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Supplement to Department of Energy Activities Relating to the Defense Nuclear Facilities Safety Board Fiscal Year 2011

Site-Specific Activities

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Site Activities

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Introduction

The discussions of safety accomplishments and activities at Department of Energy (DOE) defense nuclear facilities presented in this supplement to the DOE fiscal year 2011 (FY11) Annual Report to Congress were submitted by the cognizant DOE site, field, and operations offices (Figure 1). The responsible Program Secretarial Offices, Lead Program Secretarial Offices, and Cognizant Secretarial Offices for specific sites, site facilities, or site programs can vary depending on the programmatic nature of the work being conducted.

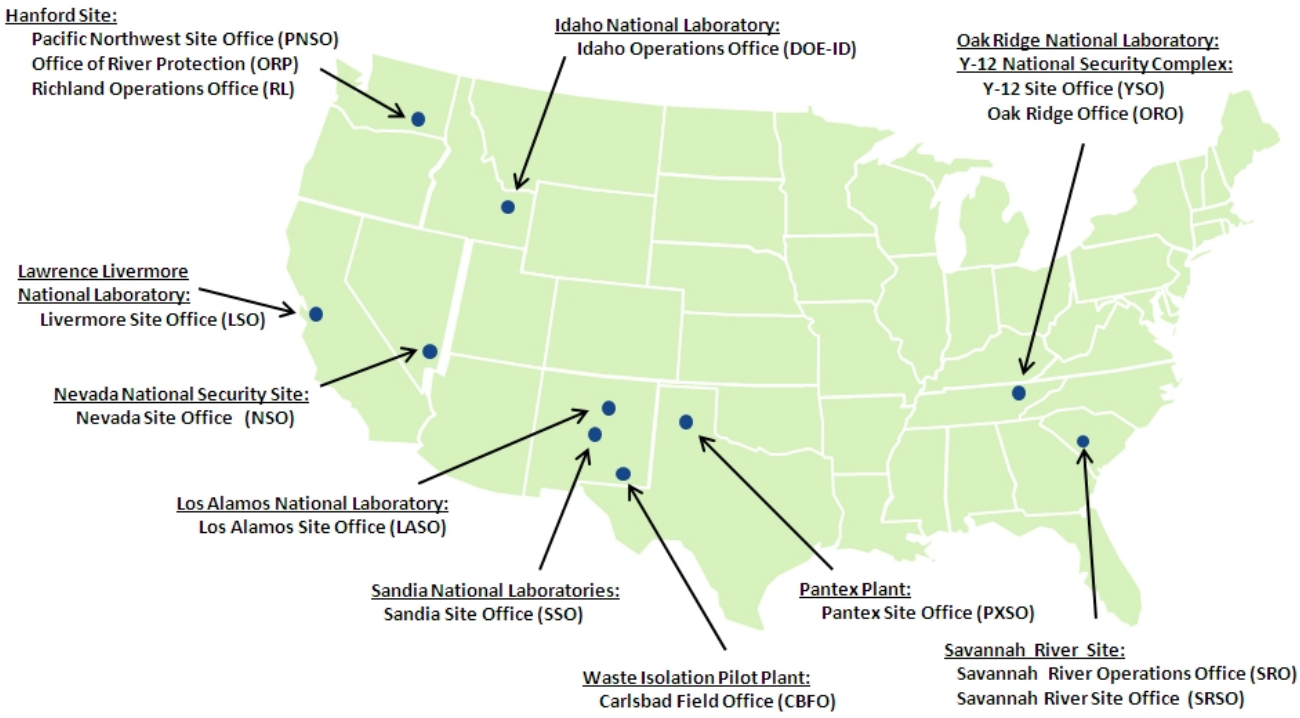

Figure 1. DOE Defense Nuclear Facility Sites

Carlsbad Field Office

Waste Isolation Pilot Plant

The Waste Isolation Pilot Plant (WIPP) continues to be a significant contributor to DOE progress toward completing cleanup throughout the Office of Environmental Management complex. WIPP received its 10,000th shipment of transuranic (TRU) waste on September 24, 2011. Also during September, the WIPP transportation system surpassed 12 million loaded miles traveled to WIPP without a radioactivity-related incident.

Waste Isolation Pilot Plant

Accomplishments during FY11

- As of September 30, 2011, WIPP has safely received 515 shipments of remote-handled TRU waste. This effort involved close coordination of characterization, transportation, safety, quality assurance, security, waste handling, and engineering operations located throughout the United States.
- On June 3, 2011, the last remaining legacy TRU waste was removed from the Lawrence Berkeley National Laboratory (LBNL) in Berkeley, California. The waste was then sent to the Advanced Mixed Waste Treatment Project (AMWTP) in Idaho, where it will be characterized for disposal, then shipped to WIPP. LBNL was the 18th site to be completely emptied of legacy TRU waste.

- On June 24, 2011, the last remaining legacy TRU waste was removed from the Nuclear Radiation Development, LLC (NRD) site near Grand Island, New York. The waste consisted of 18 cubic meters of contact-handled TRU waste, packaged in 87 steel drums that were loaded into nine TRUPACT-II shipping packages, and sent to the AMWTP where the waste will be characterized for disposal and shipped to WIPP. NRD was the 19th site to be completely emptied of legacy TRU waste.

- The first shipment of TRU waste using the TRUPACT-II shipping packages arrived at WIPP from the Savannah River Site near Aiken, South Carolina, on August 25, 2011. The new shipping package allows DOE to package and ship large-sized TRU waste items in a single box that would otherwise have to be size-reduced and packaged into multiple smaller waste boxes.

- On September 23, 2011, WIPP received the remaining legacy TRU waste (five total shipments of remote-handled waste) from the Bettis Atomic Propulsion Laboratory near Pittsburgh, Pennsylvania. The Bettis Atomic Propulsion Laboratory was the 20th DOE site to be completely emptied of legacy TRU waste.

- On September 30, 2011, the last remaining legacy contact-handled TRU waste was removed from the Argonne National Laboratory (ANL) near Chicago, Illinois. The waste was sent to AMWTP where it will be characterized for disposal, then shipped to WIPP. The remaining legacy remote-handled TRU waste at ANL is projected to be removed by July 31, 2012.

- The first DOE site to receive Voluntary Protection Program (VPP) Star status in 1994, WIPP has continued at that level ever since. In FY11, WIPP again received the Star of Excellence in DOE's VPP and the Super Star Award from the VPP Participants Association. The DOE VPP promotes safety and health excellence through cooperative initiatives among employees, management, and government at DOE contractor sites. Among other factors, a contractor must show continual improvement to receive Star status.

- In late January 2011, WIPP resumed disposal operations following an extended maintenance outage to complete some extensive facility upgrades. The maintenance work was completed above- and below-ground without a single recordable injury.

- In September 2011, WIPP was honored by the New Mexico Mining Association and the New Mexico State Bureau of Mine Safety with the Safe Operator of the Year Award for the 23rd time, demonstrating WIPP's continued role in setting the standard for mine safety.

Activities Related to Implementation of Defense Nuclear Facilities Safety Board Recommendations

- On December 21, 2010, DOE sent a letter to the Defense Nuclear Facilities Safety Board (DNFSB) regarding the development of a corrective action plan associated with the electrical safety program at WIPP in response to a September 22, 2010, DNFSB letter. Implementation of the corrective action plan is progressing in a timely manner.

- On January 20, 2011, DOE sent a letter to the DNFSB regarding the development of a corrective action plan associated with the WIPP work planning and control program in response to an October 22, 2010, DNFSB letter. Implementation of the corrective action plan is progressing in a positive manner.

- DNFSB members and a DNFSB staff team visited WIPP in FY11. The DNFSB staff team reviewed the fire protection program at the plant during their January 25-26, 2011, visit. The staff team found that, despite significant improvements made to the WIPP fire protection and emergency management programs during the past few years, some weaknesses remain.
- On June 24, 2011, DNFSB sent a letter to DOE regarding recommendations associated with the WIPP fire protection and emergency management programs. A 180-day reporting requirement on the actions taken or planned by WIPP to address the weaknesses was submitted to the DNFSB on December 21, 2011.

Idaho Operations Office

Advanced Mixed Waste Treatment Project

The Advanced Mixed Waste Treatment Project (AMWTP) is a cornerstone to the DOE commitment for complex-wide transuranic (TRU) waste cleanup. The AMWTP's mission is to process and dispose of approximately 65,000 cubic meters of waste that has been historically managed as TRU waste. Throughout FY11, the facility was managed by Bechtel BWXT Idaho, LLC (BBWI) in a safe and compliant manner. The AMWTP recently surpassed eight years and 12 million hours without a lost time injury. To date, the AMWTP has compliantly disposed of over half of the waste inventory.

On October 1, 2011, the Idaho Treatment Group, LLC (ITG) assumed management of the AMWTP for DOE. The ITG project work scope includes retrieving waste from storage, characterization, treatment as necessary, certification, preparation, and loading shipments for transport to the Waste Isolation Pilot Plant (WIPP). Alpha-contaminated mixed low-level waste that cannot be shipped to WIPP is treated and disposed of at DOE or commercial facilities, providing the best value to the government. ITG has adopted the BBWI-approved plans and procedures through a "blue sheet" review process. The process reviews the existing approved and controlled BBWI documents for technical adequacy and identifies minor changes needed to allow ITG to continue using these procedures. BBWI provided an Unreviewed Safety Question Determination for the ITG Transition Blue Sheet Procedure to support ITG blue sheet review activities.

Waste Retrieval

The AMWTP has faced significant retrieval challenges that the DNFSB has reviewed and assisted in resolving. In summary, boxes of pre-1971 waste stored on the Transuranic Storage Area/Retrieval Enclosure have not been coated with any type of preservative. The plywood has degraded significantly, especially where in close proximity to the soil, leaving the structural integrity of the boxes in question. In 2010, AMWTP reached the first of the degraded plywood boxes on Cell 3, Pad 1. Initial attempts at retrieval, repair, and over-packing of the boxes were unsuccessful. Therefore, retrieval operations were suspended pending implementation of engineering controls and process changes for protecting workers and preventing the potential spread of airborne contamination. The Retrieval Contamination Enclosure, the Inner Contamination Enclosure, and ancillary systems have now been installed. The DNFSB supported AMWTP in reviewing and commenting on the design, procurement, and construction of these systems in FY11. Although these systems are in place, the retrieval process is still in suspension.

AMWTP Accomplishments

In FY11, AMWTP started two processes that increased the waste being processed through the treatment facility. The facility began operation of a "plasma size reduction" operation to allow large/oversized material to be downsized for processing through the existing box lines in the Treatment Facility. With the start of operation of the plasma size reduction unit, AMWTP now has the capability to dispose of oversized waste. The second operation started in FY11 was the sludge treatment line located in the treatment facility box line. The sludge treatment line allows AMWTP to open drums of waste containing sludge waste and mix the sludge with a Micro-Cel® E solidification agent to absorb the liquids in the waste. This treatment allows the disposal of the waste under the WIPP Waste Acceptance Criteria.

Idaho Cleanup Project

The Idaho Cleanup Project (ICP) involves the safe environmental cleanup of the Idaho National Laboratory (INL) site, which is contaminated with legacy wastes generated from World War II-era conventional weapons testing, government-owned research and defense reactors, spent nuclear fuel reprocessing, laboratory research, and defense missions at other DOE sites. CH2M-WG Idaho (CWI) is managing the cleanup effort for the DOE. The project focuses on reducing risks to workers, the public, and the environment, and protecting the Snake River Plain Aquifer, the sole drinking water source for many Idaho residents.

Risk Reduction

- CWI loaded and shipped a total of 13 Large Cell Casks containing U.S. Navy Spent Nuclear Fuel (SNF) from storage at the Idaho Nuclear Technology and Engineering Center (INTEC) to the Naval Reactors Facility at INL in 2011.
- CWI received and unloaded eight Advanced Test Reactor SNF casks from the Reactor Technology Complex in FY11.
- Two NAC International legal weight truck casks of SNF from the Reed College research reactor and the Neutron Radiograph Reactor Facility at the Materials and Fuels Complex (MFC) at INL were received and unloaded. The Reed College SNF is part of the National Nuclear Security Administration program to convert research reactors to lower-enriched fuel as part of the nuclear threat reduction initiative.
- CWI shipped the initial two casks of Experimental Breeder Reactor II SNF from storage at INTEC to MFC in FY11.
- As of the end of FY11, the Radioactive Waste Management Complex (RWMC) had exhumed 55,542 cubic yards of waste zone materials resulting in the packaging of 26,437 drums of targeted waste since the start of the contract.

Materials and Fuels Complex at the Idaho National laboratory

- 1,665 m^3 of contact-handled TRU waste was shipped to WIPP in FY11, bringing the total shipped to 4,830 m^3 since May 2005.
- A cumulative total of 2.93 acres of the 5.69 acres required by the Agreement to Implement U.S. District Court Order, dated May 25, 2006, for targeted waste exhumation at the RWMC Subsurface Disposal Area has been exhumed.
- CWI completed the 260th shipment of remote-handled TRU (RH-TRU) waste, which included the last shipment of all CWI contract target waste scope for RH-TRU waste.
- CWI completed disposition of 65 U-233 waste containers (un-irradiated pellets and rods from a light water breeder reactor) to the Nevada National Security Site.
- ICP safely demolished 19 facilities and structures comprising over 323,000 square feet, including nine industrial, six nuclear, and four radiological legacy facilities, at INL in FY11. Deactivation and decommissioning (D&D) has completed a total combined demolition of 217 out of 221 facilities and structures representing more than two million square feet reduction in footprint.

Safety Performance

- ICP has continued to reduce recordable injuries compared to previous contract years. The overall recordable injuries rate for FY11 is lower than the first full contract year in FY06. CWI continues to set aggressive goals, engage employees and subcontractors through year-round activities, actively pursue

hazard reduction and mitigation, and encourage and recognize safe work practices by employees. The CWI Integrated Safety Management implementation is integrated into management and work practices at all levels at ICP. Worker involvement through company safety programs, such as employee safety teams (Voluntary Protection Program) and COBRA (Behavior Based Safety Program), is key to CWI's 24/7 safety culture.

- CWI employees have worked 28.7 million hours without an internal contamination event. In addition, workers have achieved 11.9 million hours since the last reportable skin contamination event and 2.0 million hours since the last reportable clothing contamination event. These statistics are particularly notable given the amount of work performed in the D&D of spent fuel processing facilities, laboratories, hot cells, and the retrieval and repackaging of buried TRU waste.

- ICP continues to maintain certification of its Environmental Management System to the International Standards Organization (ISO) 14001 standard. A full recertification audit was conducted in September 2011. The auditors stated that "CWI's Environmental Management System conforms to ISO 14001-2004 with no non-conformities and is recommended for recertification. There is strong management support and evidence of adherence to internal procedures throughout the system."

- ICP continues its environmental stewardship performance including no Notice of Violation or regulatory fines since the start of the contract, with 31 inspections having been conducted by cognizant regulatory agencies.

Deactivation and Decommissioning

- Completed the Management Self-Assessment and initial sodium steam treatment in the west basement of MFC-766 Sodium Boiler Building and treatment on more than one mile of MFC reactor secondary piping.

- Completed demolishing TRA-632 hot cells 2 and 3, and the TRA-603 Material Test Reactor Building and the attached office complex.

- Completed CPP-601 Fuel Process Building, and CPP-602 Laboratory and office building final demolition at INTEC.

- Completed removal and transport of the one million pound TRA-632 hot cell 1 from the Advanced Test Reactor Facility to the INL Comprehensive Environmental Response, Compensation, and Liability Act Disposal Facility.

- Completed the Materials Testing Reactor vessel and TRA-632 hot cell disposal.

- Disposed of 24,472 m^3 of Remediation Waste at ICDF in FY11.

- Dispositioned 1,484 m^3 of low-level and mixed low-level waste to offsite disposal facilities.

Environmental Cleanup Activities

- Completed Contractor Readiness Assessment (CRA) for accelerated retrieval project (ARP) V and completed construction and a CRA for ARP VI in FY11.
- Completed waste exhumation of 0.79 acres of Pit 5 (ARP IV) and 0.55 acres of Pit 9 (ARP V). Exhumation in ARP VI was nearing completion at the end of FY11.
- Completed ARP VII construction at the end of FY11, with Turnover and Testing to be performed in early FY12. Construction of ARP VIII was initiated at the end of FY11.
- Completed the recovery and relocation of 21 canisters (large liners) of RH-TRU waste from the MFC. This completed the shipping of a total of 130 canisters.
- Processed and repackaged the 21 large liner canisters producing 65 RH-TRU drums.
- Processed and repackaged 97 previously recovered HFEF-5 and ANL-E cans from MFC, producing 237 RH-TRU drums.
- Completed the characterization of 227 of the 237 drums as a precursor for shipment to the WIPP facility.
- Completed the final Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) soil remediation for the site-wide groundwater and miscellaneous sites project.
- Completed Phase I of the INTEC tank farm and soil remedy by installing a low permeability cover to reduce recharge.
- Completed environmental restoration of three release sites (CWI has completed the environmental restoration of a total of 121 sites to date).
- Completed decommissioning, sealing and maintenance of 28 retired monitoring wells (564 total to date under CWI).

Sodium-Bearing Waste Treatment Project

As noted in the September 2011 DNFSB Periodic Report to Congress, which provides progress and status of issues the DNFSB tracks relative to progress in new DOE facilities, there were no open issues remaining for the Sodium-Bearing Waste Treatment Project (SBWTP). The project continues to provide documents and responses to inquiries from the DNFSB staff during the test program and operational readiness activities.

- The DNFSB staff conducted a review of the final Documented Safety Analysis and Technical Safety Requirement, and all identified issues were satisfactorily resolved. DOE approved the final Safety Basis and Technical Safety Requirements, which were being implemented in the facility at the end of the fiscal year.

- The SBWTP has implemented ANSI/ISA-84.00.01 requirements for the safety-significant process control functions associated with the Integrated Waste Treatment Unit (IWTU). During FY11, the project completed initial testing of the safety significant instrumented systems, which was observed by the DNFSB staff.

- Integrated System Testing is being performed in the IWTU at the end of the fiscal year, including a "hot nitrogen" test which uses each of the major process systems. In addition, transfers of simulated carbonate product and filling of canisters are included in this test. At the completion of this test, most of the facility process systems will have been tested, and operating procedures for the process will be validated.

- SBWTP is scheduled to complete the Management Self-Assessment for the project in FY12 and then conduct the contractor and DOE Operational Readiness Reviews.

High-Level Waste Calcine Disposition Project

- Completed and issued the revised *Calcine Disposition Project Technology Maturation Plan.* The plan reflects the results of a technology readiness assessment conducted by a DOE Headquarters team during FY11.

- Completed and issued the revised *Calcine Disposition Project Waste-Form and Technology Readiness Strategy* following a review by DOE Headquarters. The strategy will support waste-form development.

- Completed and issued the revised Historical Processing Model report entitled, *Calcined Waste Storage at the Idaho Nuclear Technology and Engineering Center*, which includes comprehensive chemical and radioactive constituent information for the high-level waste calcine inventory stored at INL.

- Commenced the testing of two Calcine Disposition Project critical technology elements: Waste-form and the Hot-Isostatic Pressing can. Waste-form testing commenced at the Australian Nuclear Science and Technology Organization facility in Lucas Heights, Australia, and preliminary Hot-Isostatic Pressing can tests were conducted by Avure Technologies in Columbus, Ohio.

Livermore Site Office

The Livermore Site Office (LSO) oversees Lawrence Livermore National Laboratory (LLNL) in Livermore, California. LLNL is managed and operated by Lawrence Livermore National Security, LLC (LLNS). During FY11, LLNL completed or made continued progress on several safety-related issues of particular interest to the DNFSB including: LLNL facility and program safety enhancements, LLNL nuclear facility training program improvements, integrated safety management system (ISMS) and work control improvements, and review of tritium facility operations. Each of these areas is discussed below.

Lawrence Livermore National Laboratory

Facility and Program Safety Enhancements

Facility and program safety enhancements included: (1) continued progress on special nuclear materials (SNM) inventory reductions; (2) development of a new criticality safety training facility; and (3) transuranic (TRU) waste management activities.

SNM Inventory Reductions

SNM inventory reduction in Building 332 remains on schedule with completion targeted for the end of FY12. Approximately 95 percent of the total SNM inventory slated for removal has been shipped off site or is currently packaged and ready to ship off site to other secure DOE locations. To date, approximately 91 percent of the total SNM inventory slated for removal has been shipped off site. The goal of SNM inventory reduction is to significantly reduce SNM-associated security risks and to render any potential accidents incapable of posing a significant risk to the public.

New Criticality Safety Training Facility

LLNL is in the process of developing a training facility centered on surplus Omega West fuel assemblies in a subcritical tank assembly. The facility is currently referred to as the Inherently Safe Subcritical Assembly (ISSA). The objective of ISSA will be to provide criticality safety and reactor physics training to a broad audience (no security clearance will be required), as well as support for research and development. The training will be designed such that an inadvertent criticality is not possible, allowing the students to handle fuel and load the assembly. Each fuel assembly contains approximately 250 grams of highly enriched uranium. LLNL is currently working to configure an existing non-nuclear facility for permanent storage of the fuel and teaching activities. The fuel elements are presently stored in the facility in their shipping containers. Although an official operating date for the facility has not been established, it is anticipated the facility will be functioning to support training activities by the end of FY12.

TRU Waste Management Activities

In FY10, LLNL Site 300 successfully completed the repackaging of its TRU waste. All Site 300 TRU waste was removed and transported off site. LLNL also completed its second TRU waste shipment campaign for the main Laboratory (Site 200). Collectively, these TRU waste inventory reduction activities ensure that LLNL will maintain sufficient capacity to store and process additional TRU waste, as necessary and appropriate, at least through FY16, if not longer. The following highlights additional LLNL TRU waste management activities for FY11 and FY12 as initially incentivized by way of an LLNS contract FY11 Performance Evaluation Plan measure.

- The LLNS management and operations contract has been modified to include the DOE packaging guidance for videography.
- Building 332 operations will include operation of a disposable glovebox and repackaging tent designed to meet the new packaging requirements in FY12.
- Design and procurement activities have been initiated for a new permanent repackaging glovebox to support Building 332 repackaging operations by FY13.

DNFSB Staff Review of LLNL Nuclear Facility Training Program

In November 2010, DNFSB staff reviewed the LLNL nuclear facility training and qualification program, and LSO oversight of the program. The review covered the requirements of the new DOE Order 426.2, which replaces (with essentially the same requirements) DOE Order 5480.20A. The staff noted significant improvement in LSO oversight since the appointment of a dedicated Technical Training Manager. Although LSO has been meeting the surveillance requirements of DOE Standard 1070, which implements the order, staff pointed out the additional requirement for site office review of the contractor's certification/recertification of fissile material handlers and operators. LSO has since addressed the expectations of the order in this area through planned surveillances, has identified some weaknesses as a result, and will continue to maintain attention on the certification process through its routine surveillances.

Contractor issues identified by the DNFSB staff reflected the lack of a systematic approach to training as required by the order. Issues included the lack of linkage between the credited and cited instances of training in facility Documented Safety Analyses and the training program, the lack of a formally established continuing training program for nuclear facility personnel, gaps in instructor training requirements for positions that provide instruction that could impact safety in nuclear facilities, weaknesses in the quality of learning objectives and trainee examinations of importance to nuclear facility safety, lack of a formal feedback process to improve training content, and the lack of some training drills to prepare personnel to respond to abnormal conditions. LSO formally transmitted the DNFSB staff report to LLNL in the spring of 2011 and has been monitoring progress through the LLNL institutional Issues Tracking System, as well as periodic oversight meetings. The LSO FY12 performance evaluation will examine LLNL's ability to make progress in addressing these issues.

ISMS and Work Control Improvements

In March 2010, DNFSB staff conducted a review of the work planning and control processes of LLNL defense nuclear facilities against the National Nuclear Security Administration (NNSA) document, *Activity Level Work Planning and Control Processes: Attributes, Best Practices, and Guidance for Effective Incorporation of Integrated Safety Management and Quality Assurance*, dated January 2006. The DNFSB staff review also included evaluation of activity-level work planning and control by the LSO. DNFSB staff observations concerning areas of needed improvement included:

- LLNL nuclear facilities work planning and control processes should be fully aligned to a standards-based approach as outlined in the new and improved *LLNL Institution-Wide Work Control Process Requirements Document*. Implementation of this change should be verified.
- LSO should institutionalize the NNSA Criteria Review and Approach Documents (CRADs) and conduct additional focused reviews of activity-level work planning utilizing subject matter experts.

LLNS key efforts towards improving work control at nuclear facilities have included the following activities for FY11:

- Implementing a new work control manual for nuclear facilities that contains improved management expectations and process requirements, and improves overall alignment with associated NNSA guidance.
- Updating LLNS nuclear facility Operational Safety Plans to include specific task/hazard tables that further enhance activity-level work control for key activities. A total of 60 out of 65 plans have been completed to date, with the remaining to be completed early in FY12.
- Completing training on the new work control manual and associated processes. Eight hundred thirty-two site employees have received general awareness training, and more than 700 individuals have received detailed training on implementation.
- Continuing Daily Work Team meetings that further coordinate proposed program activities with facility work control processes and expectations, including proper work-scope reviews.

LSO improvements have focused on implementing an integrated oversight approach that involves an overall technical lead with day-to-day support at the activity level from Facility Representatives, safety system oversight staff, and subject matter experts. LSO's continuing efforts have also included institutionalizing the NNSA guidance document on activity-level work planning and control, the associated CRADS, and providing additional staff training.

Los Alamos Site Office

The Los Alamos Site Office (LASO) oversees the Los Alamos National Laboratory (LANL), a multi-discipline national laboratory with 13 nuclear facilities (five of which are Nuclear Environmental Sites). Los Alamos National Security, LLC (LANS) manages LANL under contract with DOE. Safety accomplishments and ongoing actions in 2011 are discussed below.

Plutonium Facility

On October 26, 2009, the DNFSB issued Recommendation 2009-2, which involved seismic safety at the Plutonium Facility (PF-4), and was motivated by DNFSB concerns involving one of the 20 accident scenarios analyzed in 2008, particularly the post-seismic-fire event. In February 2010, the Secretary accepted the recommendation. In July 2010, DOE issued an Implementation Plan.

Plutonium Facility (PF-4) at Los Alamos National laboratory

In April 2011, LANS identified a potential seismic-induced building collapse mode due to a weakness in the roof supporting structure in the south-half of the building. In October 2011, the laboratory completed a structural modification that addressed this weakness; however, other modifications and evaluations are still required. Also, in October 2011, the National Nuclear Security Administration (NNSA) approved refined seismic accident analysis and controls for the facility.

During the last three years, the site has taken action to better understand and address the seismic risks associated with Plutonium Facility Operations including nearly three dozen nuclear safety improvements. Ten of the 11 commitments in the Department's Implementation Plan for Recommendation 2009-2 are complete. The remaining commitment addressing seismic upgrades to select glovebox stands was delayed due to increased estimated cost. The structural modification completed in October 2011 reduced the seismic risk associated with this facility by an order of magnitude. The refined analysis and controls approved in October 2011 reduced the risk another order of magnitude, resulting in a calculated dose to a maximally exposed off-site individual of 23 rem from the post-seismic-fire accident scenario, which is below the 25 rem Evaluation Guideline. Additional improvements are being made to further reduce potential off-site consequences for this accident scenario and will be implemented at a later date.

Emergency Response

On Sunday, June 26, 2011, the Las Conchas fire started south of Los Alamos, grew to approximately 44,000 acres, and reached the southern and western boundary of the laboratory. LANL and Los Alamos County activated the Emergency Operations Center. The following day, LANL closed the laboratory and declared an operational emergency based on airborne embers igniting a one-acre spot fire on LANL property in Water Canyon (Technical Area 49). Los Alamos County initiated a mandatory evacuation of the town site. In subsequent days, the fire progressed along the western and northern border of the laboratory and town site and continued north, eventually consuming about 160,000 acres. LANL took a number of actions to reduce risk to the laboratory and town site, including thinning vegetation near the Area G transuranic (TRU) waste storage facility and on Pajarito Road, which runs through the laboratory. From June 27 to July 6, the laboratory remained closed with operations maintained in a safe and secure manner. On Friday, July 1, 2011, the operational emergency was terminated and the laboratory transitioned into a recovery mode to ensure a safe and secure resumption of normal operations. Nuclear facilities and operations were not at risk during this emergency.

During FY11, fire-fighter training included biennial emergency responder radiological training examinations and familiarization tours of a number of LANL facilities to improve pre-incident planning and emergency response effectiveness.

Nuclear Material Stabilization and Packaging

LANS has been stabilizing and repackaging nuclear materials in response to DNFSB Recommendations 1994-1, 2000-1, and 2005-1. Under Recommendation 2000-1, 927 kg of material has been stabilized and repackaged or otherwise dispositioned. About 62kg stored in 274 non-standard containers remains to be addressed.

In FY11, LANS dispositioned or repackaged 493 kg plutonium-239 equivalent. LANS also encapsulated 1.2 kg of heat-source plutonium (which is predominantly plutonium-238) into safety-class fuel storage outer containers and moved it to the vault water bath in the Plutonium Facility. LANS has also fire-tested two container designs, demonstrating damage release fractions of about one percent, and is planning testing for three other container designs. Overall, the site is working toward a graded approach to nuclear material stabilization and packaging that minimizes vault space, worker material handling risks, and repackaging scope.

Chemistry and Metallurgy Research Building

LANL has reduced the radioactive inventory of the six-decade-old Chemistry and Metallurgy Research (CMR) Building, which continues to play a critical role in the laboratory executing its national security mission until the CMR Replacement Project is completed. CMR is seismically vulnerable; however, the material-at-risk has been reduced, and the calculated accident consequences are below the 25 rem Evaluation Guideline. Efforts continue to reduce the risks associated with continued operation of this facility.

Transuranic Waste Operations

During FY11, LANL and the Carlsbad Field Office contractor shipped nearly 16,000 curies to the Waste Isolation Pilot Plant, totaling 171 shipments.

Implementation of Key Safety Management Programs

In late FY11, the NNSA raised concerns regarding the implementation of key safety management programs in the Plutonium Facility and in the site TRU waste operations. The affected programs include criticality safety, conduct of operations, and configuration management of key vital safety systems. LANS is working to address these concerns with LASO oversight.

Nevada Site Office

The National Nuclear Security Administration (NNSA) Nevada Site Office (NSO) maintains the ability of the Nevada National Security Site (NNSS) and other remote facilities to implement DOE initiatives in stockpile stewardship, crisis management, waste management, environmental management, non-defense research and development, work for others, and providing support to other DOE programs. Major non-reactor nuclear facilities at NNSS include the Device Assembly Facility (DAF), National Criticality Experiments Research Center (NCERC), and the Joint Actinide Shock Physics Experimental Research (JASPER) Facility. The U1a Complex is not categorized as a nuclear facility; however, limited-duration experiments that are considered to be nuclear activities are conducted there.

FY11 was the third year during which the NNSS management and operating contractor, National Security Technologies, LLC (NSTec), maintained full responsibility and accountability for managing and operating all facilities at NNSS, including facilities previously managed by the National Weapons Laboratories. Activities and accomplishments associated with NNSS nuclear facilities and projects are discussed below.

Environmental Management Activities

The NNSS Area 3/5 Radioactive Waste Facilities provide the infrastructure that enables implementation of the NNSA/NSO Waste Management Program. The associated low-level waste (LLW)/mixed low-level waste (MLLW) sub-projects provide disposal services and facilities for DOE and U.S. Department of Defense generators at the NNSS and across the United States. During FY11, the sub-projects safely accepted and disposed of 1,709,999 cubic feet of LLW in 2,449 shipments and 56,254 cubic feet of MLLW in 110 shipments at the NNSS Area 5 Radioactive Waste Management Complex.

Device Assembly Facility

The Device Assembly Facility (DAF) is a Hazard Category 2, non-reactor nuclear facility. Under NSTec management, the DAF continued supporting NNSA and work-for-others missions throughout the year. Strategic initiatives included receipt of special nuclear materials from the Lawrence Livermore National Laboratory, national criticality materials from various locations to support NCERC, and acceptance of test readiness materials. During FY11, the DAF management team supported initial startup of NCERC, execution of the Barolo and Bacchus subcritical experiments, and ongoing counterterrorism and criticality safety training activities.

As documented in the DNFSB September 23, 2011, periodic report to Congress, a significant safety-related infrastructure issue is the ongoing degradation of the DAF fire suppression water tank and fire suppression

system piping. The piping is susceptible to corrosion failure and cannot be relied upon to provide fire suppression system water in the event of a fire in DAF. The facility is currently managing these vulnerabilities with an NNSA/NSO-approved Justification for Continued Operation and associated compensatory measures to ensure adequate safety. With respect to corrective action, the Mission Need Statement for the piping Replacement Project was approved on May 18, 2011. NNSA estimates to complete the replacement project in 2017.

The water tank also cannot be relied upon to provide fire suppression water in the event of a fire in the DAF. Accordingly, NSTec is working with NNSA/NSO to develop a comprehensive integrated procurement schedule for a new Fire Suppression Water Tank, and procurement and installation of a new Safety Class Stand-Alone Unit (SAU) to conduct proof-of-concept performance testing for the fire suppression in one building.

Other DAF-related issues of concern to the DNFSB include vulnerabilities associated with the High Efficiency Particulate Air Filter Ventilation System, fire penetration seals, fire suppression water strainers, and gaps in configuration management. NSTec is working with NNSA/NSO to develop and implement an integrated, strategic plan to address these deficiencies in a coherent manner that ensures adequate protection of the public, workers, and the environment. NNSA/NSO continues to provide DNFSB staff with periodic progress updates related to the vulnerabilities and associated resolution.

National Criticality Experiments Research Center

NCERC is the only facility in the DOE complex where general research and hands-on training related to nuclear safeguards, criticality safety, and emergency response is conducted using Category I level nuclear materials. During FY11, a new safety basis was successfully implemented, and NCERC received authorization to startup as a Hazard Category 2, non-reactor nuclear facility. Operational critical assembly machines include Comet, Planet, Flattop, and Godiva IV.

Interactions with the DNFSB were primarily related to resolution of safety-related issues documented in an August 5, 2010, DNFSB letter. The associated staff trip report expressed concerns related to a number of deficiencies in the accident analysis, hazard control set, and safety system design associated with a critical assembly machine. Discussions were held with the DNFSB staff, and a majority of the technical issues were quickly resolved. Agreement on a path forward was reached and documented in the NNSA response letter to the DNFSB, dated February 10, 2011. During a visit to NSO during the week of February 14, 2011, the DNFSB members and staff were briefed on the corrective action plans and schedule for the resolution of the remaining issues.

FY11 activities related to DNFSB and staff interaction were focused primarily on three remaining issues identified in the August 5, 2010, letter: (1) the applicability of the ISA 84.01 standards to NCERC criticality assembly machines; (2) justification of NCERC bounding accident scenarios; and (3) functional classification of the NCERC Human Machine Interface (HMI) as a safety-significant system. A path forward and corrective action plan for this issue was completed and a letter was sent to the DNFSB in February 2011.

Joint Actinide Shock Physics Experimental Research Facility

The JASPER facility enables scientific research associated with the acquisition of high-quality performance data involving nuclear and surrogate materials. A high-velocity gas gun and associated diagnostics designed for shock physics experiments provide equation-of-state data to better understand phase change relationships of weapons materials under varying pressures and temperatures.

During FY11, activities associated with replacement of the Secondary Confinement Chamber were completed. A new safety basis was successfully implemented, and on August 25, 2011, the JASPER Facility received authorization to restart as a Hazard Category 3, non-reactor nuclear facility. On September 14, 2011, the JASPER Facility completed its return to operations by conducting an experiment with a plutonium target. This experiment represented the culmination of engineering, construction, diagnostics, operations, and other support activities that included replacement of safety-significant components, establishment of the as-built technical baseline, and optimization of standard operating procedures.

U1a Complex

The U1a Complex is comprised of many surface support buildings and trailers, and an extensive series of underground drifts and experiment alcoves 965 feet beneath NNSS ground level. The U1a Complex supports the nation's Stockpile Stewardship Program and provides an underground experiment test bed for the conduct of subcritical experiments using high-explosives and special nuclear materials. Although the U1a Complex is not categorized as a nuclear facility, certain subcritical experiments may be classified as Hazard Category 2 or 3 nuclear activities, and therefore the U1a complex is considered a "facility of interest" to the DNFSB. Specific subcritical experiments performed in FY11 included the Barolo and Bacchus campaigns.

The Gemini Project is part of the Stockpile Stewardship Program conducted in conjunction with Los Alamos National Laboratory and NSTec for the NNSA. The Gemini Project was designated by the NNSA Defense Programs Deputy Administrator as a high-priority demonstration that integrates a scaled subcritical experiment with special nuclear material. The experimental campaign is a first-of-a-kind demonstration culminating in three integrated experiments involving high-explosives and special nuclear material. Initial "surrogate" experiments (named Leda and Castor) will be conducted underground at the NNSS U1a Complex without the presence of special nuclear material. The final experiment (named Pollux) will include special nuclear material and is designed to deliver final experimental data in support of the Stockpile Stewardship Program. Final execution of these tests at NNSS is anticipated to be complete by the end of FY12.

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U1a Facility Air Support Building at the Nevada National Security Site

Minor safety basis changes are being developed, as necessary, to incorporate differences in special nuclear material and high-explosive quantities required for the execution of Gemini experiments within Hazard Category 3 limits. Validation of continued readiness for U1a within the 18-month required period will be demonstrated via the Leda engineering hydro-test which will be performed at U1a. This test will be followed up by the Castor confirmatory experiment, which will be performed in an almost identical fashion to the Leda hydro-test. These two high-fidelity surrogate experiments will ensure confidence that the Pollux experiment can be safely executed while meeting all regulatory requirements.

NNSS Activity-Level Work Planning and Control

DNFSB staff members reviewed NSTec activity-level work planning and control processes and their implementation at NNSS during the period November 15-19, 2010. The purpose of the staff's review was to assess the implementation of Integrated Safety Management in the activity-level work planning and control processes used by NSTec to ensure the protection of workers. The DNFSB staff representatives concluded that the NSO oversight and its ability to assist NSTec in correcting the assessment deficiencies would directly

benefit from DOE's issuance of a work planning and control technical standard and a guide supporting DOE Order 226.1 B, *Implementation of Department of Energy Oversight Policy*.

NSTec, NSO, and NNSA provided a response and action plan to the DNFSB observations in a letter to the DNFSB, dated June 6, 2011, *NNSA/NSO Response to DNFSB Letter of March 28, 2011, – Activity Level Work Planning – Nevada National Security Site*. Several NSO actions described in the letter are complete. All other commitments are on or ahead of schedule for completion.

Line Oversight/Contractor Assurance Systems Affirmation/Review

NSO and NSTec hosted two separate meetings with the DNFSB and staff during FY11 to discuss Line Oversight/Contractor Assurance Systems (LOCAS). A meeting and general discussion was held with NSO and NSTec senior management and the DNFSB staff members on December 15, 2010, to introduce how NSO performs oversight of its contractors, as well as the tools used by contractors to prepare for assessments and oversight in the field. A demonstration of the NSTec Dashboard was completed by NSTec. Briefings by NSO and NSTec management were provided to the DNFSB staff. On February 17, 2011, the DNFSB returned to NSO for additional briefings and updates related to LOCAS.

Oak Ridge Office

The mission of the DOE Environmental Management Program at Oak Ridge is to carry out coordinated reservation-wide cleanup that resolves health and environmental risks, and supports and protects DOE vital missions.

Transuranic Waste Processing Center

During FY11, the Transuranic Waste Processing Center (TWPC) continued to safely and systematically reduce the inventory of transuranic (TRU) waste at Oak Ridge. TWPC continued with repackaging of contact-handled (CH) waste drums and boxes in the glovebox and the box breakdown area (BBA) processing lines. Remote-handled (RH) concrete waste casks were also processed in the hot cell process line. In early FY11, TWPC brought the drum venting system into production mode, installing vents and sample lines to perform headspace gas sampling/analysis in over-packed CH waste drums as a precursor to repackaging in the glovebox or the BBA. Much of the CH inventory has been repackaged and is awaiting final certification while RH repackaging is approximately 20 percent complete. The remaining CH waste containers are typically containers involving overpacks, free or containerized liquids greater than one gallon in volume, scaled sleeves, and other specialty containers. Some edits are being made to the Documented Safety Analysis and Technical Safety Requirements prior to processing some of the waste containers.

During FY10 and FY11, the majority of RH waste repackaged in the hot cell was found to actually meet CH criteria upon characterization. This repackaging required removal of the CH waste from the hot cell and moving it into the CH characterization process. Additionally, the wear and fatigue issues associated with processing CH waste in a highly specialized processing line prompted the project to install an additional CH process line. This additional process line would allow the processing of approximately 200 RH casks containing CH waste using supplied breathing air similar to the existing CH BBA processing line. Construction of the process line is under way with operations scheduled to begin the second quarter of FY12.

Transuranic Waste Storage

TRU waste at Oak Ridge National Laboratory (ORNL) is stored and transferred to TWPC for characterization and processing prior to disposal. Management of TRU waste storage activities at ORNL transitioned from Bechtel Jacobs Company, LLC, to URS/CH2M Oak Ridge, LLC, in FY11. Twenty-six drums of special nuclear material declared to be waste in the mid-1980s are included in the stored inventory. Activities completed in FY11 included: revisions to the safely basis, upgrades to physical security features, and demonstration of the retrieval operations to support future retrieval and transfer of this waste to TWPC.

Oak Ridge National Laboratory

Building 3026C/D Hot Cells

The 3026C/D facilities at ORNL are hot cells and laboratory facilities comprised of two adjoining facilities. The 3026C facility is comprised of four structures (Tritium Lab, Counting Room, and Cell Banks 1 and 2). The 3026D side is comprised of connecting radioactive material handling cells (hot cells A, B1, and B2). The 3026D facility also includes the Sorting and Storage cell bank that is connected via an underground tunnel to hot cell A. The facility's main wooden structure was demolished in 2011. As of September 2011, the Tritium Lab and Counting Room have been decontaminated and prepared for demolition. Cell bank 1 and 2 decontamination is approximately 85-percent complete. Approximately 126 cubic meters of low-level waste (e.g., fume hood,

lead countertops, lead wall liners, light fixtures, duct, and piping) have been removed and packaged for disposal. Decontamination of the remaining hot cells continues. In March 2011, higher-than-anticipated contamination levels were found in cell A of 3026D. The project is reevaluating the technical approach for cell cleanout due to the increased levels of detected radioactivity.

Tank W-1A Project

The Tank W-1A project at ORNL involves an empty, abandoned tank buried approximately eight feet below ground and surrounded by highly contaminated soils. These soils contribute to an ongoing release of radioactive contaminants to groundwater, which subsequently discharges to a down-gradient stream. The project scope includes excavation, size reduction as required, packaging and transport for disposal of approximately 355 cubic yards of contaminated soil, the tank shell, the concrete pad, and tank supports; and characterization of the area along the pipeline north of the tank to delineate further soil to be removed. During the first half of FY11, practice and preparation to get ready for field work was conducted. The DOE readiness review was completed in August and excavation of soil began in September. Shipment of contaminated soil to the Nevada National Security Site began in October 2011. The project is scheduled to be completed in the spring of 2012.

Uranium-233 Project

The U-233 Project completed the final design for Building 3019 modifications necessary to support the dissolution and down-blending of the U-233 inventory in March 2011 as planned. DOE commissioned a review of alternatives for dispositioning the U-233 inventory. Phase I of the Alternatives Analysis, which screened and identified potential alternatives, was completed in January 2011. The Deputy Secretary of Energy endorsed the review recommendations in April 2011. The team began planning a two-part Direct Disposition Campaign: (1) inventory identified for other programmatic uses; and (2) the potential direct disposal of the Consolidated Edison Uranium Solidification Project inventory. The Direct Disposition Campaign will begin with shipment of the zero-power reactor plates to the Device Assembly Facility at the Nevada National Security Site. Phase II of the Alternatives Analysis will provide a more detailed evaluation of processing options for the inventory that is unable to be directly dispositioned, and is expected to be complete in FY12.

Isotek continues to safely manage the 3019 Complex. DOE approved Isotek's Integrated Environment, Safety, and Health Management System Description in March 2011 and its Worker Safety and Health Program in May 2011. Isotek received approval of Revision 5 of the Documented Safety Analysis in June 2011, which incorporated the Building 3019-B Facility. Revision 6, which addresses the zero-power reactor plate shipping campaign activities in the Building 3019 Complex, was approved in September 2011. Isotek is operating under an approved 10 C.F.R. Part Radiation Protection Plan (July 2010) and Revision 3 of the Safety Design Strategy (January 2011).

Office of River Protection

The DOE Office of River Protection (ORP) is responsible for retrieving and treating for disposal, the 56 million gallons of chemically complex radioactive waste, which resulted from more than three decades of plutonium production. The waste is stored in 177 underground tanks on the Hanford Site. Working together with prime contractors Bechtel National, Inc., (BNI) and Washington River Protection Solutions, LLC, (WRPS), the mission is to remove the waste from the tanks, design and construct the Waste Treatment and Immobilization Plant (WTP) to vitrify the waste (i.e., to turn it into a stable glass waste form) for long-term storage and ultimate disposal, and close the Tank Farms.

Waste Treatment and Immobilization Plant and Tank Farms

ORP and its Tank Operations Contractor, WRPS, focus efforts to safely manage the tank waste. There are 149 single-shell tanks (SST) and 28 double-shell tanks (DST) located on the Hanford Site. Some of the SSTs have leaked in the past, putting an estimated one million gallons of waste into the soil and threatening the nearby Columbia River. The SSTs have been “stabilized” by transferring all pumpable liquids to the newer DSTs, reducing the environmental risk.

Waste Treatment and Immobilization Plant Project

ORP remains focused on safely completing the design, construction, and commissioning of WTP. The project has resolved numerous technical challenges and completed the majority of construction on this first-of-a-kind plant, while maintaining safety rates that are superior to construction industry averages. Of the five major facilities (Pretreatment (PT) Facility, Low-Activity Waste (LAW) Facility, High-Level Waste (HLW) Facility, Analytical Laboratory, and Balance of Facilities) four have no major technical issues identified at this time. The PT Facility is the only facility that has unresolved major technical issues.

WTP is at a pivot point in the project, shifting focus from design/construct to construct/commission. This "pivot" focuses work from constructing to operating WTP. Three of the main facilities, including LAW, Analytical Laboratory, and the Balance of Facilities, are more than 60 percent constructed. These three facilities, along with HLW and PT, form a complex operation requiring a workforce and supporting infrastructures unlike that which has existed at Hanford for decades.

DOE ORP emphasis on the integration of the WTP and Tank Farms work scopes is critical to ensuring successful startup, commissioning, and eventual operation of WTP. The goal of this integration is to create a "one-system" model for delivery of WTP and elements of the Tank Farms project associated with feed stream delivery, and acceptance of WTP products as an integrated system to ensure efficient, consistent waste feed, waste processing, and product delivery during operations.

As of November 2011, the WTP project was 61 percent complete, with engineering 84 percent complete, procurement 65 percent complete, and construction 57 percent complete. Through October 2011, approximately 218,000 cubic yards of concrete; 19,100 tons of structural steel; 845 tons of heating, ventilation, and air conditioning ducting; 310,000 linear feet of piping; and 292,000 linear feet of cable and wire were installed. Other significant accomplishments included:

- Working more than 8.75 million hours without a lost workday injury and receiving DOE's Voluntary Protection Program Superior Star recognition;
- Setting a 102-ton shield door in the PT Facility hot cell;
- Receiving a 50-ton carbon dioxide storage vessel that is integral to the LAW Facility container decontamination system;
- Completing the Water Treatment Building that will treat more than 500,000 gallons of water per day during plant operations;
- Placing a 19-ton, pre-assembled piping module inside the PT Facility;
- Installing a key bridge crane in the HLW Facility for handling 55-gallon, carbon-steel drums before and after they are filled with residual solid waste; and
- Awarding a subcontract to build a large-scale testing platform to perform the testing used to confirm the plant's vessel mixing design in areas that require design confirmation.

Interactions with the DNFSB

ORP remains focused on working closely with the DNFSB to resolve all ongoing technical issues. ORP has demonstrated dedication to addressing these issues over the past year, and will continue to do so in a way that supports the role of the DNFSB.

On December 17, 2010, the DNFSB issued Recommendation 2010-2, *Pulse Jet Mixing at the Waste Treatment and Immobilization Plant*, which the Department accepted on February 10, 2011. DNFSB's recommendation documented their position that testing and analysis completed to date have been insufficient to establish with confidence that the pulse jet mixing and transfer systems at WTP will perform adequately at full scale. DNFSB identified five unresolved technical concerns:

- Limitations of the small-scale testing program;
- Modeling of the mixing performance;
- Tank Waste characterization and feed certification;
- Planned WTP process vessel modifications; and
- Limitations of pulse jet mixing controller and instrumentation testing.

DOE has worked cooperatively with DNFSB staff on specific actions DOE will take to address the recommendations. The Implementation Plan was transmitted to the DNFSB by the Secretary of Energy on November 10, 2011.

In April 2011, the DNFSB and staff visited the Hanford Site and met with ORP and contractor management and staff to discuss FY11 priorities, radiological control and corrective action management, tank waste retrievals, supplemental treatment of tank waste, integration of TF and WTP, TF infrastructure to feed WTP, and criticality safety. They also toured the WTP, TF, and 222-S Laboratory.

On June 9, 2011, the DNFSB issued Recommendation 2011-1, *Safety Culture at the Waste Treatment and Immobilization Plant*. The recommendation stated the DNFSB position that both DOE and contractor project management behaviors reinforce a subculture at WTP that deters the timely reporting, acknowledgement, and ultimate resolution of technical safety concerns. The DNFSB identified two findings: (1) a chilled atmosphere adverse to safety exists, and (2) DOE and contractor management suppress technical dissent.

DOE is committed to establishing and maintaining a strong nuclear safety culture. It is DOE's policy and practice to design, construct, and operate nuclear facilities in a manner that ensures adequate protection of workers, the public, and the environment. DOE developed a comprehensive Implementation Plan to address DNFSB's recommendation to strengthen the safety culture at WTP and transmitted it to the DNFSB on December 27, 2011. Among the actions identified in the implementation plan, ORP and its contractors have engaged and supported independent reviews. On December 1, 2011, the BNI-sponsored Safety and Quality Culture Assessment team issued their report and findings from the nuclear safety and quality culture in-depth

assessment at WTP. In January 2012, the Office of Health, Safety and Security (HSS) issued a report that assessed nuclear safety culture and management of nuclear safety concerns at WTP. This HSS assessment provides DOE management with a follow-up on the October 2010 HSS review of the WTP nuclear safety culture.

Several DNFSB staff on-site reviews were supported by ORP and contractor staff in areas associated with WTP and TF, such as WTP Data Quality Objectives, Erosion/Corrosion Allowances for WTP Vessels and Piping, WTP Preliminary Fire Hazards Analysis, WTP Low-Order Accumulation Model Benchmark Test Program, WTP computational fluid dynamics code, FLUENT, Validation and Verification Program, and Tank Farms Project Review. These technical issues will continue to be addressed in FY12.

Structural Issues

The Summary Structural Report (SSR) was finalized for the PT and HLW facilities to summarize the calculation methodologies for the structural design based on the revised ground motion criteria. The original SSRs were updated to incorporate the modified design methodology along with DNFSB staff review comments that were incorporated in 2008. In December 2010, the DNFSB concluded that all the issues relating to composite steel behavior/structural steel design issues on WTP are closed. Additionally, through DOE Peer Review Team (PRT) Quarterly Review discussions on System for Analysis of Soil-Structure Interaction (SASSI) Computer Code on the application of SASSI - Subtraction and Direct Methods on WTP's HLW foundation, DOE WTP and BNI documented a comparative and reliable technical justification between the stated methods. The DOE PRT is reviewing this justification document, and results will be reported in early 2012. The final versions of the SSRs will be issued during 2012/2013 at the completion of WTP structural design, while incorporating required interim updates requested by DNFSB staff. DOE ORP will continue providing quarterly updates on the DOE ORP PRT input until all issues are fully resolved.

Hydrogen in Pipes and Ancillary Vessels (HPAV)

At the recommendation of the DNFSB, a twelve-member HPAV Independent Review Team (IRT) was assembled and chartered to review the proposed approach to use a quantitative risk analysis (QRA) for analyzing and designing piping that has the potential to accumulate hydrogen and be exposed to detonations during the life of the plant. The team identified 35 findings that must be completed prior to their concurrence on the overall approach. The IRT concluded that the design approach for HPAV piping and components are acceptable provided BNI resolves the findings. In July 2011, the project issued the calculations, reports, and Summary Response Sheets to support the IRT's final review. The project issued all revised and new calculations in late October 2011 to support the final approval and closure by the QRA Peer Review Team (QPRT), which is expected in early FY12. The IRT and QPRT approval allows closure of remaining actions to support verification and validation of the QRA software in accordance with the U.S. Nuclear Regulatory Commission nuclear quality assurance standard, NQA-1, and DOE Order 414.1C.

Authorization Basis Changes (Design and Standards Change Approvals)

A Safety Requirements Document (SRD) provides formal documentation of the safety requirements for structures, systems, and components (SSCs) classified as safety class (SC) and safety significant. Implementing codes and standards are specific to SC and safety-significant SSCs. Topics (i.e., Radiological, Nuclear, and Process Safety Objectives; Radiological and Process Safety and Standards; Engineering and Design; Radiation Protection; Documented Safety Analysis; and Technical Safety Requirements) are subdivided into Safety Criterion with its associated implementing codes and standards. Three significant changes to the WTP SRD were approved in FY11:

- Clarification of seismic and environmental qualification requirements for accident monitoring instrumentation consistent with IEEE-497, *Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations*, and the basis of the processes to determine how their qualification requirements are implemented.
- Clarification of American Society of Mechanical Engineers Boiler & Pressure Vessel Code, Section VIII, *Rules for Construction of Pressure Vessels*, pressure vessel design requirements for applying detailed stress and fatigue analysis for vessels located outside of black cells.
- Modification of SRD Safety Criterion 4.3-5, *Single Failure Criteria*, to clarify application of redundant SC SSCs when failure or removal of any non-safety control system component leaves intact a system satisfying all reliability, redundancy, and independence.

DOE reviewed and approved five changes to the Preliminary Documented Safety Analysis (PDSA) in FY11, as well as approving four authorization basis amendment requests to the SRD. Additionally, DOE approved three Justifications for Continued Design, Procurement, and Installation (JCDPIs). The JCDPI approvals included post-ultra filtration precipitation minimization/elimination of insoluble solids into the Cesium Ion Exchange process system, implementation of turbine technology (in lieu of diesel generators) for the purpose of SC emergency power, functional classification upgrade to the High Efficiency Mist Eliminator internal components to support continued design, and procurement activities for the PT Facility Process Vessel Vent Process/Vessel Vent Exhaust System. DOE also approved the WTP recommended value of a site-specific dry deposition velocity (DV) used in accident dose consequence calculations. The WTP site-specific DV value of 0.1 cm/sec was consistent with the default value specified for unmitigated/unfiltered particulate releases to be used throughout the DOE complex in the HSS Safety Bulletin No. 2011-02. There were 33 changes to the PDSA and eight changes to the SRD in FY11 that required only contractor approval. The number of DOE-approved changes remained about the same as in the previous fiscal year. However, DOE rejected several draft authorization basis amendment requests based on inadequate bases for approval. The number of amendment request submittals is likely to increase in the future as facility-specific hazard analyses are revised.

Structural and Equipment Qualification PRT Activities

ORP continues to provide quarterly updates to the DNFSB staff regarding PRT activities. The primary activities for FY11 performed by the Structural PRT were:

- PT Facility Control Building Soil Structure Interaction analysis,
- SASSI model approaches on HLW seismic response for the application of the SASSI computer code using the Subtraction Method and quality assurance issues, and
- Review of BNI responses, specific analyses, and drawings released since the last Structural PRT meeting.

The Equipment Qualification PRT also met to review equipment and analyses in FY11. ORP continues to increase the involvement of the Equipment Qualification PRT given the maturing design of WTP equipment. A number of issues previously identified by both teams were closed during the August 2011 review, which DNFSB staff observed.

Tank Farms

The Tank Farms contain 56 million gallons of radioactive and chemical waste that resulted from more than three decades of plutonium production. The waste is stored in 177 large underground tanks. ORP and its Tank Operations Contractor, WRPS, are removing and transferring this waste from the older 149 SSTs to the newer 28 DSTs to reduce the environmental risk posed by the older tanks.

During FY11, the Tank Farms project completed the American Recovery and Reinvestment Act (ARRA) scope and achieved 100 percent of ARRA key milestones by the September 30 deadline. ORP and WRPS completed 21 sub-projects and a total of 2,300 Key Performance Parameters using ARRA funds in FY11. ARRA funding was used to upgrade the Tank Farms infrastructure, extend the life of critical operating facilities, and prepare to feed waste to WTP. Other key projects focused on the development of state-of-the-art technologies that will be used to retrieve and consolidate tank waste. ARRA funds also facilitated improved integration with WTP, as WRPS developed systems to mix and sample tank waste in order to consistently feed waste to WTP.

The Tank Farms project made the most single-year retrieval progress in its operating history including resuming retrieval operations on tank C-104, beginning retrieval operations on tank C-111, cutting a hole in tank C-107 to accommodate the Mobile Arm Retrieval System (MARS), and installing MARS in tank C-107. In addition, WRPS achieved DOE's Voluntary Protection Program Merit status, received DOE's Sustainability Award for 222-S Laboratory, and passed three million hours without a lost workday injury.

Tank Farms Conduct of Operations

Throughout FY11, WRPS pursued a continuous improvement approach to achieve its expectations for rigorous Conduct of Operations. As discussed in the DNFSB's March 30, 2011, letter, WRPS accomplished improvements in some areas of Conduct of Operations, but continued focus on ongoing actions is necessary to safely and efficiently support the planned increase in operational tempo. WRPS will institutionalize and continue to utilize Conduct of Operations Coaches to ensure supervisors and work crews have a solid understanding of disciplined Conduct of Operations, Integrated Safety Management System, Radiological Controls, and work planning and control. WRPS has also engaged management and workers in improvement forums and made organizational changes to improve ownership, accountability, and access to program subject matter experts. Specific improvements have been pursued in work instructions/technical procedures, control of work by field work supervision, housekeeping, shift turnover, and radiological controls. These improvements were evident during completion of Tank Farms stimulus work, recent tank waste transfers completed at the end of 2011, and the safe initial operations of the C-107 MARS in October 2011.

Work Planning and Control

During FY11, WRPS completed a suite of corrective actions to address an ORP concern with the work planning and control process and associated implementation. The actions focused on the development and implementation of a WRPS process containing the necessary controls to ensure rigorous, consistent implementation. ORP and WRPS participated in the Energy Facility Contractors Group work planning and control team, and WRPS further participated in the development of the URS Corporation work control standard. WRPS identified that the gaps to support implementation of the URS standard are minor, and WRPS intends to implement the standard in FY12 followed by a corporate assessment of implementation.

At the end of 2011, WRPS performed an end-point assessment to evaluate the effectiveness of the completed corrective actions to improve work instruction/procedure development and use, and the overall health of the WRPS work planning process. The team found that overall performance in work planning and control has improved, as demonstrated by a decrease in consequential issues, and that a strong foundation for the work control and planning process has been established that will result in successful work planning and control. Mechanisms are in place to address the various aspects of work scope definition, hazard identification, control selection, work release, and the administrative portions of work control. However, weaknesses were observed in work instruction compliance in the field, and use of change control to ensure field activities remain aligned with the documented instructions and approved controls. These weaknesses are representative of an ongoing culture change, and additional actions will be taken to foster rigorous compliance with work instructions and the self-correction of instructions in response to changing conditions, invalid initial assumptions, or recognition of the need for clarification or changes to the initial controls.

Technical Challenges

WTP's successful operation depends on the ability to mix waste slurries at various concentrations and with various physical properties. Some mixing processes will take place in vessels located in black cells that will be inaccessible after hot operations have commenced. Thirty-four process vessels in the PT Facility and four in the HLW Facility rely on pulse jet mixing as the primary means of mixing. The safety implications of incomplete mixing include the following:

- Potential for criticality due to accumulation of large particles of fissile materials;
- Generation of hydrogen within accumulated solids; and
- Accumulated solids interfering with measurement of the level and average density in the vessels, leading to potential pulse jet mixer malfunctions and damage to process vessels.

The Department is working closely with the contractors on all technical challenges to ensure the systems will safely operate.

Pacific Northwest Site Office

The Pacific Northwest National Laboratory (PNNL) operates the Radiochemical Processing Laboratory (RPL), also called the 325 Building. The 325 Building is located in the 300 Area on the Hanford Site, Richland, Washington. It is a Hazard Category 2 nuclear facility.

Pacific Northwest National Laboratory

Key Department Safety Initiatives

- The Pacific Northwest Site Office (PNSO) completed a review of the Office of Health, Safety and Security Safety Bulletin 2011-01 on Events Beyond Design Safety Basis Analysis for the RPL and participated in the June 2011 Nuclear Safety Workshop.

- Directives Reform:

  - Approval of Training Implementation Matrix for DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*. Full implementation of the

certification program for Fissionable Material Handlers and Supervisors is planned for first quarter of FY12.

- Approval of Conduct of Operations Applicability Matrix for implementation of DOE Order 422.1, *Conduct of Operations*.

- Approval of Procedures for Implementation of DOE Order 425.1D, *Verification of Readiness to Startup or Restart Nuclear Facilities*.

- Approval of Nuclear Maintenance Management Program for implementation of DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*.

- Federal Competency:

  - PNSO continues to support the Federal Technical Capabilities Panel by assigning staff to this panel and participating in monthly telecoms and face-to-face meetings.

- Operational Safety:

  - PNSO continues participation on the Integrated Safety Management Champions Council.

  - PNSO continues to promote PNNL initiatives to strengthen laboratory culture, individual accountability, and employee engagement through participation as a Voluntary Protection Program Star site over the past ten years, and establishment and implementation of Laboratory Zero Accident Committees.

- PNNL has implemented DOE Manual 441.1-1, *Nuclear Material Packaging Manual*, and the majority of items have been placed into Engineered Contamination Barriers or designated for disposal. Exceptions include items with unique configurations and special shielding requirements that pose a greater risk if moved from their current configuration. This approach has been approved by PNSO. In addition, PNNL is currently working with Los Alamos on the acquisition of new DOE Manual 441.1-1 compliant containers to supplement material management capability.

Safety Accomplishments and Activities

Progress continues on facility infrastructure upgrades that support mission extension for the 325 Building:

- The Readiness Assessment (RA) for operation of four new hot cells and three new gloveboxes was successfully completed and start-up approved in December 2010. The approach for the successful RA has been shared via Lessons Learned, and a presentation was given at the annual Readiness conference at Oak Ridge and the Operating Experience meeting in Richland, Washington.

- A new air emissions stack monitoring system that meets the latest American National Standards Institute N13 Standard, current Environmental Protection Agency, and Washington Department of Health requirements was installed.

- PNNL completed replacement of two 300-ton chillers and associated coils. These chillers provide main cooling of the building's air supply and are vital to the operations of the facility's laboratories.

- PNNL completed refurbishment of the C-Cell main shield (hot cell) window in the High-Level Radiochemistry Facility Annex within the 325 Building. Visibility of this four-ton window had significantly degraded. Along with the window refurbishment, C-Cell itself was completely refurbished with new decks and trays, and was re-purposed for mission support. A similar initiative is underway for B-Cell.

- Construction work was started to refurbish and modernize four laboratories within RPL. When complete in 2012, these laboratories will be contemporary, modular, and flexible through the use of standardized casework and fume hoods.

- An upgrade to the 300 Area water supply system was completed that included the installation of new 8- and 16-inch water lines that support the 325 Fire Suppression System. This work replaced aging fire water supply lines to the 325 Building, along with several new Post Indicator Valves and fire hydrants.

- The RPL Documented Safety Analysis and Technical Safety Requirements have been fully implemented to recognize a more conservative plutonium clearance class than previously assumed, to incorporate new accident analyses, to streamline radioactive material management, and to reduce potential off-site dose consequences in support of safe and compliant operation.

- Safety System Oversight assessments of the Fire Suppression System, Criticality Alarm System, Confinement System, and Natural Phenomena Hazards mitigation completed in FY11 concluded that RPL maintains functional and reliable system operation, configuration and program management, training, and maintenance.

Pantex Site Office

In FY11, Pantex successfully exceeded commitments to fully support the Directive Schedule and Defense Program "Getting the Job Done" Goals. These goals were achieved within resources in Directed Stockpile Work, Readiness in Technical Base and Facilities, and Safeguards and Security. At the same time, Pantex continued to upgrade safety systems to enhance the safety of nuclear explosive operations.

The Pantex Plant

Pantex completed the dismantlement of the B53 15 months ahead of schedule and sustained a significant safety milestone in that all weapons program operations meet Seamless Safety for the 21st Century criteria, thus completing a multi-year effort to infuse enhanced safety techniques into weapon operations.

Pantex accomplished the National Nuclear Security Administration (NNSA) weapons production mission while achieving a level of safety that ranks among the top "safety leaders" in the NNSA complex over the last five years. In FY11, the contractor established the lowest ever Total Recordable Case (TRC) rate of 0.33 (Pantex record). Pantex obtained Voluntary Protection Program Star status in FY10 and continues to maintain it through a variety of management initiatives such as the B&W President's Accident Prevention Safety Team.

In conjunction with the NNSA Pantex Site Office (PXSO), B&W Pantex continued to deploy the Pantex Highly Reliable Organization (HRO) framework plant wide to minimize the potential for a high-consequence, systems accident. Pantex continues to share this experience with other NNSA sites, federal agencies, and commercial entities. B&W Pantex further demonstrated its commitment to the success of the Pantex Plant by continuing to invest in a comprehensive and ongoing plan to actively engage employees across the organization through employee outreach, recognition, empowerment, training and support, and professional growth and career advancement. System mapping and barrier analysis methodologies were developed and tested for several nuclear and high explosive operations as models for further HRO improvements.

B&W Pantex continued to enhance nuclear safety performance through improving the effectiveness of its Contractor Assurance System (CAS). B&W completed a self-assessment to the criteria of NNSA policy letter NAP-21, *Transformational Governance and Oversight*, in preparation for NNSA affirmation in FY12. Further, B&W Pantex provided timely and accurate information regarding performance through quarterly CAS reports.

Pantex continued to excel in environmental stewardship by fostering a system of environmental management recognized by the NNSA Pollution Prevention Best-in-Class Award and the DOE Environmental Sustainability Award for exemplary environmental sustainability. FY11 marked the 17th consecutive year with no violations or findings from the annual Texas Commission on Environmental Quality waste inspection, and the plant received recertification approval of Gold Leadership-level participation in the Clean Texas Program. A third-party audit by ABS Environmental Evaluations, Inc., conducted every three years, determined that the plant's Environmental Management System conforms to International Organization for Standardization (ISO) 14001:2004, which specifies requirements for an environmental management system to enable an organization to develop and implement an environmental policy and objectives. Disposition of surplus W62 components was accomplished after an NNSA-wide review was completed. Pantex obtained a contract with an outside vendor for the disposition of B53 components. Beryllium stack sampling was completed for the Microwave, and is fully operational in support of the Component Disposition Program.

Looking ahead to FY12, Pantex will continue to uphold a high standard of excellence in safety, security, and quality to provide the foundation for sustained nuclear weapons production and improved capabilities to support NNSA's long-term plan for a viable and efficient Nuclear Security Enterprise (NSE). Pantex will continue to work with partners within NSE to focus on planning scenarios and projects that support footprint reduction, as well as positioning the site to meet future staging and surveillance requirements.

Operational Excellence

Pantex demonstrated outstanding leadership within the plant, as well as the NSE, by providing the direction, coordination, and communication required to successfully deliver on NNSA goals while retaining its recognized status as one of the safest companies in the United States. Pantex continues to strive for operational excellence by proactively identifying and resolving issues to improve execution in mission performance, as the organization emerges as an HRO.

In FY11, B&W Pantex and PXSO have continued to foster the concept of "One Team, One Plant, and One Customer." This alignment is a natural outgrowth of the cooperative partnership between B&W Pantex and PXSO over the past several years in effectively managing through challenging issues to successfully meet the plant mission. The shared value between B&W Pantex and PXSO leadership is sustaining operational excellence at Pantex.

Safety Performance

Pantex continued to enhance operational safety performance and maintain its position as a "best-in-class" safety leader within NSE. Employees continue to demonstrate a strong safety culture by embracing opportunities to lead various employee-driven and/or owned safety programs designed to increase operational safety performance. The result for FY11 was a TRC rate of 0.33 and a Lost Time Case rate of 0.12. For the third year in a row, Pantex set a new record for the all-time low TRC rate.

Pantex continues to embrace employee-driven safety through the Voluntary Protection Program, Behavior Based Safety (BBS), the B&W President's safety council, and the Safety Observations Achieve Results (SOAR) program, which integrates BBS, Integrated Safety Management (ISM), and human performance improvement for use by the protective force. The SOAR group is comprised of front-line supervisors, representatives from each department in the Security Division, and a team of champions from senior management. SOAR observations require that the observer have an anonymous conversation with the person(s) being observed. The SOAR committee meets monthly and specifically extracts the trending information based on the observations performed for the protective forces.

B&W Pantex received several safety awards throughout FY11, including the DOE Voluntary Protection Program Superior Star award and the National Safety Council's Occupational Excellence award. Also, the contractor received the Accreditation Association for Ambulatory Health Care award, which is a nationally recognized standard that measures the quality of a medical program's services and performance against nationally recognized standards.

Finally, B&W Pantex created and populated an external web page for Pantex multimedia lessons learned items which allowed DOE/NNSA organizations to access and utilize key lessons learned videos. This creative method of presenting lessons learned information was recognized and presented at the annual DOE Integrated Safety Management Champions Workshop in September 2011.

Nuclear Safety Improvements

Pantex continued a significant effort to improve fire protection for weapon program operations by continuing the capital project to upgrade the distribution piping of the high pressure fire loop. Additionally, the project was expanded to include the installation of new pumps and tanks for the system. A comprehensive causal factor analysis was completed to identify weaknesses and improvements needed to refine the process used to track and complete Technical Safety Requirement (TSR) surveillance and in-service inspections and improvements identified from that process. The refinements are being factored into an electronic system that will replace current manual tracking methods. Pantex revised the Lightning Protection Project Plan to address the remaining lightning issues generated from a variety of reviews and assessments. Pantex also completed the following specific improvements to nuclear explosive operating facilities in FY11:

- Developed and successfully demonstrated a new single model electrostatic discharge footwear checker.
- Installed and approved for weapon program operations six new ASME nuclear facilities hoist standard, NUM 1, Type 1B seismically qualified hoists.
- Resolved seismic concerns involving six nuclear explosive operating bays.
- Completed intrinsic bonding tests for 13 nuclear explosive facilities, and completed new bonding scheme retrofits in eight facilities.
- Completed deluge system valve replacement in three bays.
- Completed combustible loading updates for three weapon programs, and established a “safe haven” loading for one program.
- Completed a multi-year activity to establish a permanent trainer maintenance program that refreshes the trainer components on a regular and scheduled basis.

Regarding management of the Pantex safety basis, for the third year, 20 percent of TSRs were verified for proper implementation, bringing the total to 60 percent, and on track to review all TSRs in a five-year period. In addition to controls, two safety management programs were evaluated, and smart samples of “List B” directives from the contract were reviewed. B&W Pantex efficiently closed 59 of 104 legacy conditions of approval from past Documented Safety Analysis (DSA) reviews and closed 62 percent of the available planned improvements from the DSA. B&W Pantex significantly revised and updated the DSA improvement plan to establish the guidance that will be used to make the DSA documents more useful to operators and analysts.

Weapons Operations

B&W Pantex exceeded planned weapon deliverables by overcoming schedule obstacles including technical issues and availability of critical components. Pantex delivered 109 percent of planned W76-l Life Extension Program deliverables, 120 percent of surveillance deliverables, and dismantled all B53 weapons to eliminate them from the U.S. inventory 15 months ahead of schedule. B&W Pantex successfully met or exceeded product delivery commitments to fully support the FY11 Directive Schedule and Defense Program's "Getting the Job Done" goals. Additionally, Pantex continued to support planning and development activities for the B61 Life Extension Program. Pantex met all FY11 milestones for the project to upgrade the B83 tooling, disassembly, and inspection process. The new process substantially improves safety by eliminating all lifts (about 70) and employing passive design features to ensure the control of electrostatic discharge hazards. Significantly, Pantex maintained its authorization to perform work on all nuclear explosives in the active stockpile. Pantex completed several other specific activities in direct support of stockpile surveillance work, including a multi-year effort to implement a comprehensive weapon trainer maintenance program; a plan for modernization, manufacturing efficiencies, and operational responsiveness that incorporates core process improvements for safety, quality, and security; hazardous material container on-site stewardship; implementing an expanded pit staging to alleviate staging capacity issues in FY14; and coordinated measuring machine operations for the W80, W84, and W87 pits.

Special Nuclear Material Operations

Pantex successfully implemented facility reconfiguration for pit staging to address future pit storage capacity concerns in a timely and cost-effective manner. As a result, NNSA is now afforded the time necessary to efficiently implement the infrastructure and facilities necessary to support pit disassembly and conversion.

Pantex completed laser gas sampling for B61 pit surveillance necessary for the stockpile surveillance mission. Additional pits from current disassembly and inspection cycles were also completed, exceeding quantity targets defined in the Baseline Work Execution Plan. The Pantex Plant completed W76 pit requalification activities to support the W76-1 LEP and began installation of a second laser gas sampling system to support the B83 program. Further, laser gas sampling unit one was approved for all Los Alamos National Laboratory (LANL) pit types. Pantex continued to use redundant capabilities for Weigh and Leak Test Station and Micro Focus X-ray, and High-Resolution X-ray Computed Tomography to support surveillance activities and capability.

In other pit surveillance activities, Pantex accomplished nuclear material container surveillance objectives by shipping pits and radioisotopic thermoelectric generators (RTG) to LANL and shipping RTGs to the Department of Defense using a variety of shipping containers. Those containers were reaccepted using a recently qualified Pantex process to increase efficiency for NNSA. Pit storage sample surveillances were

conducted to meet scheduled commitments, and Pantex completed the surveillance of the shipping containers impacted by the FY10 rainwater event.

As a result of recent issues of downtime for laser gas sampling and the integrated pump and fill station, and conduct-of-operations issues, Pantex conducted a comprehensive self-assessment of conduct-of-operations reviews for all Special Nuclear Material (SNM) Component Requalification Facility operations. B&W Pantex identified several corrective actions for improving operations, including transitioning to specific use procedures, adding additional management and supervisory staff, and increased rigor in training for technicians.

Performance Assurance/HRO

During FY11, Pantex continued to execute the Contractor Assurance System/Line Oversight (CAS/LO) process. All Quarterly CAS Performance Reports were completed and briefed to PXSO. B&W Pantex continues to declare the CAS effective, and PXSO has concluded the process is approved for use. Additionally, the Site Office provided a separate evaluation of performance through routine management assessment reports and the quarterly PXSO management issues report. B&W CAS reports continue to provide metrics and analysis of information to identify "top issues" impacting Pantex. Those issues are routinely evaluated and reviewed by the contactor and PXSO.

As an additional way to evaluate and trend issues, all items in the issues management system were screened against the ISM Guiding Principles and causal factors. The data was binned, trended, and provided to PXSO. Extensive data analysis was performed on a quarterly basis. Pantex continued to execute its commitment to regularly evaluate compliance with the orders covered in DOE Order 410.1 and completed Prime Contract List B assessments. PXSO completed 100 percent of the line oversight scheduled assessments for FY11. As part of the line oversight process, PXSO completed another fifth of TSR implementation evaluations to achieve 3/5ths in three years and tracking to assess implementation of all TSRs within a five-year period. Additionally, PXSO completed an in-depth assessment of the quality of the DSA development process from training through analysis and documentation. Further, PXSO has completed safety system functional assessments for all safety-class and safety-significant systems to provide a performance/vulnerability baseline.

Pantex has also completed all planning for FY12 CAS and LO activities, and has begun execution. The contractor coordinated CAS/LO integration and shadow activities with PXSO in September 2011, and developed the FY12 CAS assessment schedule to support final approval by the end of FY11.

Pantex continued to implement HRO concepts and practices within the Pantex Plant and continued to deliver the improvements to NNSA and outside entities. Pantex implemented a systems mapping process for mission/product lines, in addition to the barrier analysis process developed last year, as a way to identify barriers to prevent catastrophic events that could cripple the ability to execute its mission. This analysis process was successfully completed for two systems in the explosives technology and SNM management areas. This analysis process resulted in the identification of the sub systems and support activities requiring

further mapping and evaluation to ensure reliability. In addition, Pantex partnered with Texas Tech University to develop a safety culture survey that was completed for the Explosives Technology Division. Results were analyzed for actions and the safety culture survey process was refined based on those results. Pantex continued to provide HRO seminars to the plant population and other interested parties. Several outside organizations participated in these seminars including the Norwegian oil exploration and production company, Statoil. As a result of these seminars, Pantex was invited to discuss HRO principles and practical application with Texas Tech University as part of their effort to develop an HRO resource at the university level. Specific HRO-related activities include:

- Published list of Pantex pinnacle and plateau events;
- Published a draft of the Pantex barrier analysis process;
- Initiated HRO collaborative academic efforts with Texas Tech University;
- Published a multi-year HRO implementation plan with PXSO approval, and completed FY11 deliverables; and
- Completed a comprehensive safety culture survey of the Explosives Technology Division at Pantex with Texas Tech University.

Richland Operations Office

The DOE Richland Operations Office (RL) is reaching closer to its plan to reduce the active footprint of the 586 square mile Hanford Site to 75 square miles by the year 2015. This 2015 Vision for Hanford Cleanup will not only reduce the active cleanup footprint, but will also free up resources, reduce risk, and most importantly, demonstrate measureable progress toward cleanup of the site.

Hanford K-Basins

During FY11, RL continued extensive oversight of its contractors, including a significant oversight effort focused on American Recovery and Reinvestment Act (ARRA) work. The Hanford Site Solid Waste Stabilization and Disposition Project completed the ARRA Key Performance Parameter (KPP) 4: 2,000 cubic meters of contact-handled TRU waste disposed. The 100-K Area Closure Project met its last ARRA KPP with the demolition of fifteen 100-K Area facilities (five radiological and ten industrial facilities). To date, the project has completed six radiological and 17 industrial ARRA-funded facility demolitions, and four additional facilities are in the process of being demolished.

DNFSB staff performed a Plutonium Finishing Plant (PFP) review in May 2011, focusing on pre-job briefings, drills, surveillances, walk-downs, operator aids, log keeping, and lockout/tagout processes. The DNFSB staff also performed a Waste Encapsulation and Storage Facility Conduct of Maintenance Review in July 2011, including maintenance, procedure non-compliance, work planning observations, contractor oversight program, and safety basis documentation.

RL is issuing a revised draft environmental assessment under the National Environmental Policy Act of 1969. The revised draft assessment evaluates the potential environmental impacts of closing the Nonradioactive Dangerous Waste Landfill and the Solid Waste Landfill (SWL). SWL received slightly more than one million gallons of sewage effluent and 100,000 gallons of garage wash water in liquid waste trenches during its 21 years of operation.

RL has scheduled external briefings to discuss Tri-Party Agreement changes with the Tribes, the Oregon Department of Energy, and the Hanford Advisory Board., The changes will allow continued progress on shared priorities for cleanup including safe and compliant operations, river corridor cleanup, ground water pump and treat operations, compliance monitoring and reporting, and PFP decommissioning and demolition.

RL hosted the DOE ISM Champions Workshop in Kennewick, Washington, in September 2011. Featured speakers were Jim Whittaker, first American to summit Mt. Everest and former CEO of Recreational Equipment Incorporated; Richard Picciotto, New York Fire Department Battalion Commander and highest ranking firefighter to survive the World Trade Center collapse; and Dr. John Boice, professor at Vanderbilt University School of Medicine. The workshop drew more than 1000 participants throughout the complex.

FY11 Activity Highlights

PFP – Ready for Demolition – Material Balance Area (MBA) Closure

On September 7, 2011, the RL Security and Emergency Services Division Safeguards Representative, along with personnel from the PFP Operations and the Mission Support Alliance, LLC Safeguards organization, conducted a walk-down of MBA-218B at the PFP. This MBA is part of the former plutonium storage vault complex (Building 2736-Z/ZB) within the PFP compound. Subsequent to de-inventorying discrete containers of plutonium from Building 2736-Z/ZB, it still contained small amounts of plutonium in the form of holdup in gloveboxes and filter housings. The plutonium holdup has now been removed, and the building turned over for demolition. A final safeguards walkthrough was necessary as the first step in the process to ensure that no accountable nuclear material remained, inventory records were updated, MBA seals and forms were returned, and final closure paperwork was signed so the MBA could be closed.

K Basins

The containerized sludge staged in the K-West Basin requires retrieval, treatment, and packaging. The goal for the Sludge Treatment Project (STP) is to remove all of the sludge material from the K-West Basin by 2014, at which point the basin will be deactivated and then removed. The STP is divided into two sub-projects:

- The Knock-Out Pot Disposition sub-project: Removal and treatment of engineered container sludge will be completed in two phases. The first phase involves removing the sludge from K-West Basin to T-Plant (located on the Central Plateau) for interim storage and is scheduled for completion by December 2015. The second phase involves sludge treatment and packaging and its subsequent shipping to the appropriate facility for final disposal.

- Engineered Container/Settler Tank sub-project: Knock-out-pot sludge will be processed in the K-West Basin. The coarse sludge will be separated from the finer sludge material, packaged into multi-canister over-packs, and transferred to the Canister Storage Building for interim storage until its disposal with other spent nuclear fuel. Transfer to the Canister Storage Building is expected to be completed by September 2012. The fine knock-out pot sludge material will be processed in the same manner as the engineered container sludge.

100-K West Fuel Storage Basin Material Balance Area (MBA) Re-Categorization

The MBA holds residual special nuclear material in the form of spent nuclear fuel pieces and spent fuel "sludge." Based on results of sludge sampling and characterization efforts, quantitative data has been made available allowing a definitive nuclear material attractiveness and category determination downgrade from a Category III MBA to a Category IV MBA. The downgrade allows for a reduction of physical security and basin operational controls, eliminates a security deviation, and simplifies the next phase of sludge disposition.

Sandia Site Office

Sandia National Laboratories

The DOE/NNSA Sandia Site Office (SSO) is the management office providing oversight of Sandia National Laboratories (SNL). Sandia Corporation, a wholly-owned subsidiary of Lockheed Martin Corporation, manages and operates SNL. SNL designs all non-nuclear components for the nation's nuclear weapons, performs a wide variety of energy research and development projects, and works on assignments that respond to national security threats. The following sections summarize significant interface activities with the DNFSB and staff during FY11.

Sandia National Laboratories Main Campus

SNL operates the following nuclear facilities and activities that are of interest to the DNFSB:

- Annular Core Research Reactor Facility;
- Sandia Pulsed Reactor Facility/Critical Experiments; Gamma Irradiation Facility;
- Manzano Nuclear Facility;
- Auxiliary Hot Cell Facility; and
- Onsite Transportation of Hazard Category 3 Radioactive Materials.

In addition, SNL was granted a temporary exemption from 10 C.F.R. Part 830, Subpart B (Safety Basis Requirements) allowing the processing of transuranic (TRU) waste drums containing Hazard Category 3 quantities of radioactive materials at the SNL Radioactive and Mixed Waste Management Facility. Under this exemption, SNL safely completed repackaging of six drums of TRU waste.

DNFSB Interaction Activities

The Board and its staff provided advice on the assurance of safe and compliant nuclear activities at SNL nuclear facilities through regular correspondence with SSO and SNL staff via conference calls, requests for information/documentation, and formal site visits. Through constant, open interaction with the Board and the staff engineer, SNL and SSO continue to achieve outstanding performance and mission success through the integration of nuclear safety principles into the business processes. SNL and SSO continue to support formal DNFSB recommendations, requests for information/briefings, site visit requests, and the corresponding DOE implementation plans authored in response to formal DNFSB correspondence.

Notable activities/accomplishments resulting from DNFSB and DNFSB staff interactions included:

- Review of the safety, reliability, and operability of the SNL Z Machine in the planning and successful performance of plutonium isentropic compression experiments;
- Review of TRU waste container processing at the Auxiliary Hot Cell Facility;
- Review of the 10 C.F.R. Part 830 exemption request for the processing of TRU waste drums containing Hazard Category 3 quantities of radioactive material at a non-nuclear facility;
- DNFSB Staff observation of validation/verification activities for the processing of TRU waste containers at the Radioactive and Mixed Waste Management Facility;
- Review of the use of engineered storage silos at SNL Technical Area V facilities; and

- DNFSB staff evaluation of the NNSA review of Specific Administrative Controls (SACs) at SNL nuclear facilities. The NNSA review was in support of attempting to close Board Recommendation 2002-03, *Requirements for the Design, Implementation, and Maintenance of Administrative Controls.*

The following DNFSB activities are in process at SNL/SSO:

- Review of the Documented Safety Analysis (DSA) for the Annular Core Research Reactor;
- Review of Work Planning and Control at SNL Technical Area V Facilities; and
- Review of Implementation of DOE-NA-STD-3016-2006, *Hazard Analysis Reports for Nuclear Explosive Operations*.

The DNFSB staff has completed six site visits. These visits focused on processing of TRU waste, a tour of the Radioactive and Mixed Waste Management Facility, a review of the DSA for the Annular Core Research Reactor, work planning and control, Line Oversight of Contractor Assurance Systems, and evaluation of the NNSA review of SACs at SNL nuclear facilities.

Savannah River Operations Office

The Savannah River Site (SRS) performs activities for the DOE Office of Environmental Management (EM) and the National Nuclear Security Administration (NNSA). Activities performed by the site contractors – Savannah River Nuclear Solutions, LLC (SRNS), Savannah River Remediation, LLC (SRR), and Parsons Infrastructure and Technology Group, Inc. (Parsons) – in support of EM are overseen by the DOE Savannah River Operations Office (DOE-SR) and include nuclear materials stewardship and environmental stewardship. Major activities and accomplishments in FY11 for the EM specific facilities/projects at SRS are summarized below.

H - Area at the Savannah River Site

Safety Programs

A DNFSB letter dated July 16, 2010, expressed concerns that certain hazard controls at the SRS could be modified or eliminated by the contractor without prior DOE approval, and thus, degrade the safety posture. In response, SRNS and SRR reviewed the Consolidated Hazard Analysis (CHA) for each facility and selected controls not already under DOE purview, including those identified as "Defense-in-Depth/Important-to-

Safety." Tables with these controls were put in the Documented Safety Analyses (DSAs) during annual updates and other scheduled changes to the DSAs. These controls are also monitored in the Unreviewed Safety Question process. The DNFSB visited SRS to discuss SRS progress on October 21, 2010, including discussions of how CHA controls that are not Safety Significant/Safety Class are identified and protected, how nuclear criticality safety program controls are evaluated for elevation to DSA and Technical Safety Requirements (TSRs), what evaluations have led to control changes, and ongoing changes to major site manuals E7 Engineering Manual, 11Q Facility Safety Manual, and SCD-11 Consolidated Hazard Analysis Manual.

A teleconference was held on October 20, 2011 with the DNFSB to discuss meteorological data and how it is used in accident consequence analyses HSS Safety Bulletin 2011-02, *Accident Analysis Parameter Update*, alerted the DOE complex to a potentially under-conservative method (deposition velocity in the dose consequence software program MACCS2). In addition, the DNFSB wrote a letter to NNSA asking about some related issues with the Tritium Facilities. All the issues are being rolled up into a resolution plan to be developed by SRNS in coordination with SRR and Parsons. DOE-SR also wrote a white paper and sent it to HSS asking them to consider modifying the standards and guides and other related documents to resolve the issues involving atmospheric dispersion modeling.

DOE-SR responded to the DOE Headquarters request related to HSS Safety Bulletin 2011-01, *Events Beyond Design Safety Basis Analysis,* on May 10, 2011. In the response to the EM Office of the Deputy Assistant Secretary for Safety and Security Program (EM-20), the DOE-SR Nuclear Safety Council (NSC) committed to lead an assessment of the site-wide emergency preparedness plans and procedures, identify any weaknesses, and develop a corrective action plan, if necessary. The first phase of data collection occurred on June 2, 2011, when the DOE-SR NSC was provided an initial briefing on the subject by both SRNS and SRR contractors, including nuclear safety and emergency preparedness staff. The topics focused on SRNS and SRR Hazard Category 2 nuclear facilities, including design basis accident consequences, emergency/abnormal operating procedures, infrastructure response support, on-site and off-site assistance protocols, and interfaces with other major site contractors, such as Parsons Salt Waste Processing Facility (SWPF), NNSA Tritium Facilities, and the Mixed Oxide Fuel Fabrication Facility.

The next phase of the assessment will be for the DOE-SR NSC to review the local SRNS emergency response procedures and manuals and other collected data and create an assessment plan. The DOE-SR NSC is working with the DOE Office of Safeguards, Security and Emergency Services, which oversees the emergency preparedness programs at SRS, to coordinate the assessment. The workshop focused on evaluation of beyond design basis events, natural phenomena hazards, and emergency management. The DOE-SR assessment is planned for calendar year 2012.

Emergency Preparedness

In response to HSS Safety Bulletin 2011-01, preparations for the multiple facility drill are in progress relative to training needs, procedure modifications, tabletop drills, and ultimately the site drill. Site Emergency

Management and representatives from the facility training programs are working together to provide the necessary training for a larger-scale drill. The annual Site Training Drill is scheduled for March 2012 and tentatively includes HB-Line, H-Canyon, Tritium, and H-Tank Farm. H-Material Disposition is conducting its second phase of training, which integrates multiple facility inputs into the scenario during tabletop training drills. Tritium and H-Tank Farm personnel are actively participating in these tabletop drills.

The Tritium Facility has conducted seismic-related drills in which the facility emergency response organization is severely stressed. H-Tank Farm has drilled their emergency mobile venting capability and their capability to evacuate the facility. Tabletop drills to train the Facility Emergency Coordinator, Area Emergency Coordinator, and Emergency Duty Officers on the means for transmitting/assimilating information, establishing priorities, and delegating responsibilities during catastrophic events were conducted in November 2011.

Savannah River National Laboratory

In September 2011, DNFSB staff members conducted a fire protection review for the SRS A-Area in which the Savannah River National Laboratory (SRNL) participated. The DNFSB areas of interest for this review were the A-Area fire water supply systems. Tours were conducted for the staff, followed by discussions of the various components and the overall condition of the fire water supply pumps and tank. SRNL continues to maintain close communication with the DNFSB on all issues within their purview.

Recommendation 2004-2 (Active Confinement Systems) Accomplishments

In 2011, SRNL made progress toward addressing the highest priority gaps, as noted below:

- B/C OGE Standby Fan Autostart (J-MT-A-00005) addresses DNFSB 2004-2 Gap 21. Baseline Change Proposal (BCP) CR11MO149 was approved to establish the project baseline. A constructability review of conceptual design and a safety basis review of implementation strategy were conducted. Final design was issued for review.

- B/C CHEX HEPA Bank Blanks (LF1096) addresses DNFSB 2004-2 Gaps 1 and 5. BCP CR11MO149 was approved to establish the project baseline. SRNL developed the model design and work package for installing blanks and the TSR mode change process to integrate TSR LCO 3.2.2, Administrative Control 5.7.2.5 and Design Feature 6.7 requirements. One set of blanks was installed.

- E-Wing Ventilation Project (Y646) addresses DNFSB 2004-2 Gaps 35, 36, 37, 38, 39, 40 and 42. BCP CR11MO149 was approved to establish the project baseline, and Gap 38 was added to the scope of the project. Engineered material is maintained in storage. SRNL performed a constructability and maintainability review of the preliminary design and a Safety Basis review of the implementation strategy. The final design was approved, and the balance of final design was issued for review.

- E-Wing Supply and Exhaust Interlocks (J-MT-A-00006) addresses DNFSB 2004-2 Gaps 26, 28, 29, 30, 31 and 32. BCP CR11MO149 was approved to establish the project baseline. A Safety Basis review of the implementation strategy was conducted, and the final design was issued for review.

Nuclear Materials Storage and Disposition

The SRS participated in a DNFSB public hearing conducted on June 16, 2011. Questions were posed by DNFSB members to DOE-SR, DOE Headquarters, NNSA, and SRNS panel members regarding the storage and disposition of nuclear materials in the H-Area, K-Area, and L-Area facilities. The DNFSB was particularly interested in DOE's current and future mission plans for H-Canyon, including DOE's interpretation of "High State of Readiness," operator proficiency, equipment reliability trends, and staffing levels. The DNFSB was also interested in plutonium and spent fuel storage and disposition plans. Key areas of interest and activities included:

F-Area

- DNFSB staff members were hosted in September to address Safety Basis documentation for the 235-F facility. Tours were conducted for the staff, followed by discussions of future plans for de-inventory and deactivation of the facility. DNFSB staff raised several questions concerning the SRNS unapproved Basis for Interim Operation, along with the facility combustible loading. DOE-SR is actively working to resolve both issues through follow-up discussions.
- Planning activities associated with 235-F facility risk reduction continue. A new Basis for Interim Operation was developed and is in the approval process.

H-Area

- H-Canyon maintained the ability to receive and process spent (used) nuclear fuel (UNF) from L-Area in case DOE makes the decision to process UNF and/or determines the need to disposition at-risk fuel.

K-Area

- DNFSB staff members were hosted in September to address fire protection for the K-Area Complex. Tours were conducted for the staff, followed by discussions of the condition of the fire water supply system. No significant issues were raised.

L-Area

- UNF continued to be safely received and stored in the L-Area Basin to await disposition.
- SRS has maintained the ability to ship UNF from L-Area to H-Area in case DOE makes the decision to process UNF and/or determines the need to disposition at-risk fuel.

Liquid Waste Disposition

The liquid waste disposition program made significant progress in FY11 in safely treating and dispositioning high-level wastes and reducing risk. The program has maintained close communications with the DNFSB, including participation in the June 16th public meeting and monthly conference calls to keep abreast of and address critical DNFSB areas of interest. These areas of interest include:

- Recommendation 2001-1, *High-Level Waste Management at the Savannah River Site,* associated with tank space management;
- Recovery of Tank 48;
- The performance and reliability of, and enhancements made to, the Saltstone Facility (Saltstone);
- The Defense Waste Processing Facility (DWPF);
- The Actinide Removal Process/Modular Caustic Side Solvent Extraction Unit (ARP/MCU); and
- Progress in tank closure activities.

Recommendation 2001-1 and Tank Space Management

Numerous commitments regarding Recommendation 2001-1 were developed and completed. These are associated with managing the margin of available tank space in the SRS tank farms to ensure safe and efficient tank waste disposition. The DOE Implementation Plan for Recommendation 2001-1 (2001-1 IP) matured as the SRS liquid waste system has develop and as liquid waste disposition has progressed. In 2011, DOE completed the last three commitments in the 2001-1 IP, Rev 6:

- Commitment 3.9.1 "Complete 35 percent Design of Tank 48 Treatment Project," completed January 2011;
- Commitment 3.13.1 "Award Effluent Treatment Project and Saltstone Procurements," completed January 2011;
- Commitment 3. 13.2 "Complete Modular Caustic Side Solvent Extraction Unit (MCU) Decontaminated Salt Solution Tie-in Design," completed October 2011.

The tank space management effort recovered approximately 2.5 million gallons of space in FY11 through operation of three evaporator systems, thereby allowing H-Canyon to meet its objectives, tank closure activities to remain on schedule, DWPF to maintain canister production, and sludge batch preparations to proceed as scheduled. The DNFSB closed Recommendation 2001-1 in December 2011.

Tank 48

Tank 48, a new-style waste tank at SRS, contains legacy organics from the in-tank precipitation process. DOE has embarked on a project employing a fluidized bed steam reforming (FBSR) technology to disposition this waste and recover Tank 48 to support ongoing liquid waste disposition activities. In late FY11, the Tank 48 FBSR project was suspended upon identification of a promising, cost-effective new technology for treating the waste, and in recognition of an improved outlook on high-level waste tank space needs. The alternate technology selection process has been briefed to the DNFSB, and the staff has begun following the maturation process.

Saltstone Facility

One of the key areas of interest to the DNFSB is the reliability of Saltstone Facility and the improvements necessary to meet the liquid waste system plan requirements. Saltstone is the disposal facility for low-level waste in a grouted waste form. Since 2008, Saltstone has processed approximately 4.7 million gallons of salt solution. Saltstone processed approximately 1.5 million gallons of salt waste from Tank 50 over the past 12 months, with a monthly maximum of more than 500,000 gallons processed during June 2011. Saltstone has taken measures to address and repeatedly demonstrate that it will meet all expectations. Actions are targeted at planning and executing equipment upgrades, ensuring facility reliability beyond the current capability, and then implementing staffing changes and requisite operational shift schedules to support availability consistent with the overall liquid waste flow sheet. In support of continuity of Saltstone operations, design and building of Saltstone Disposal Unit (SDU) 2 was field completed. Balance-of-plant activities are underway, and SDUs 3 and 5 are under construction.

Defense Waste Processing Facility

The DWPF has been the focus of DNFSB interest, particularly regarding its performance with enhancements e.g., bubblers. In FY11, DWPF produced 267 canisters, with a monthly maximum of 35 canisters in August 2011 and more than 30 canisters produced in February, July, and September of 2011. Another key facet of DWPF improvements includes the reduction of the DWPF recycle stream (2001-1 IP commitment) by 180,000 gallons in FY11. The DWPF recycle stream continues to be managed with beneficial reuse and water management initiatives in the chemical process to minimize the tank space impacts, a key focus of the DNFSB.

Actinide Removal Process/Modular Caustic Side Extraction Unit

The DNFSB continues to show a great deal of interest in the performance and plans for the continued operation of ARP/MCU. ARP/MCU started up in 2008 and has met two of the commitments in the 2001-1 IP. More than two million gallons of salt solution have been processed to date since initiating radiological operations in April 2008. Decontamination factors of the salt solution have averaged well above the design basis of 12. The ARP/MCU continues to provide critical information to the SWPF while meeting the needs of the system plan. The continued operations have included plans to upgrade process equipment, the availability of spare parts, and adjustments to the preventive maintenance program through increased performance monitoring. In addition, research and development activities have led to the development of a promising next-generation solvent for caustic side solvent extraction, which improves on the technology in use at ARP/MCU, that is to be used at the future SWPF.

Tank Closure

The DNFSB has shown a great deal of interest in general progress in closure of the old-style tanks at SRS and the ongoing development of the enhanced chemical cleaning (ECC) process. The F-Tank Farm made significant progress toward completion of Federal Facilities Agreement milestones for waste removal and tank closure. Bulk waste removal from three more old-style tanks is complete, and isolation of Tanks 5 and 6 is complete. The preliminary design for ECC Unit 1 and conceptual design for ECC Unit 2 have been completed. In addition to the general closure of the old-style tanks, the DNFSB expressed great interest in the leak response plan and beyond-design basis event responses. These specific response plans were briefed to the DNFSB during the 16 June 2011 public meeting in Augusta, GA and via monthly communications and numerous technical reports.

Salt Waste Processing Facility

Construction of the SWPF capital project is nearly 50 percent complete. The remaining design activities focus primarily on digital control system (DCS) programming, finalization of the DSA, and Title III support. The SWPF project and the DNFSB staff developed and documented a mutually agreed-to list of remaining open items with associated closure activities in early 2010. During the past year, DNFSB staff has continued to follow the status of these open items and the project's progress in completing the identified closure activities. Most of the open items were closed in 2011, significant among those being the design implementation of DOE-STD-1066, vessel heat-up calculations, calculations of time to combined lower flammability limit, and air dilution flow rate calculations. Remaining areas of DNFSB staff interest include finalization of vessel mixing protocols and completion of DCS design and programming. The SWPF project continues to work constructively to complete the closure activities identified for these remaining areas of DNFSB staff interest and is targeting resolution of all open items in 2012.

Savannah River Site Office

The Savannah River Site Office oversees tritium programs-related NNSA activities at SRS. These activities include nuclear weapons stockpile stewardship and operation of the Tritium Facilities. NNSA activities at SRS are performed by the site contractor, SRNS. The activities and accomplishments in FY11 associated with the NNSA tritium programs included:

- Tritium work was accomplished safely in FY11, as evidenced by the Total Recordable Case rate of zero for both Operations and Construction. This accomplishment is especially noteworthy because it was achieved despite the continual, year-long distraction of a site workforce restructuring initiative and several major process outages, some involving extensive open-glovebox maintenance.

- The SRS Tritium Facilities exceeded the FY11 requirements in support of the Stockpile Stewardship Program. Gas transfer systems were successfully function-tested, and the resulting data were provided via formal reports to the design agencies in support of the annual stockpile certification.

- The Tritium Extraction Facility (TEF) completed extraction of the Watts Bar Cycle 9B Tritium-Producing Burnable Absorption Rods ahead of schedule and without incident. When not in extraction mode, SRNS successfully transitioned to "Responsive Operations" – a cost-effective strategy that involves moving cross-trained personnel to work in other facilities.

- Many accomplishments advanced the strategic Tritium Responsive Infrastructure Modifications initiative, which is relocating and right-sizing the remaining functions from 1950s- and 60s-vintage process facilities into the more modern facilities. For example, mechanical completion was achieved for the project for relocating the helium-3 recovery process to the H-Area New Manufacturing (HANM) facility and two other projects that enable HANM-centric control of all tritium operations (an expansion of the successful responsive operations strategy). These were the TEF/HANM DCS Tie-in project, which ties together the distributed control systems of the two facilities, and the H-Area Old Manufacturing (HAOM) Remote Alarm Monitoring project, which established the capability to monitor HAOM alarms in the HANM Central Control Room (CCR). Command and control was then transferred from the HAOM CCR (which had been continuously manned 24/7 since 1958) to the HANM CCR.

- Annual updates of the TEF and Tritium Facility (TF) safety bases were submitted to NNSA and were in the approval process at the end of FY11. The TEF safety basis was upgraded based on a revised CHA and includes several new TSR-level controls: Worker Protection System Crossover Alarm (a Limiting Condition of Operation, or LCO); Truck Bay Crane (LCO); Explosion Prevention (a Specific Administrative Control, or SAC); Transfer Line Integrity Program); Critical Lift and Traffic Control Programs (an Administrative Control); and the cask trolley guide plate (design feature). The updated TF safety basis includes the scope of the project that relocates the helium-3 recovery process to the HANM facility.

- Tritium Emergency Preparedness personnel initiated integrated natural phenomenon hazard drills, thus becoming the recognized site leader. This major effort involved training and drills of every shift for ten weeks.

- Progress was made on implementation of Governance Reform. Highlights included: 1) setting up a Joint Operating Requirements Review Board; 2) conducting a contractor self-assessment addressing the NNSA Transformational Governance Oversight Line Oversight of Contractor Assurance Systems Affirmation Criteria in NNSA Policy Letter 21; and 3) delivering several improvements to the Contractor Assurance System to transform it into a more holistic Management Assurance System.

- An extensive purge stripper/Z bed recovery outage in HANM was performed to upgrade heat trace to improve system performance, incorporate automatic process controls to improve throughput and reduce operator workload, and replace end-of-life components. Work during the outage included replacing existing stainless steel piping with Hastelloy™ piping to alleviate stress corrosion cracking issues that result from high temperature/high moisture effects, and rerouting pipe to eliminate “dead-legs” where water could accumulate and cause stress corrosion cracking.

- On August 19, 2011, the NNSA Administrator received a DNFSB letter regarding a review of the SRS Tritium Facilities Safety Basis conducted in the summer of 2010. The letter requested a report and briefing within 90 days to describe NNSA's plans to address issues and outline corrective actions for deficiencies identified in the attached trip report. A response addressing the issues from the letter was transmitted to DNFSB on November 14, 2011. In addition, NNSA has asked SRNS to develop new interim controls to be used until the completion of the entire plan. Work is underway to credit existing passive and engineered features and to lower the facility Material at Risk limits.

Y-12 Site Office

During FY11, the Y-12 Site Office (YSO) and the site contractor, Babcock & Wilcox Technical Services Y-12, LLC, (B&W Y-12), continued work to improve the overall safety and operation of the Y-12 National Security Complex (Y-12) by focusing on: (a) implementation of the site strategic plan, (b) close oversight and line management attention to ensure safe operation of several aging nuclear weapon production facilities, and (c) continued improvement of nuclear safety programs and conduct of operations.

Y-12 National Security Complex

Strategic Plan for Aging Facility Continued Operation or Replacement

9212 Enriched Uranium Complex

In 2005, the DNFSB wrote two letters to the National Nuclear Security Administration (NNSA) noting the urgency of constructing a Uranium Processing Facility (UPF) to replace the aging 9212 Enriched Uranium Complex (9212). NNSA's long-term plan for missions involving enriched uranium (EU) is to replace the operations in existing facilities with a new UPF. However, until the new UPF is constructed and operational,

EU operations will depend on continued operations at 9212, portions of which are more than 60 years old, are costly to keep operating, and do not meet current design requirements for Hazard Category 2 nuclear facilities.

In response to the DNFSB letters in 2006, a joint team consisting of personnel from B&W Y-12 and the YSO conducted a Facility Risk Review (FRR) of 9212 to identify the actions necessary to continue its safe operation during a 15-year period until the UPF is built and transitioned to operations. The 9212 FRR from 2006 resulted in an extensive list of practical facility modifications that were considered prudent and necessary to ensure safe operations, as well as recommendations to refurbish and upgrade certain facility systems, to increase resources for maintenance support and critical spares, and to reduce the material at risk (MAR) within the facility. NNSA established and funded a Nuclear Facilities Risk Reduction (NFRR) project to address the system refurbishments and upgrades identified in the 9212 FRR recommendations. Significant progress has been and continues to be made on the NFRR project. Upgrades of the steam, ventilation, and electrical systems in 9212 are underway, and completion is expected in the next two years. The MAR in 9212 continues to be reduced, and additional maintenance resources are being provided.

However, recent changes in the UPF project approach could impact the schedule for moving nuclear processes from 9212 to UPF. As directed in the February 4, 2011 UPF Project Direction from NNSA Defense Programs, the current UPF project goal is to complete the UPF building construction by the end of 2020 and achieve initial functionality in UPF for 9212 capabilities by the end of 2021. In a September 10, 2010 report to Congress the DNFSB expressed serious concerns about whether 9212 can continue to operate until 2021. The DNFSB wrote, “DOE has taken steps to reduce the quantities of radioactive material in these facilities and has taken other steps to reduce the risks to the public and workers. However, these are stop-gap measures. The DNFSB is especially concerned as schedules for replacement facilities UPF and the CMRR Facility [at Los Alamos] continue to slip, requiring the 9212 Complex to operate until at least 2021 and CMRR to operate until some future date, yet to be defined.”

In a January 27, 2011 letter, the YSO site manager directed that a joint B&W Y-12, YSO, and NNSA Headquarters team conduct a follow-on evaluation using recent operating data, evaluation of refurbishments underway, and operating experience to validate and update as appropriate the 9212 FRR from 2006 and its conclusions. The 9212 FRR follow-on evaluation reached the following conclusions:

- The 9212 FRR recommendations and conclusions from 2006 remain valid and appropriate, and they are being effectively executed to support initial functionality for 9212 capabilities in UPF by the end of 2021.
- Effective management and oversight of the 9212 facility are in place, and personnel are effectively using a suite of tools (including performance indicators, reliability analysis, field inspections, and operations plans) for management and oversight of the facility.
- By 2021, most 9212 systems and processes would be operating significantly beyond their design life, and it is unlikely that reliable, safe EU production operations can be maintained beyond 2021 without substantial refurbishments that would be very costly.

- To ensure continued safe EU production beyond 2021, it is imperative that UPF construction be completed by 2020 and initial functionality for EU operations in UPF by 2021.

The results of the 9212 FRR update were briefed to the DNFSB, which agreed with the recommendations and conclusions.

Storing Non-Material Access Area Material in Building 9720-5

In a February 4, 2011 letter, the DNFSB expressed concerns about the proposed change to the safety basis for Building 9720-5 at Y-12, which would allow Building 9720-5 to store non-Material Access Area (MAA) material. Y-12 supported NNSA's response to the request by providing: (1) a summary of the Y-12 evaluation and selection process used to determine the Y-12 consolidated non-MAA uranium storage site; (2) a Y-12 report that addresses the rationale for selecting Building 9720-5 for non-MAA material storage; (3) identification of the type and amount of material to be stored; (4) identification of current nuclear material storage locations; (5) a discussion of specific disposition paths for excess non-MAA materials; (6) discussion of alternatives for the long-term storage of non-MAA material; and (7) an updated ventilation system evaluation report.

Y-12 used a qualitative evaluation and selection process that considered safety, security, and mission capability to identify the appropriate Y-12 warehouse for consolidated non-MAA uranium materials. The selection of Building 9720-5 was the best choice overall from a safety, security, and mission capability perspective. Various material forms of uranium, including depleted uranium (DU), will be consolidated into Building 9720-5 at the end of FY12. Some of the DU is currently stored in wooden crates. Y-12 plans to initiate the over-pack of the wooden crates beginning in FY12 and complete it within four years. While the ultimate solution to address non-MAA storage at Y-12 is to consolidate all non-MAA materials into a new warehouse facility (currently projected in the 2025-2028 timeframe), the NNSA considers the Y-12 proposal to use Building 9720-5 in the interim to be a prudent course of action.

The DNFSB was briefed during a site visit on May 17-18, 2011 and agreed with the proposed path forward, with the provision that non-MAA storage be re-evaluated in five years.

Uranium Processing Facility Project

As a result of re-planning direction received in February 2011, the UPF project developed a revised critical decision (CD) strategy and split the original CD-2/3 package into a CD-2/3A (site readiness) package and a CD-2/3B (site preparation and long-lead procurement) package. The CD-2/3A package was reviewed by a Bechtel National, Inc. review team in August 2011. The review found it to be of high quality and on track for submittal to YSO in September 2011.

Recent DNFSB staff discussions with staff from both the Los Alamos National Laboratory (LANL) Chemistry and Metallurgy Research Building Replacement (CMRR) project and the UPF project have emphasized several remaining concerns about DOE's response to the DNFSB letter, dated July 29, 2011, regarding the use and

validation of System for Analysis of Soil-Structure Interaction (SASSI). Specifically for UPF and CMRR, interactions between DNFSB and staff members for each project have focused on resolving two issues associated with the SASSI computer program:

- Additional verification and validation problem scenarios are needed for SASSI to better represent the geotechnical complexity of the LANL and Y-12 sites and the dimensions of the CMRR Nuclear Facility (CMRR-NF) and the UPF.
- A root cause analysis is needed to determine how anomalous results are produced when using the subtraction method, based on a thorough understanding of the numerical algorithm and the theoretical basis of the SASSI code. Analysis of the second issue should specifically explain why the modified subtraction method resolves the anomalous results from the subtraction method.

The integrated action plan for the two projects has been coordinated with the NNSA Office of the Assistant Deputy Administrator for Infrastructure and Construction (NA-16); the NNSA Assistant Deputy Administrator for Nuclear Safety, Nuclear Operations and Governance Reform (NA-17); the Chief of Defense Nuclear Safety; and the Chief of Nuclear Safety. Both projects recognize the issues associated with SASSI and have analyzed SASSI using models representative of the CMRR-NF and UPF structures. This analysis indicates that SASSI is applicable for the structure and soil interaction component of seismic design for facilities like CMRR-NF and UPF. The purpose of resolving the two items listed above is to reinforce the validity of the seismic design and to validate that SASSI calculates the structural and soil interaction for these two projects. Given that each project's current seismic design is conservative and was developed with other validated analysis tools, it is appropriate for this resolution to occur in parallel with ongoing design efforts.

Engineering and Nuclear Safety

Criticality Safety Program Improvements

The Y-12 site continued working the Nuclear Criticality Safety (NCS) Strategic Vision and Improvement Plan, which was briefed to the DNFSB in October 2010. The plan defines the strategic direction and objectives to reach the vision of being recognized as Best in the Complex Criticality Safety Program. The NCS program made several improvements targeted on implementation of requirements in the field. These included:

- B&W Y-12's completion of three additional CSE upgrades in addition to the six Criticality Safety Evaluation (CSE) Upgrades identified in the plan for accomplishment in FY11.
- Improved implementation of CSEs through coordination and communication with the newly created Senior Criticality Officer position.
- The convening of a small group of knowledgeable personnel to recommend improvements and requirements for floor time, and revised the floor-time metric to reflect these new expectations.

- An evaluation of the effectiveness of small group seminars to expose any issues, communicate expectations to floor personnel, and improve training of floor personnel. A survey of participants (including Cognizant Secretarial Offices and production supervisors) indicates that the small group seminars are functioning as intended.
- A review of standards to recommend simplification of storage postings, and revision of the posting procedure to clarify and modify requirements in line with this recommendation. The process should be coordinated with the production organization to establish the priority of NCS work to be accomplished.
- Completion of benchmarking with LANL and Lawrence Livermore National Laboratory.
- Development of a strategy for using newly designed containers in anticipation of UPF operations. NCS design criteria for simplified container loading requirements and simplified storage requirements have been provided to the UPF design team. The NCS organization has established a communication path with the EU Transition Manager.

Facility Safety Basis

Facility safety basis annual updates were submitted for 11 nuclear facilities. and many were approved with either no or minor comments from YSO. However, consistently producing high-quality submittals was a concern throughout the year. Schedule adherence was much improved in FY11; most annual updates were submitted ahead of schedule, and only one was submitted late. Semi-annual program assessments of Unreviewed Safety Question (USQ) evaluations showed that these are consistently high-quality products. The Expert USQ Determination process, which was approved for use late in FY10, was implemented across Y-12 in FY11. This new process is intended to achieve cost savings by streamlining the evaluation of simple changes when it is apparent to an expert that no USQ exists. A mid-year assessment by YSO determined that the process was being used correctly and yielding correct results, but increased utilization appears to be appropriate. This process, implemented first at Y-12, is the model that other Nuclear Weapons Complex sites are following.

Y-12 Response to DNFSB Letter on Toxicological Consequences

On April 20, 2011, the DNFSB issued a letter with a 30-day reporting requirement for a report and briefing addressing the YSO effort to reevaluate the classification of controls at the Highly Enriched Uranium Material Facility (HEUMF). During the DNFSB visit on May 17-18, a briefing addressing those issues was provided to the DNFSB. The toxicological issue was resolved, and agreement was reached that YSO would update and engage staff as the safety designation of the HEUMF Secondary Confinement System was reevaluated during the annual update of the HEUMF Documented Safety Analysis (DSA) in October 2011.

B&W Y-12 will evaluate the effects of toxicological and chemical hazards in safety basis documents. The evaluation will meet the requirements of 10 C.F.R. Part 830 and DOE-STD-3009 or DOE-STD-1189. In NNSA draft Technical Bulletin 2011-1, this issue is included in a question-and answer format. The answer given is that "hazardous materials as defined in the standard (DOE-STD-3009) including material rated with a Health

Hazard rating of 3 or 4 in NFPA [National Fire Protection Association] 704 must be evaluated in a DSA that is written to comply with DOE-STD-3009."

B&W Y-12 will also analyze the potential for releases or effects of these material releases using the hazard analysis and, as appropriate, the accident analysis. The Safety Design Strategy for the UPF will be revised. The contractor will analyze the toxicological consequences in the UPF Preliminary Safety Design Report and the Preliminary DSA. Also, B&W Y-12 will revise the HEUMF DSA to analyze toxicological consequences in a manner similar to that used for the UPF. YSO will review and approve both analyses.

Y-12 plans to provide the DNFSB with information as the re-evaluation progresses.

Conduct of Operations

The key to establishing a safety culture with nuclear safety as an overriding priority is a resilient and reliable Conduct of Operations (CONOPS) program. In support of that goal, the B&W Y-12 Production Division's CONOPS focus is continuous improvement while reinforcing the basic fundamentals that result in safe and efficient nuclear operations. Recent assessments, observations, and issues have indicated that some of Y-12's basic CONOPS fundamentals require renewed attention to ensure that continuous improvement is sustained. In response to the DNFSB letter of August 25, 2011 noting these concerns, the Production Division, along with Nuclear Safety, and Engineering, developed a CONOPS Improvement Plan, which was issued in September and is being actively addressed. The improvement plan actions focus on: (1) increasing line management involvement and oversight of operations on the floor; (2) providing less-complicated work processes that plan and control work safely and efficiently (procedures); (3) improving personnel understanding and acceptance of their accountability and responsibility at the line manager, supervisor, and worker level; (4) instituting focused practical operational training; and (5) shifting to a more performance-based assessment program.

The CONOPS Improvement Plan actions build on improvements that were already underway and address concerns expressed in the DNFSB letter. To date, actions have been completed to put more experienced nuclear operation managers in place in key management positions, and (following the example of the Vice President for Production) line managers are spending more time on the floor observing operations and reinforcing performance standards. A pilot for more practical CONOPS training is underway, and a team consisting of subject matter experts, workers, and supervisors is evaluating procedure development process changes that will improve technical procedure content, safety, and efficiency. It is expected that the B&W Y-12 CONOPS Improvement Plan will become the basis of the DNFSB's requested NNSA assessment and six-month reporting requirement on the effectiveness of B&W Y-12 actions to improve CONOPS performance at the site.

List of Acronyms an Abbreviations

9212	Y-12 9212 Enriched Uranium Complex
AMWTP	Advanced Mixed Waste Treatment Project
ANL	Argonne National Laboratory
ARP	Accelerated Retrieval Project
ARRA	American Recovery and Reinvestment Act
BBA	Box Breakdown Area
BBS	Behavior Based Safety
BCP	Baseline Change Proposal
BNI	Bechtel National, Inc.
B&W Y-12	Babcock & Wilcox Technical Services Y-12, LLC
CAS	Contractor Assurance System
CCP	Central Characterization Project
CCR	Central Control Room
CD	Critical Decision
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH	Contact-Handled
CHA	Consolidated Hazard Analysis
CMR	Chemistry and Metallurgy Research
CMRR	Chemistry and Metallurgy Research Replacement
CMRR-NF	Chemistry and Metallurgy Research Replacement Nuclear Facility
CONOPS	Conduct of Operations
CRA	Contractor Readiness Assessment
CRAD	Criteria and Review Approach Document
CSE	Criticality Safety Evaluation
CWC	Central Waste Complex
CWI	CH2M-WG Idaho
DAF	Device Assembly Facility
DCS	Digital Control System
D&D	Deactivation and Decommissioning
DNFSB	Defense Nuclear Facilities Safety Board

DOE	Department of Energy
DOE-SR	DOE Savannah River Operations Office
DSA	Documented Safety Analysis
DST	Double-Shell Tank
DU	Depleted Uranium
DV	Deposition Velocity
DWPF	Defense Waste Processing Facility
ECC	Enhanced Chemical Cleaning
EM	Office of Environmental Management
EU	Enriched Uranium
FBSR	Fluidized Bed Steam Reforming
FRR	Facility Risk Review
FY	Fiscal Year
HANM	H-Area New Manufacturing
HAOM	H-Area Old Manufacturing
HEUMF	Highly Enriched Uranium Material Facility
HLW	High-Level Waste
HMI	Human Machine Interface
HPAV	Hydrogen in Pipes and Ancillary Vessels
HRO	Highly Reliable Organization
HSS	Office of Health, Safety and Security
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
IP	Implementation Plan
IRT	Independent Review Team
ISA	Instrumentation Society of America
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
ISO	International Organization for Standardization
ISSA	Inherently Safe Subcritical Assembly
ITG	Idaho Treatment Group, LLC
IWTU	Integrated Waste Treatment Unit
JASPER	Joint Actinide Shock Physics Experimental Research

JCDPI	Justification for Continued Design, Procurement, and Installation
KPP	Key Performance Parameter
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LASO	Los Alamos Site Office
LAW	Low-Activity Waste
LBNL	Lawrence Berkeley National Laboratory
LCO	Limiting Condition of Operation
LLNL	Lawrence Livermore National Laboratory
LLNS	Lawrence Livermore National Security, LLC
LLW	Low-Level Waste
LO	Line Oversight
LOCAS	Line Oversight Contractor Assurance System
LSO	Livermore Site Office
MAA	Material Access Area
MAR	Material at Risk
MARS	Mobile Arm Retrieval System
MBA	Material Balance Area
MCU	Modular Caustic Side Solvent Extraction Unit
MFC	Materials and Fuels Complex
MLLW	Mixed Low-Level Waste
NCERC	National Criticality Experiments Research Center
NCS	Nuclear Criticality Safety
NFRR	Nuclear Facilities Risk Reduction
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NSC	Nuclear Safety Council
NSE	Nuclear Security Enterprise
NSO	Nevada Site Office
NSTec	National Security Technologies, LLC
NRD	Nuclear Radiation Development, LLC
ORNL	Oak Ridge National Laboratory
ORP	Office of River Protection
PDSA	Preliminary Documented Safety Analysis

PF-4	Plutonium Facility
PFP	Plutonium Finishing Plant
PNNL	Pacific Northwest National Laboratory
PNSO	Pacific Northwest Site Office
PRT	Peer Review Team
PT	Pretreatment
PXSO	Pantex Site Office
QPRT	QRA Peer Review Team
QRA	Quantitative Risk Analysis
RA	Readiness Assessment
RH	Remote-Handled
RL	Richland Operations Office
RPL	Radiochemical Processing Laboratory
RTG	Radioisotopic Thermoelectric Generator
RWMC	Radioactive Waste Management Complex
SAC	Specific Administrative Control
SASSI	System for Analysis of Soil-Structure Interaction
SAU	Stand-Alone Unit
SBWTP	Sodium-Bearing Waste Treatment Project
SC	Safety Class
SDU	Saltstone Disposal Unit
SNF	Spent Nuclear Fuel
SNL	Sandia National Laboratories
SNM	Special Nuclear Material
SOAR	Safety Observations Achieve Results
SRD	Safety Requirements Document
SRNL	Savannah River National Laboratory
SRNS	Savannah River Nuclear Solutions, LLC
SRR	Savannah River Remediation, LLC
SRS	Savannah River Site
SSC	Structures, Systems, and Components
SSO	Sandia Site Office
SSR	Summary Structural Report
SST	Single-Shell Tank

STP	Sludge Treatment Project
SWL	Solid Waste Landfill
SWPF	Salt Waste Processing Facility
TEF	Tritium Extraction Facility
TF	Tritium Facility (Savannah River)
TRC	Total Recordable Case
TRU	Transuranic
TSR	Technical Safety Requirement
TWPC	Transuranic Waste Processing Center
UNF	Spent (Used) Nuclear Fuel
UPF	Uranium Processing Facility
USQ	Unreviewed Safety Question
VPP	Voluntary Protection Program
WAI	Wastren Advantage, Inc.
WIPP	Waste Isolation Pilot Plant
WRAP	Waste Receiving and Processing Facility
WRPS	Washington River Protection Solutions, LLC
WTP	Waste Treatment and Immobilization Plant
Y-12	Y-12 National Security Complex
YSO	Y-12 Site Office