

September 30, 2009

Mr. Thomas Gutmann, Director
Waste Disposition Programs Division
U.S. Department of Energy
Savannah River Operations Office
P.O. Box A
Aiken, SC 29802

SUBJECT: U.S. NUCLEAR REGULATORY COMMISSION JUNE 3, 2009, ONSITE
OBSERVATION REPORT FOR THE SAVANNAH RIVER SITE SALTSTONE
FACILITY

Dear Mr. Gutmann:

The enclosed report describes the U.S. Nuclear Regulatory Commission's (NRC's) onsite observation activities on June 3, 2009, at the Savannah River Site (SRS) Saltstone Facility. This onsite observation was conducted in accordance with Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (Section 3116), which requires NRC to monitor disposal actions taken by U.S. Department of Energy (DOE) for the purpose of assessing compliance with the performance objectives set out in 10 CFR Part 61, Subpart C. The activities conducted during the site visit were consistent with those described in the NRC's monitoring plan for salt waste disposal at SRS (dated May 3, 2007) and NRC's staff guidance for activities related to waste determinations (NUREG-1854, dated August 2007).

Though all performance objectives are considered during every monitoring event, this onsite observation at SRS was primarily focused on assessing compliance with the performance objective in 10 CFR 61.41, Protection of the general population from releases of radioactivity, by observing DOE's ongoing construction of disposal cells at the Saltstone Disposal Facility (SDF).

NRC continues to conclude that there is reasonable assurance that the applicable criteria of Section 3116 can be met if key assumptions made in DOE's waste determination analyses prove to be correct. In accordance with the requirements of Section 3116 and consistent with NRC's monitoring plan for the salt waste disposal facility, NRC will continue to monitor DOE's disposal actions at SRS. The monitoring activities are expected to be an iterative process. Several onsite observation visits and technical reviews may be necessary in order to obtain the information needed to close all of the current open issues, as well as issues that may be opened in the future.

T. Gutmann

2

If you have any questions or need additional information regarding this report, please contact Nishka Devaser of my staff at (301) 415-5196.

Sincerely,

/RA/

Patrice Bubar, Deputy Director
Environmental Protection
and Performance Assessment Directorate
Division of Waste Management
and Environment Protection
Office of Federal and State Materials
and Environmental Management Programs

Enclosure:
NRC Observation Report

cc: w encl:
S. Wilson
Federal Facilities Liaison
Environmental Quality Control Administration
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201-1708

T. Gutmann

2

If you have any questions or need additional information regarding this report, please contact Nishka Devaser of my staff at (301) 415-5196.

Sincerely,

Patrice Bubar, Deputy Director
Environmental Protection
and Performance Assessment Directorate
Division of Waste Management
and Environment Protection
Office of Federal and State Materials
and Environmental Management Programs

Enclosure:
NRC Observation Report

cc: w encl:
S. Wilson
Federal Facilities Liaison
Environmental Quality Control Administration
South Carolina Department of Health
and Environmental Control
2600 Bull Street
Columbia, SC 29201-1708

DISTRIBUTION:

RidsOpaMail

RidsOgcMailCenter

RidsOcaMailCenter

ML092170006

| OFC | DWMEP:PM | DWMEP:PM | DWMEP:LA | RII/CCI:CI | DWMEP:BC | DWMEP:BC | DWMEP:PM |
|------|----------|----------|---------------|------------|-----------|----------|------------|
| NAME | NDevaser | DBrown | AWalker-Smith | AMasters | CMcKenney | GSuber | NDevaser |
| DATE | 08/26/09 | 08/26/09 | 08/27/09 | 09/14/09 | 09/14/09 | 09/17/09 | 09/ 21 /09 |

OFFICIAL RECORD COPY

U.S. NUCLEAR REGULATORY COMMISSION JUNE 3, 2009, ONSITE OBSERVATION REPORT FOR THE SAVANNAH RIVER SITE SALTSTONE FACILITY

EXECUTIVE SUMMARY

U.S. Nuclear Regulatory Commission (NRC) staff conducted its fifth onsite observation visit of the Saltstone Facility at the Savannah River Site (SRS) on June 3, 2009. This visit was intended to focus on one of the four performance objectives — 10 CFR 61.41, “*Protection of the general population from releases of radioactivity*,” — by obtaining information on construction of disposal Cells 2A and 2B of the U.S. Department of Energy (DOE) saltstone disposal facility. This report provides a description of NRC onsite observation activities and identifies NRC observations from the visit. Based on the results of the visit, the NRC continues to have reasonable assurance that the performance objectives of 10 CFR 61 can be met.

There are no new open issues resulting from this observation, however, at the time of the observation, the revised performance assessment for the new vault design was not yet available for NRC staff review. As a result, staff was unable to fully assess risk significance of construction activities and materials used in construction. A summary of the staff’s observations and conclusions is provided below:

Disposal Cell Construction

- The staff observed ongoing construction at Saltstone Disposal Facility Cells 2A and 2B. At the time of the staff’s visit, all vertical wall panels were installed for both cells. Closure strips had been installed for disposal cell 2B and preparation was complete for the introduction of structural concrete between panel interstices.
- The DOE has one follow-up action from this activity relating to NRC staff’s request for vendor-supplied historical documentation of the performance of various construction materials as well as documentation of materials testing performed by the disposal cell vendor. NRC staff also made a recommendation that DOE either verify that concrete quality assurance requirements in a required national code and standard is being met, or determine the effects of any deviations on performance of the concrete.

1.0 BACKGROUND

Section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005 (Section 3116) authorizes the DOE, in consultation with the NRC, to determine that certain radioactive waste related to the reprocessing of spent nuclear fuel is not high-level waste, provided certain criteria are met. Section 3116 also requires NRC to monitor DOE disposal actions to assess compliance with the performance objectives in 10 CFR Part 61, Subpart C.

On March 31, 2005, DOE submitted a “Draft Section 3116 Determination, Salt Waste Disposal Savannah River Site” to demonstrate compliance with the Section 3116 criteria, including demonstration of compliance with the performance objectives in 10 CFR Part 61, Subpart C (DOE, 2005). In its consultation role, the NRC staff reviewed the draft waste determination and concluded that there was reasonable assurance that the applicable criteria of Section 3116 could be met, provided certain assumptions made in DOE’s analyses are verified via monitoring. NRC documented the results of its review in a technical evaluation report (TER) issued in

Enclosure

December 2005 (NRC, 2005). DOE issued a final waste determination in January 2006 taking into consideration the assumptions, conclusions, and recommendations documented in NRC's TER (DOE, 2006).

To carry out its monitoring responsibility under Section 3116, NRC plans to perform three types of activities: (i) technical reviews, (ii) onsite observations, and (iii) data reviews. These activities will focus on key assumptions — called “factors” — identified in the NRC monitoring plan for saltwaste disposal at SRS (NRC, 2007). Technical reviews generally will focus on obtaining additional model support for assumptions DOE made in its performance assessment (PA) that are considered important to DOE's compliance demonstration. Onsite observations generally will be performed to (i) observe the collection of data (e.g., observation of waste sampling used to generate radionuclide inventory data) and review the data to assess consistency with assumptions made in the waste determination, or (ii) observe key disposal (or closure) activities related to technical review areas (e.g., slag and other material storage, grout formulation and preparation, and grout placements). Data reviews will supplement technical reviews by focusing on monitoring data that may also indicate future system performance or by reviewing records or reports that can be used to directly assess compliance with performance objectives.

On June 3, 2009, the NRC staff onsite observation visit at SRS focused primarily on the performance objective in 10 CFR 61.41, *Protection of the general population from releases of radioactivity* by observing DOE's ongoing construction of disposal cells at the Saltstone Disposal Facility (SDF). Future visits will assess the performance objective in 10 CFR 61.42, *Protection of individuals against inadvertent intrusion*, and also continue to assess DOE compliance with the other performance objectives.

Saltstone Facility Operational Status at the time of the Observation

At the beginning of the visit, DOE and DOE contractor staff provided a brief overview of operations at the Saltstone Facility and the status of disposal cell 2 construction since the last onsite observation (NRC, 2009). The DOE contractor then led NRC staff accompanied by the South Carolina Department of Health and Environmental Control (SCDHEC) on a tour of the disposal cell 2 construction site. NRC staff observed construction activities associated with concrete placement in some of the 32 closure strips of Tank 2B.

At the time of the observation, DOE was starting a transition to a new liquid waste contractor, Savannah River Remediation, LLC (SRR), which will succeed the Washington Savannah River Company (WSRC) on July 1, 2009 (DOE, 2009).

2.0 NRC ONSITE OBSERVATION ACTIVITIES

2.1 Disposal Cell Construction

NRC staff monitors ongoing construction of disposal cells, as described in section 3.2.3, "Vault Construction," of the staff's monitoring plan (NRC, 2007).

2.1.1 Observation Scope

The observation of DOE vault construction is related to Factor 1 – "Oxidation of Saltstone," Factor 2 – "Hydraulic Isolation of Saltstone," and Factor 3 – "Model Support," which were identified in the NRC monitoring plan for the SRS SDF (NRC, 2007). The monitoring plan also states the importance of understanding potential mechanisms that could result in loss of vault integrity. The disposal cell system is comprised of a number of different engineering materials designed to properly interact to contribute to leak proof performance. These include reinforced concrete, steel, epoxy, caulk, HDPE liners, and rubber. Each of these materials, individually, has unique physical and chemical characteristics that will vary with time and changes in environment. Staff would like to gain a better understanding of how these materials will behave during the performance period of these cells.

The general purpose of NRC staff observations of ongoing construction of Saltstone Facility disposal cells 2A and 2B is to identify noticeable deviations from the vault design, focusing on changes that could affect potential pathways for water to intrude into the vaults, such as penetrations or joints. In addition to material effects, NRC staff paid particular attention to those processes contributing to the assembly and installation the vault wall panels.

2.1.2 Observation Results

The staff observed ongoing construction at Saltstone Facility disposal cells 2A and 2B. At the time of the staff's visit, the cell floors and all wall panels had been fully installed for disposal cells 2A and 2B, most of the wall panel joints had been poured for disposal cell 2B. NRC staff also observed construction activities associated with concrete placement in some of the 32 closure strips of disposal cell 2B.

2.1.2.1 Concrete Batch Accounting

Staff reviewed a concrete batch ticket package that contained two documents. The documents were associated with the batch that was delivered and placed in the closure gaps. One document contained information regarding initial batch time, and the other document indicated the time that the truck left the batch plant. This batch was tested for slump, air content, temperature, and concrete cylinders were made for compressive testing. QORE Property Sciences is the subcontractor responsible for independent materials testing, which includes but is not limited to performing the on-site concrete receipt testing and making the concrete test cylinders to be used for compressive strength breaks. The QORE representative on-site performed the concrete receipt testing, made the concrete test cylinders to be used for compressive strength breaks, and recorded and reviewed the results of the tests. The batch ticket indicated that the concrete was initially batched (water added) at 11:40 a.m., the truck left the batch plant at 12:15 p.m. The QORE representative stated that the truck was finished

pouring at 1:47 p.m., which is in excess of 2 hours. ASTM C94 (ASTM, 2009) states the following:

“Discharge of the concrete shall be completed within 1½ hours or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates. These limitations are permitted to be waived by the purchaser if the concrete is of such slump after the 1½-h time or 300-revolution limit has been reached that it can be placed, without the addition of water, to the batch.”

Upon review of ASTM C94 (ASTM, 2009), staff believes that not meeting, by a small margin, the discharge time limit specified in the standard may not have a significant impact on long-term concrete strength and stability of the disposal cells, especially if the concrete had been determined to be “of such slump. . . that it can be placed without the addition of water.”. The staff have not identified any follow-up actions, open issues or recommendations associated with this observation.

2.1.2.2 Closure Strip Deviations

ACI 117-06, Section 2.3.1 (ACI, 2006) provides requirements for placement of embedded items and states “Clear distance to nearest reinforcement shall be the greater of the bar diameter or 1 in.” The commentary section R2.3 provides further clarification on this requirement with diagrams showing the clear distance should be from the embedment and the stud (Figure 1 shows the requirements designated by ACI 117-06 and Figure 2 shows a photograph of the closure strips used in disposal cell 2A [taken onsite during June 3 observation]).

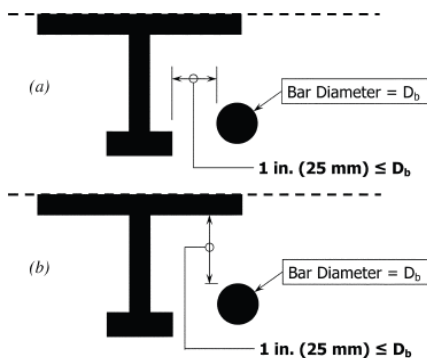


Figure 1: ACI 117-06 Requirements

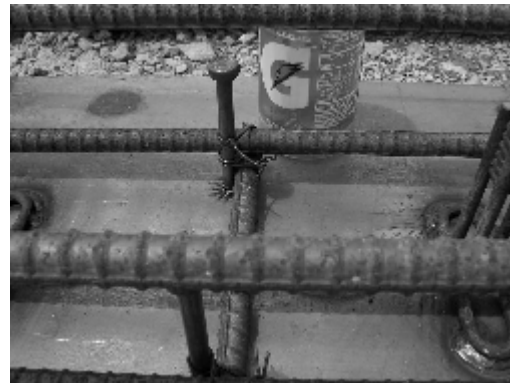


Figure 2: June 3, 2009 Photograph of Closure Strip

One of the intents of this requirement is to ensure proper concrete consolidation and bonding to all surfaces of the embedment and rebar and to prevent localized voiding issues. The steel closure strips were constructed with studs embedded in the concrete and rebar was placed less than 1" from these studs and in several instances actually in contact with the studs. Voiding issues of this sort could lead to preferential pathways within the disposal cell and could produce unforeseen weaknesses during the performance period. Given the potential for localized voiding created by this deviation, the staff recommends that DOE either confirm the absence of such voids or consider the potential for such voids in evaluating the performance of the cells.

2.1.2.3 Materials Performance

Many engineering materials are being used in construction of the disposal cells. These materials have properties potentially affecting long-term performance of the disposal cells. NRC staff requested information from the vendor, which has decades of experience with the performance of these materials, in order to evaluate whether past experience with tanks of similar design might be useful in predicting long-term performance of the disposal cells.

2.1.3 Conclusions and Follow-up Actions

No open issues were identified during the observation of disposal cell construction. However, staff observed deviations of required concrete codes and standards. NRC staff would like to discuss these deviations in future meetings. NRC staff have identified one follow-up action and one recommendation at the close of this observation.

DOE Follow-up Action

Provide vendor-supplied historical documentation of performance of various materials used in construction as well as documentation of materials testing performed by the disposal cell vendor.

DOE Recommendation

DOE should either confirm the absence of voids caused by deviation from ACI 117-06, or consider the potential for such voids in evaluating the performance of the cells

3.0 PARTICIPANTS

U.S. NRC (HQ)

Larry Camper
Nishka Devaser
Jim Shaffner

U.S. NRC (Region II)

Anthony Masters

SCDHEC

John McCain
Jason Shirley
Josh Yon

U.S. DOE

Jeff Bentley
Jim Folk
Tom Gutmann
Chun Pang
Sherri Ross
Linda Suttora

SRNS

Kent Rosenberger

SRR

Doug Bumgardener
Seth Campbell
Ginger Dickert
Keith Liner
Bruce Long
Dave Olson
Larry Romanowski
F. Malcolm Smith

BSRI

Bernie Eneroldsen
Karl Weiss

4.0 REFERENCES

U.S. Department of Energy (DOE). DOE-WD-2005-001, "Basis for Section 3116 Determination Salt Waste Disposal at the Savannah River Site." Washington, DC: DOE. March 2005.

———. DOE-WD-2005-001, "Basis for Section 3116 Determination Salt Waste Disposal at the Savannah River Site." Washington, DC: DOE. January 2006.

———. EQMD-09-032, "Savannah River Site (SRS) Liquid Waste (LW) Contract Transition." Washington, DC: DOE. May 8, 2009 (ADAMS Accession No. ML091390680).

U.S. Nuclear Regulatory Commission (NRC). "Technical Evaluation Report for Draft Waste Determination for Salt Waste Disposal." Letter from L. Camper to C. Anderson, DOE. December 28, 2005. (ADAMS Accession No. ML053010225)

———. "U.S. Nuclear Regulatory Commission Plan for Monitoring the U.S. Department of Energy Salt Waste Disposal at the Savannah River Site in Accordance with the National Defense Authorization Act for Fiscal Year 2005." Washington, DC: NRC. May 3, 2007. (ADAMS Accession No. ML070730363)

———. "Nuclear Regulatory Commission March 25-26, 2009 Onsite Observation Report for the Savannah River Site Saltstone Facility." May 22, 2009 (ADAMS Accession No. ML091320439)

ASTM Standard C 94/C 94M – 09, 2009, "Standard Specification for Ready-Mixed Concrete," ASTM International, West Conshohocken, PA, 2009, www.astm.org.

American Concrete Institute (ACI) Standard 117-06, 2006, "Specifications for Tolerances for Concrete Construction and Materials and Commentary," ACI Committee, 2006, www.concrete.org/.