to technical expertise in nuclear facility startup, testing, and integration into the liquid waste system. Integration support to the SWPF construction contractor includes goods and services purchased through the SLA process from the M&O contractor such as utilities.

<u>Supplemental Information</u>

The SWPF is designed to process waste at a faster rate than the current LW processing rate and may require near term, infrastructure upgrades and modifications to the tank farm in preparation of feed batches at the maximum SWPF capacity. Additionally, infrastructure

upgrades and modifications may be required to process the high-activity SWPF effluents at DWPF, and the low-activity effluents at Saltstone.

SWPF tie-ins will require a four-month outage of DWPF operations, a two-month outage of SPF operation, and a cessation of ARP/MCU prior to SWPF operations.

The current tie-ins to support SWPF startup include: HTF feed tank(s) system tie-ins to SWPF, SWPF sludge and SE tie-ins to DWPF Low Point Drain Tank, and SWPF tie-ins to the IAL to Saltstone. These tie-ins will establish the capability to:

- Support the transfer of salt batch solution from Tank 49 to SWPF via underground transfer line.
- Receive batches of SE salt solution with high Cs-137 from the SWPF.
- Receive batches of the MST/Sludge Solids into the Low Point Pump Pit – Precipitate Tank (LPPP-PPT) from SWPF.
- Send DSS to Saltstone.

C.2.3 Salt Waste Processing Facility Transition (WBS: 02.03)

The Contractor shall submit an SWPF Operations Transition Plan consisting of identified SWPF transition activities, including involved organizations and a transition schedule to assume possession with continued operations of the SWPF complex without negatively impacting other ongoing LW operations. The plan shall include as a minimum review for inclusiveness and acceptance of all necessary facility asset documentation, safety basis plans engineering drawings, FIMS required information, identification of any changes to operations and maintenance procedures, training and training requirements.

The SWPF Operations Transition Plan shall be submitted not less than six months prior to the transfer of SWPF operations to the Liquid Waste Contractor. The duration of transition shall not exceed 90 days. The Contractor should review and update impacted site functional responsibility changes (current ICDs vs SLAs and Functional Service Agreements (FSAs)), and identify, document and resolve any additional operations, maintenance and training requirements that become evident during SWPF hot commissioning which may require the SWPF construction contractor resolution.

All Government-owned real and personal property and associated records, including equipment, material, and facilities, currently assigned to the SWPF construction contractor through engineering, procurement and construction to perform the SWPF operations work scope will be turned over to the Contractor for operations. During the SWPF transition period, the Contractor should verify the inventory of such property in the DOE FIMS, Federal Inventory System, and applicable property site database.

The Contractor shall accept full accountability for the remaining government-owned property transferred from the SWPF construction contractor, based on existing inventory records, on an “as is” basis and complete a formal inventory of all other nuclear and non-nuclear real property

and personal property within 60 calendar days upon SWPF and ancillary facilities transfer. Any discrepancies from the existing inventory records shall be reported to the CO.

The Contractor shall ensure that post-transition activities under this PWS element are completed within six months of the completion of transition of operations of SWPF to the Liquid Waste Contractor.

Supplemental Information

An integral part of the Liquid Waste Contract is the requirement for a smooth transition of continued SWPF facilities (complex) operations, after one (1) year of radioactive (i.e., hot) operations from the SWPF construction contractor to the Contractor. The objectives of the SWPF Operations Transition Plan are to prepare and complete successful transition of the SWPF complex possession, safe and secure operations, and eliminate any impacts for continuity of the integrated Liquid Waste operations.

C.2.4 Tank Closures (WBS: 02.04)

The Contractor shall complete Tank Closure on a minimum of five Type I and Type II old style waste tanks during the base contract period of performance, and a minimum of two tanks during the option period of performance. Tank closure shall be conducted in accordance with the applicable General Closure Plan, tank specific Closure Module, and the DOE Order 435.1 Tier 1 Closure Authorizations and tank specific Tier 2 Closure Plan. Tier 1 Closure Authorizations for F- and H-Area Tank Farms are complete. Waste tanks approved by DOE, EPA, and SCDHEC may be permanently closed as described in Section C.2.4.1 through C.2.4.3.

The tank closure phase generally consists of: 1) isolation of the tank from waste transfer systems and chemical addition systems; 2) filling the tank, tank annulus, and tank cooling coils with grout; and 3) capping all tank risers. A flowchart for the entire tank closure process is included as Attachment 4. Following completion of all closure activities, each tank system will be removed from the Wastewater Permit upon SCDHEC approval in accordance with the General Closure Plan.

C.2.4.1 Heel Removal and Residual Sampling (WBS: 02.04.01)

Once bulk waste removal is completed, the remaining waste in a tank is referred to as the heel. The Contractor shall remove the heel waste from each tank. Waste from each entire tank farm shall be removed to the maximum extent practicable achieving approximately 99 percent removal of the highly radioactive radionuclides as defined by the applicable Basis for Section 3116 Determination for Closure document. When heel removal is determined to be sufficient, the Contractor shall submit a request to enter the Sampling and Analysis Phase and obtain preliminary cease waste removal concurrence from DOE, the EPA, and SCDHEC. The resulting “residual” waste remaining in the tank will be sampled and analyzed to characterize the residual waste remaining and assess the risk.

The residual waste in a given tank will vary depending upon the ability to remove the waste. The residual waste will be sampled and analyzed and the results documented in a Residual Inventory Determination Report and a Special Analysis completed against the Tank Farm Performance Assessment. Both the Tank Farms Performance Assessments have been completed. A Closure Module and Tier 2 Closure Plan will be developed for each tank to confirm the DOE Order 435.1 and regulatory performance objectives continue to be met and that the stabilized tank is protective of human health and the environment. An FFA Final Cease Waste Removal concurrence must be approved by the SCDHEC and the EPA for each tank.

Supplemental Information

Types I, II, and IV old style high level waste tanks (Tanks 1F through 4F, 7F, 8F, 9H through 11H, 13H through 15H, and 21H through 24H) are planned for operational closure in accordance with a formal agreement (FFA) between the DOE, the SCDHEC and the EPA.

Some of these tanks may require heel removal and/or cooling coil flushing and annulus cleaning (Type I and II tanks) prior to partial isolation from tank farm services, residual sampling, and tank stabilization by completely filling the tank with clean grout. Heel removal is required with documented waste removal results to demonstrate to DOE, SCDHEC, and EPA diminishing effectiveness of the deployed waste removal technology and that additional waste removal is not practical. Residual sampling and analysis must be conducted in accordance with the SCDHEC approved Liquid Waste Tank Residual Sampling and Analysis Plan and the associated Quality Assurance Program Plan, which specify Savannah River National Laboratory (SRNL) as the only laboratory that can perform these analyses. These services are obtained via an SLA. Concentration and volume data are used to characterize the residual material to produce radiological and non-radiological inventories for the Special Analysis and CM. Tank specific closure documents are prepared to demonstrate compliance with DOE and regulatory requirements as well as NDAA Section 3116.

C.2.4.2 Tank Isolation (WBS: 02.04.02)

The Contractor shall isolate waste tanks and associated systems in accordance with the tank specific CM, Tier 2 Closure Plan, and defined safety basis requirements. Priority shall be given to waste tanks 9H, 10H, 11H, 13H, 14H, and 15H due to the proximity of the water table.

Supplemental Information

Isolation activities prior to stabilizing the tank with grout are the physical process of disabling waste transfer and chemical addition systems from a tank such that no material may be transferred into or out of the tank. Tank transfer line isolation may include cutting and capping, and blanking mechanical system components. Isolation of remaining intact services can be performed after the tank has been filled with grout. This includes but is not limited to air, electrical power to all components, and ventilation systems. Isolation plans for each tank being closed are prepared and described in the specific Closure Module.

C.2.4.3 Tank Grouting (WBS: 02.04.03)

Prior to grouting the Contractor shall develop the Residuals Inventory Determination Report, perform the Special Analysis, and prepare the Closure Module and Tier 2 Closure Plan. After the CM is approved by SCDHEC, the Tier 2 Closure Plan is approved by DOE, and DOE, SCDHEC, and EPA provide their respective Final Cease Waste Removal decisions, the tank is stabilized with grout in accordance with the approved CM and Tier 2 Closure Plan.

A tank is considered "closed" when DOE concurs that the Contractor has completed the work scope to remove the tank from service as defined in the approved closure module. Following closure, the Contractor will complete any remaining isolation of the tank from Tank Farm services, prepare the tank specific Final Configuration Report and tank specific Explanation of Significant Differences, and then request the tank be added to the Hazardous Waste Permit and removed from the Industrial Wastewater Permit.

Supplemental Information

Grouting is the process of placing reducing grout in the primary tank up to and including the risers, remaining equipment, annulus, and cooling coils. The reducing grout provides long-term chemical durability and minimizes leaching of residual waste over time. The reducing grout is self-leveling, and encapsulates the residual waste and equipment remaining inside the tank and annulus. Grouting activities include field modifications and grout procurement.

For tanks with installed equipment or cooling coils, internal voids are filled with a flowable grout mixture. In those tanks where the cooling coils have broken, alternative techniques are used to minimize voids in the grout matrix.

The final grouted tank configuration is an integral monolith free of voids and ensuring long-lasting protection of human health and the environment. The number of cubic yards per tank varies as the volume of tanks varies.

C.2.5 Safety Basis Upgrade Implementation (WBS: 02.05)

The Contractor shall revise the Documented Safety Analysis (DSA) and Technical Safety Requirements (TSRs), including development/revision of supporting hazards and accident analyses, necessary to comply with DOE-STD-3009-2014 for the CSTF and DWPF within four years of the Notice to Proceed.

Any required revisions to the DSA and TSRs for the CSTF and DWPF shall be submitted in accordance with the memo, Operating Experience Level 1, OE-1: 2015-1. The submittals shall also include an associated implementation plan. If the implementation plan includes physical modifications or additions to the facilities, the modifications or additions shall be completed within the base period of the contract and shall be executed under the facility operations WBS.

A gap analysis for the SWPF DSA against all of the requirements of DOE-STD-3009-2014 shall be performed and submitted for DOE review and approval within two years after SWPF transition to the LW Contractor.

The Contractor shall revise the DSA and TSRs, including development/revision of supporting hazards and accident analyses, necessary to resolve the identified gaps for the SWPF within the base period of the contract.

Any required revisions to the DSA and TSRs for SWPF shall be submitted in accordance with the memo, Operating Experience Level 1, OE-1: 2015-1. The submittal shall also include an associated implementation plan. If the implementation plan includes physical modifications or additions to the facility, the modifications or additions shall be completed within the base period of the contract and shall be executed under the facility operations WBS.

Supplemental Information

Operating Experience Level 1, OE-1: 2015-1, approved by the Deputy Secretary of Energy, provides requirements related to evaluation of existing DOE defense nuclear facilities' DSAs to the revised DOE Standard 3009-2014, “Preparation of DOE Nonreactor Nuclear Facility Documented Safety Analysis.” The OE-1:2015-1 requires qualitative evaluation of Hazard Category (HC) 2 facilities with unmitigated offsite dose estimates that exceed 5 rem against the specified requirements of DOE-STD-3009-2014, “Preparation of DOE Nonreactor Nuclear Facility Documented Safety Analysis”. The gap analysis required in OE-1:2015-1 is not a full comparison to DOE-STD-3009-2014, rather it is a limited gap analysis focusing on offsite/safety class issues only. The approved gap analysis will be used as input into developing an implementation plan to come into full compliance (i.e., all aspects, not just offsite/safety class issues) with DOE-STD-3009-2014 for the CSTF and DWPF.

C.2.6 System Optimization (WBS: 02.06)

The Contractor shall optimize the liquid waste system in order to meet or exceed contract commitments and decrease the liquid waste program life cycle cost and/or schedule. Identified activities to support system optimization are found in each of the subheadings below this PWS element.

In addition, the Contractor may identify, develop, and implement improved approaches and technologies for tank closure, tank space management initiatives, waste removal, waste treatment, and/or waste disposal which reduce lifecycle Liquid Waste program costs, accelerate radioactive liquid waste disposition schedules, or otherwise optimize system performance. The Contractor shall support and participate in DOE-sponsored technology initiatives which benefit the Liquid Waste system.

The Contractor shall maintain an interactive program/system planning process for Liquid Waste program milestones and execution schedules including comprehensive salt and sludge batch

planning. A comprehensive liquid waste system plan that addresses the scope necessary to complete the liquid waste program life cycle shall be developed and submitted to DOE annually.

C.2.6.1 Next Generation Solvent Deployment (WBS: 02.06.01)

The Contractor shall implement the NGS into SWPF at the end of the 2nd year of hot operations to ensure compliance with minimum salt waste processing requirements.

Supplemental Information

A new solvent has been developed that results in significantly improved cesium decontamination factors and processing rates in a caustic side solvent extraction system. The new solvent, termed NGS, has been successfully deployed in the MCU. Use of NGS requires a different strip solution (boric acid) and scrub solution (caustic) to replace the current strip and scrub solutions (solutions of nitric acid). Modifications to provide boric acid storage/transfer and caustic scrub capability are required in order to support SWPF operation with the new solvent. This requires a Boric Acid Bulk Tank, a Boric Acid Day Tank, and a Scrub Caustic Day Tank.

DOE intends to direct the SWPF construction contractor to design, construct, and install the necessary modifications in SWPF prior to CD-4 that will allow for use of NGS. These modifications include the three chemical storage tanks (concentrated boric acid, dilute boric acid, and caustic scrub) and the associated infrastructure (building, dikes, sumps, transfer pumps, piping, etc.) SWPF is expected to be ready to implement NGS at the end of the second year of operations with no additional modifications or changes required in the balance of the LW system. Only final tie in of the system modifications will be required.

C.2.6.2 At-Tank Cesium Removal (WBS: 02.06.02)

The Contractor shall assume responsibility for testing and operating an at-tank cesium removal process, called the Tank Closure Cesium Removal (TCCR) System Unit on waste tank 10H. The Contractor shall also determine an acceptable interim safe storage location within the tank farms and an off-site disposal facility for the TCCR filter media and any other contaminated equipment/material not suitable for disposal at SRS. Upon the successful demonstration of the TCCR processing at tank 10H, the Contractor may consider the use of the TCCR unit on other waste tanks.

Supplemental Information

The TCCR System is an at-tank technology processing unit such that the cesium removal process takes place outside of LW tanks. DOE is in discussions with the South Carolina Department of Health and Environmental Control to pursue commercial sources for treatment of salt waste in an effort to accelerate tank closure through the issuance of a request for expression of interest. The TCCR unit is in the procurement process with operations scheduled to commence in FY 2018. Tank 10H contains saltcake and interstitial liquid contaminated with radioactive cesium-137. This saltcake will be dissolved by adding water and the resultant solution will be available for cesium removal. The solution will be transferred to the TCCR

System unit through a jacketed transfer line where the TCCR System will decontaminate the solution and send the decontaminated solution to nearby Tank 11H through a jacketed transfer line.

C.2.6.3 Dry Feed Modifications (WBS: 02.06.03)

The Contractor shall review existing Dry Feed Modifications Design Change Packages (DCPs) for completeness, correctness of structural load evaluations, compliance with applicable codes and standards, including the S/RID, and compatibility with all applicable load requirements, and recommend changes, as necessary. Upon completion of review activities and any necessary changes, the Contractor shall implement the DCPs at the Saltstone Production Facility (SPF), make changes to the Distributed Control System (DCS), and perform system functional testing. Upon completion of the modifications, the Bulk Material Unloading and Conveying, Premix Blending and Conveying, and Premix Feeder Systems shall be capable of supplying dry feeds material to the SPF mixer at a rate sufficient to support salt waste processing activities.

Supplemental Information

Dry feeds materials for the saltstone grout process, consisting of cement, slag, and flyash, are delivered separately in trucks to the facility. The truck unloading system consists of one station (inlet piping) for each of four silos. Dry materials arriving in trucks are unloaded into the silos using blowers supplied by the vendor/shipper.

Four storage silos with a total volume of nearly 18,000 cubic feet are used for the dry feeds materials. The dry feeds are gravity fed from the silos into a weigh hopper and premixed into the premix feed bin using an air compressor and pneumatic lines for feed to the mixer. A weigh hopper is provided to enable weighing of dry materials to prepare batches of premix, which is the blended product of the three dry materials. Dry feeds premixing continues throughout the grout making process.

C.2.6.4 Melter Fabrication (WBS: 02.06.04)

The Contractor shall evaluate DWPF operational performance of the melter's life expectancy and required HLW canister production in DWPF against the need to procure and fabricate additional melters. Upon installation of Melter #3, the Contractor shall maintain Melter #4 ready to install and complete fabrication of Melter #5 in a time period commensurate with the risk of premature melter failure based on planned DWPF production rates. Building 717-F will continue to be available for storage of unused melters and for the fabrication of future melters.

Supplemental Information

The performance of DWPF is reliant on the continued operation of the melter. The melter design is mature and readily available for the continued use for future melter fabrication. Planning for future melters is based on having a melter ready for installation upon a melter failure which requires one melter in storage ready for installation and a second melter in full fabrication. Currently, DWPF is operating on Melter #2, Melter #3 is in storage at 719-F and

ready for installation (minus components that are required to be installed at time of installation), and Melter #4 has been fabricated and assembled and is undergoing corrective actions to resolve non-compliances. The current approach to completion of the corrective actions will result in Melter #4 being available for installation by the end of FY 2018. The refractory brick for Melter #5 has been procured and final delivery is expected in August, 2016.

C.2.6.5 DWPF Operational Improvements (WBS: 02.06.05)

The Contractor shall implement modifications of the DWPF to minimize effluents and process additions, to streamline the DWPF feed process, and to maximize DWPF waste processing operations. The operational improvements must at a minimum address the increased SE influent to DWPF from SWPF. The Contractor shall provide all engineering, design, fabrication/modifications, installation of any jumpers, utility tie-in information, and the volumetric changes calculated to result from the proposed modifications.

Supplemental Information

The DWPF recycle stream back to the tank farm is highly influenced by the canister decontamination frit stream. Modifications implemented by the Contractor at DWPF could reduce the recycle waste stream back to the Tank Farms by 500,000 gallons annually.

C.2.6.6 Tank 48 Recovery (WBS: 02.06.06)

The Contractor shall maintain Tank 48H in a safe condition during the contract period.

If the Contractor determines it is advantageous to return Tank 48H to service as a part of optimization efforts during the contract period, the Contractor shall provide an Analysis of Alternatives to DOE-SR that includes consideration of previous alternatives analyses, identification of any new approaches, and a final recommended approach. Any recommendation to recover Tank 48H and return it to high level waste service must address the technical approach, safety basis impacts, cost, and schedule among other attributes. Execution of the Tank 48H recovery effort may be considered to be within the IDIQ scope (C.4) of this Contract.

Supplemental Information

Tank 48H, located in the H-Tank Farm, is a 1.3 million gallon Type III compliant high level waste tank. It currently holds approximately 250,000 gallons of radioactive liquid waste material from the operation of the In-Tank Precipitation process. The tank contains approximately 26,000 kg of organic tetraphenylborate compounds. The organic material is incompatible with other waste treatment facilities at SRS; consequently the tank is isolated from the other tanks in H-Tank Farm.

Tank 48H is located in close proximity to DWPF sludge preparation/qualification tank (Tank 51H), the Saltstone Production Facility feed tank (Tank 50H), and the SWPF feed tank (Tank

49H). As such, its return to service could greatly enhance the ability to prepare salt or sludge feed batches.

DOE and its contractors have considered a number of technologies and operational approaches to the recovery of Tank 48H. Those technologies have historically been cost prohibitive and have not developed beyond the design and laboratory scale testing phase.

C.2.6.7 Technology Development and Deployment (WBS: 02.06.07)

The Contractor shall identify and propose technology development and deployment activities required to optimize the liquid waste system in order to meet or exceed contract commitments and decrease the liquid waste program life cycle cost and/or schedule. Upon review and concurrence from DOE, the Contractor shall execute specific technology development and deployment activities.

C.2.7 Additional Glass Waste Storage Capability (WBS: 02.07)

The Contractor shall analyze planned production of HLW canisters in DWPF against the storage capabilities of the current GWSBs and determine when additional on-site storage capacity is required. Options to be considered shall include but are not limited to: 1) implementation of double stacking in GWSB #2; 2) a third GWSB similar to the two other facilities; 3) a concrete pad, above grade storage approach potentially with canister overpacks; and 4) design and construction of a canister shipping facility. The Contractor's analysis shall ensure that storage space is available for at least 800 canisters beyond the end of this Contract. The Contractor's analysis, including a recommended alternative, shall be completed and submitted for DOE review and approval by the end of year five of the Contract. The final determination for any additional storage capability is subject to DOE approval, and the Contractor's analysis excludes the development of a complete specification for additional GWS capability.

<u>Supplemental Information</u>

The DWPF has historically produced between 100 and 250 canisters of vitrified HLW annually. These canisters must be moved via the Shielded Canister Transport Vehicle into a storage facility. Currently, SRS has two such facilities, GWSB #1 and GWSB #2. The initial capacity of these facilities was 2,262 and 2,340 canisters, respectively but only 2,251 useable spaces are available in GWSB #1. Beginning in FY 2015 and planned for completion in FY 2023, the Contractor is undertaking an activity to "double stack" most of the HLW canisters in GWSB #1. The net result of this effort will yield an additional 2,251 storage positions in GWSB #1.

C.3 Liquid Waste Program Support (WBS: 03)

This Section describes the scope of the support functions to be performed by the Contractor associated with the safe and effective execution of this Performance Work Statement. These functions do not stand alone without the execution of the direct work scope under the WBS. In some cases, the Contractor shall bear full responsibility for performance of necessary support functions. In other cases, substantial support will be provided to the Contractor as GFS&I by DOE via other site contractors. Section J, includes an appendix identifying support functions to be performed by SR contractors and specifies the respective responsibilities of the involved SR contractors.

The Contractor shall develop input for the Program/Project Execution Plan per DOE O 413.3B for any scope of work that DOE determines to be Capital Asset or Line Item Projects. The Program/Project Execution Plan shall address the Contractor's approach to performance measurement, work control and reporting. The Contractor shall annually develop a revision of the Liquid Waste System Plan and submit for DOE approval by December 31st of each year. The Contractor shall price each case identified in the LW System Plan revision and develop life-cycle cost based on each case or as requested by DOE. The approved LW System Plan will be a key input to any Contractor CPB updates. The Contractor's final CPB shall be submitted by 180 days after the end of the Contract Transition Period. As necessary, the Contractor CPB shall be submitted for DOE approval for the subsequent years to maintain alignment with the Contract.

Contractor shall provide DOE a report of all Contractor planned Information Technology (IT) procurements, spend plans and budgets. The Contractor shall also provide monthly reports to DOE for IT cost incurred per DOE O 200.1A.

The following major categories of Program Support activities include:

- Standards/Requirements Identification Document (S/RID) Functional Areas
- Management & Administrative Services
    - Service Level Agreements (SLA)
- Government Furnished Services & Items (GFS&I)
    - Functional Service Agreements
    - Landlord Services (LLS)
    - Essential Site Services (ESS)
    - Unit Billing Services (UBS)

C.3.1 Management of Standards/Requirements Identification Document Functional Areas (WBS: 03.01)

The Contractor shall maintain the processes and procedures required to manage the Standards/Requirements identification Document (S/RID) functional area program work scope and its implementation to ensure execution of fully compliant work to all LW operations and

projects. The Contractor management of Functional Area support shall consist of twenty (20) formal SR functional areas and associated work scope. These functional areas are:

- Management Systems
- Quality Assurance
- Configuration Management
- Training and Qualifications
- Emergency Management
- Safeguards and Security
- Engineering Program
- Construction Program
- Conduct of Operations
- Maintenance
- Radiation Protection
- Fire Protection
- Packaging & Transportation
- Environmental Restoration
- Facility Disposition
- Waste Management
- Research & Development Experimental Activities
- Nuclear and Process Safety
- Occupational Safety & Health
- Environmental Protection

Management of each Functional Area shall consist of oversight of field implementation, overall staffing levels across the functional areas, subject matter experts, and required records and reporting. In the event the Contractor becomes non-compliant with the S/RID, appropriate action to protect human health and safety and the environment shall be taken until compliance is reestablished. When activities are not in compliance with appropriate requirements, the Contractor shall accept violation notices and be responsible to pay any resulting fines assessed in accordance with the Section H clause entitled “DOE-H-2014, Contractor Acceptance of Notice of Violation or Alleged Violations, Fines, and Penalties.”

C.3.1.1 Integrated Safety Management System

The Contractor shall develop and submit to the CO for approval a single Integrated Safety Management System (ISMS) program description in accordance with DOE Acquisition Regulation (DEAR) clause 970.5223–1, Integration of Environment, Safety, and Health into Work Planning and Execution. The Contractor shall annually review, and submit to the CO for approval, any proposed changes the ISMS program description. The Contractor shall also annually review, and submit to the CO for approval, changes to the safety Performance Objectives, Measures, and Commitments (POMCs) consistent with and in response to DOE’s program and budget execution guidance and direction.

C.3.1.2 Safety Culture and Safety Conscious Work Environment

The Contractor shall establish and maintain a strong Safety Culture and Safety Conscious Work Environment (SCWE), in accordance with DOE expectations and ISMS per DEAR clause 970.5223–1, Integration of Environment, Safety, and Health into Work Planning and Execution. The Contractor shall provide special emphasis on behaviors and values that specifically enhance sustained performance in three Safety Focus Areas: Leadership, Employee Engagement and Organizational Learning. The Contractor shall leverage required Employee Concerns Programs and Differing Opinions Processes to encourage free, open and fearless expression of employee concerns and their resolution in support of a strong safety culture. The Contractor shall take action to demonstrate absolute prescription of actions/environment contributing to a chilling effect such as harassment, intimidation, retaliation, and/or discrimination.

C.3.1.3 Department of Energy/National Nuclear Security Administration Radiological Emergency Response Asset Support

In consultation with the Department of Energy/National Nuclear Security Administration (DOE/NNSA) Regional Response Coordinator, the Contractor shall provide Health Physics professionals to support the DOE Region 3 Radiological Assistance Program (RAP) and the regional Aerial Measuring System (AMS) program. The Contractor shall ensure that individuals designated to support RAP/AMS are provided the opportunity to participate in required training and drills/exercises to maintain their qualifications for these collateral duties. Qualified personnel are assigned to teams with rotating on-call duties to ensure responses to requests for offsite radiological assistance are provided within DOE/NNSA response timelines. In addition to their emergency response duties, RAP/AMS personnel will also be made available to support other RAP/AMS missions, including training for offsite response partners, exercise participation, support to the Department of Homeland Security Mobile Detection Deployment Unit (MDDU), and support for Special Events and National Special Security Events. Funding for labor and travel associated with all RAP/AMS activities is provided separately by the NNSA.

C.3.2 Management and Administrative Services (WBS: 03.02)

The Contractor shall provide management and administrative services required to execute the Liquid Waste work scope. This scope includes, but is not limited to:

- Executive Leadership & Management
- General Counsel
- Corporate Communications
- Government & Community Relations
- Internal Audit
- Contract Administration
- Operational Excellence / Continuous Improvement
- Strategic and Operational Planning
- Chief Financial Officer functions

- Employee Concerns
- Human Resources and Work Force Services

Additionally, the Contractor shall provide all necessary support for a smooth Contract transition at the end of the Contract period. Sixty days prior to the expiration of the Contract period the Contractor shall submit a Contract Close-out Plan to DOE for review and approval. The Contract Close-out Plan shall include all remaining administrative matters necessary to effectively and efficiently close out the Contract, including, but not limited to, resolution of remaining and open agreements and all records management activities. Records management activities include, but are not limited to, the remaining records retention and disposition activities (including the final active/inactive records inventory of both Government-owned and Contractor-owned records, and all media types), turnover of electronic records management systems and/or other electronic information systems, records finding aids or any other activities.

Service Level Agreements (SLAs)

Service Level Agreements (SLAs) are specific services performed by the M&O contractor at the request of the LW Contractor. SLAs are the Work Authorization Documents that define the scope of work, performance requirements, and costs for work requested and funded by the Contractor. The LW Contractor is ultimately responsible for ensuring the performing contractor delivers a product or service meeting requirements of the requesting Contractor. These negotiated services between the LW Contractor and the M&O contractor are invoiced to the LW Contractor from the M&O contractor monthly. Revisions to the SLA scope or service level (e.g., cost, scope, or schedule) will be by mutual agreement of the parties. Proposed changes to SLAs shall be available to DOE prior to implementation.

C.3.3 Government Furnished Services and Items (WBS: 03.03)

Government Furnished Services and Items (GFS&I) shall be identified for specific tasks which support the Contractor. The DOE prime contractors shall provide or receive services from other contractors and ensure GFS&I are identified and documented in accordance with the Interface Management Plan. The DOE is responsible for the oversight of the individual DOE prime contractors and ensuring they meet the requirements for delivery of services.

The Contractor shall analyze current GFS&I services provided to it by other contractors for opportunities to reduce costs to the Government through self-performance, subcontracting or working with the SR Management and Operating (M&O) Contractor to identify opportunities to increase efficiencies, methodologies, etc. to reduce costs. The Contractor shall document opportunities and submit to DOE for consideration and potential implementation.

C.3.3.1 Functional Service Agreements

FSAs encompass those general site support activities referred to as Landlord Services (LLS), Essential Site Services (ESS), and Unit Billing Services (UBS). FSAs are not included in the scope or funding of the Liquid Waste Contract, but are a GFS&I. Each fiscal year, funding is

placed on the Site M&O contract on a scheduled basis for the LW contribution of the FSAs. The Contractor shall interface with the M&O Contractor to ensure Liquid Waste program FSA requirements are fully addressed.

The Contractor shall periodically review all services received under the FSA and identify any activities for which the Contractor receives no support or has its own activities that duplicate those charged as part of the site FSA. DOE, in conjunction with the LW Contractor and the site M&O Contractor, will evaluate the need to revise the FSA services annually.

The funding for the LW Contractor's allocated portion of the Functional Service work scope will continue to be provided by DOE directly to the M&O contractor. The list of FSAs is identified in Section J, Attachment 12, Appendix B.

C.3.3.1.1 Landlord Services (LLS): Landlord Services are work functions and assets performed or managed by the M&O Contractor that support and benefit all tenants residing at SRS. This includes but is not limited to: Emergency and Safety Services, Common Infrastructure, Tenant Interface Management, and Site Document Delivery Services. LLS are allocated at the site level based on total funding.

C.3.3.1.2 Essential Site Services (ESS): Essential Site Services (ESS) represents a pool of activities basic to site operations such as roads and bridges, fire departments, laboratory services, police, etc. ESS work functions are performed by the M&O Contractor to support a nuclear facility but cannot easily be directly charged to a specific project or scope. This includes but is not limited to: Site management and centralization support for Records and Document Control, Asset Management, Geotechnical engineering services, Bioassay Lab, SRNL Utilities, Facilities & Site level services, Quality Services & Site-wide Procedures. ESS is allocated at the site level based on total funding with adjustments based on services that the Contractor does not receive.

C.3.3.1.3 Unit Billing Services (UBS): Contractor provided GFS&I services performed by or received from other site contractor: Site Radio and Pagers, Personnel Protection clothing and equipment, Industrial Hygiene Instrument program, warehouse services, radiological protection services (Thermo-luminescent Dosimeter (TLD), In-Vivo Bioassay, monitoring equipment, central counting facility, SmartPlant engineering services, training services including Computer Based Training and other classes, Information Technology (IT) services which includes the Consolidated IT services seat and telephone lines. UBS is allocated at the site level based on the number of units used/in service by the Contractor.

C.3.4 Legacy Benefits (Pension and Post-Retirement Benefits) (WBS: 03.04)

Legacy pension and post-retirement benefits (collectively referred to as Legacy Benefits) are not included in scope or funding of the Liquid Waste Contract, but are a GFS&I. Legacy Benefits includes the remaining Legacy Pension and Post-Retirement Benefits for DOE contractors working for the site before December 10, 2008. The annual site pension contribution requirement is calculated by actuaries based on the current number of covered employees.

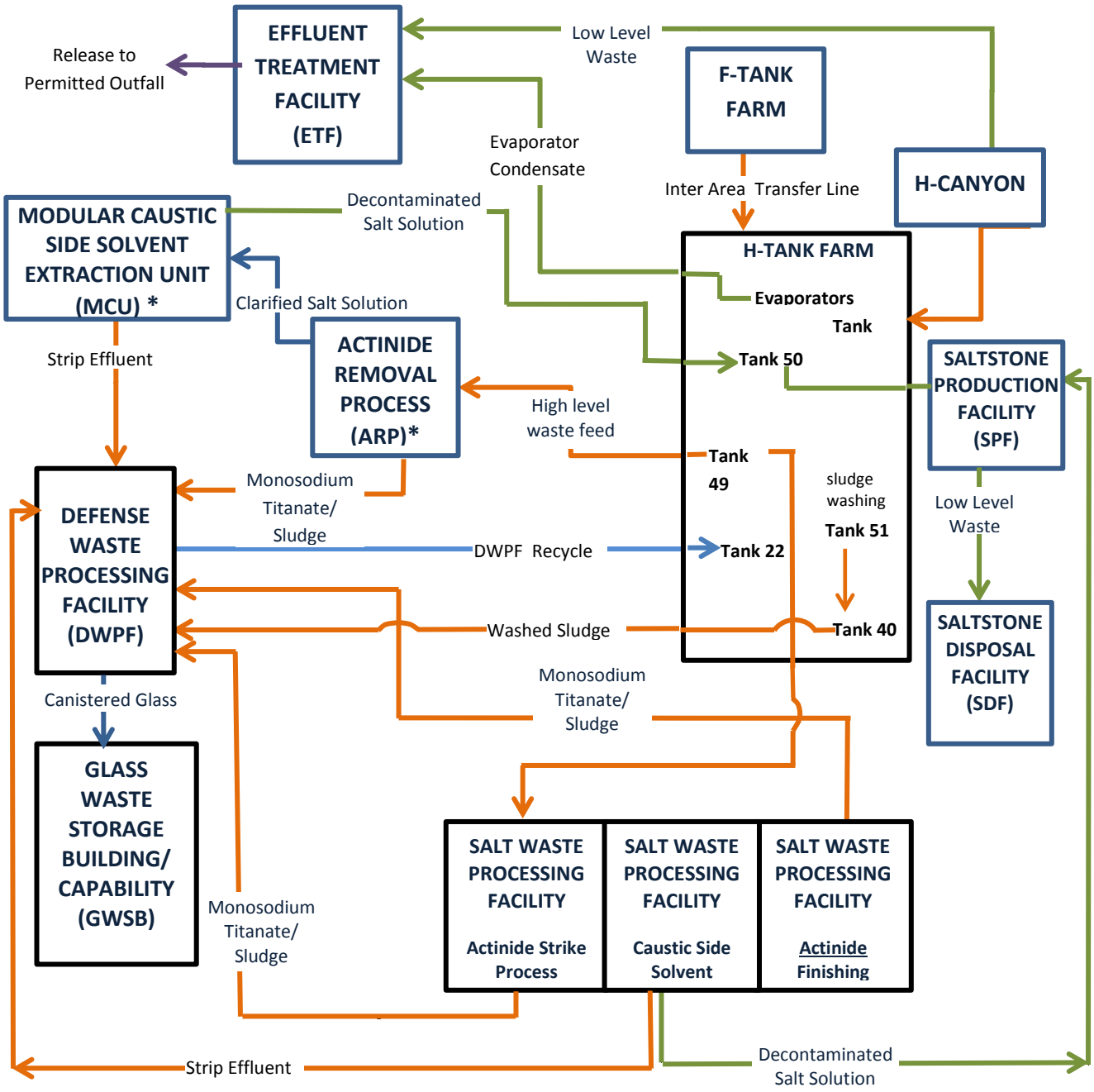
DOE works with the Liquid Waste Contractor, the Site M&O Contractor, and the NNSA to develop the allocation of legacy benefits based on head count of plan participants and funding. This methodology is reviewed annually during the federal budget cycle. Once a new fiscal year begins, funding is placed on the Site M&O contract to for all contributions to the Pension Fund on a scheduled basis. This approach will continue during the base period of performance and the option period of performance.

C.4 Indefinite Delivery/Indefinite Quantity Work

Work scope directly related to liquid waste operations, projects, or program support that is not otherwise included within the remainder of the PWS may be included under the Indefinite Delivery/Indefinite Quantity (IDIQ) Contract Line Item Number (CLIN) by mutual agreement of the parties. Such work, tasks, and activities may include, but are not limited to, Tank 48 recovery efforts, etc.

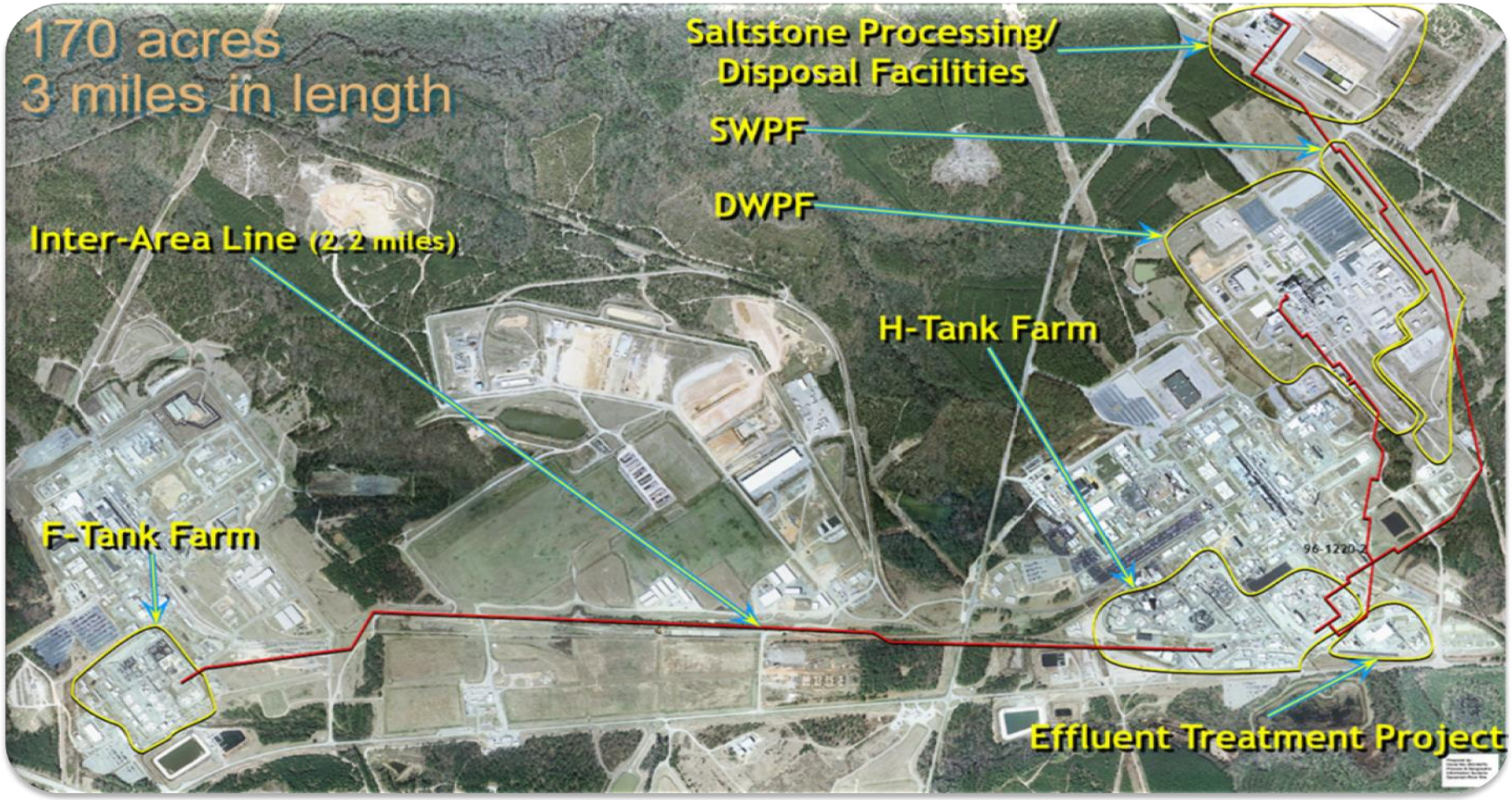
IDIQ work will be ordered by the Government under Task Orders. The scope, price, and period of performance will be specified in each order. Performance standards for IDIQ work will generally be the same as those in the PWS, unless otherwise stated.

Attachment 1 – Liquid Waste Process Diagram

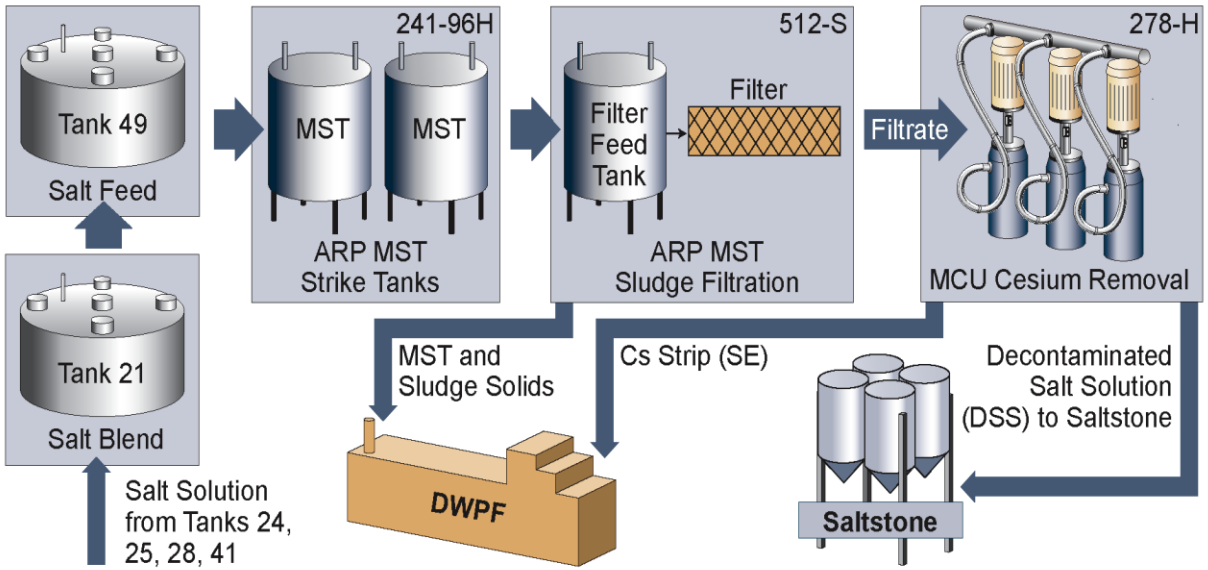
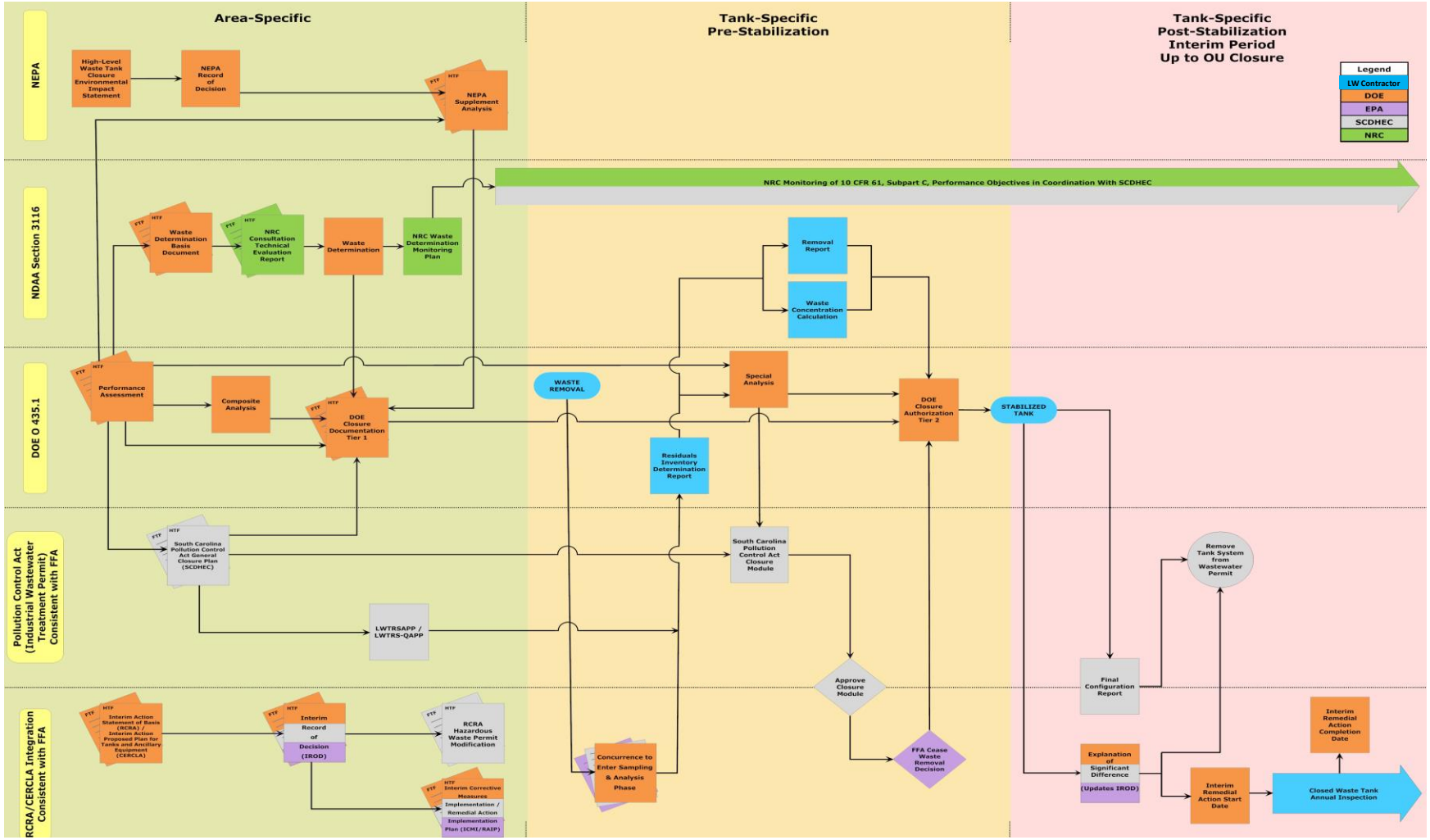


*MCU and ARP will not be operable (transfer lines isolated/terminated) when SWPF

Attachment 2 – Liquid Waste Facilities



Attachment 3 – Schematic of the ARP/MCU Process



Attachment 4 – SRS Tank Closure Regulatory Roadmap