Assessment of Radioactive Waste Management at Sandia National Laboratories New Mexico

Interim Report

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Office of Enterprise Assessments
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Assessment of Radioactive Waste Management at Sandia National Laboratories September 16-26, 2019 Interim Report

Overview

This assessment is in response to the Deputy Secretary of Energy's July 9, 2019, memorandum directing the Office of Enterprise Assessments (EA) to undertake a U.S. Department of Energy (DOE)-wide assessment of the procedures and practices for packaging and shipping radioactive waste. The assessment activities focused on the waste management performance of the Sandia National Laboratories (SNL) management and operating (M&O) contractor, National Technology and Engineering Solutions of Sandia, LLC (NTESS), in Albuquerque, New Mexico. Waste management activities include characterizing, packaging, and shipping low-level waste (LLW) and mixed low-level waste (MLLW) for disposal. Because NTESS does not generate significant amounts of transuranic waste, management of this type of waste was not part of this assessment. The assessment team, identified in Appendix A, examined a sample of waste generator operations representing about 80% of the total waste shipped to a disposal facility. NTESS's diverse control strategy (defense-in-depth) for its waste management processes, from the generator to final packaging, is illustrated in Appendix B.

This report provides the interim results of the assessment of LLW and MLLW management at SNL, addressing non-compliances and apparent causes contributing to weaknesses. At the conclusion of the enterprise-wide assessment, a final compilation report will include the results of this summary. The perspective gained by conducting this assessment could change as additional information becomes available from subsequent site assessments. The final compilation report will identify best practices, lessons learned, and cross-cutting recommendations.

DOE Order 227.1A, *Independent Oversight Program*, describes and governs the DOE independent oversight program, which EA implements through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. DOE Order 227.1A defines the terms best practices, findings, deficiencies, opportunities for improvement, and recommendations. In accordance with DOE Orders 227.1A and 226.1B, *Implementation of Department of Energy Oversight Policy*, it is expected that the site will analyze the causes of findings and deficiencies identified in this summary, develop corrective action plans for findings, and implement compensatory corrective actions for program and performance deficiencies.

Summary

Overall, NTESS's waste management program ensures proper characterization, packaging, and shipping of radioactive waste for disposal, and the Sandia Field Office (SFO) maintains adequate Federal operational awareness of waste management activities. This assessment found no findings, one interim recommendation, and two opportunities for improvement for consideration by DOE Federal and contractor management. This assessment also found four NTESS deficiencies in training, segregation of duties, a gap in procedures addressing in-process inspections, and assessments of performance at the point of waste generation. Although these deficiencies did not result in mishandling of LLW and MLLW, management attention is warranted to reduce the risk of mishandling in the future. One SFO deficiency was also identified in radioactive management program oversight and documentation. The self-assessment directed by the National Nuclear Security Administration (NNSA) Chief of Staff's July 16, 2019, memorandum was limited to reviewing findings and observations from previous independent

assessments and surveillances. SFO stated that the limited scope of the self-assessment along with crediting this EA assessment fulfilled the NNSA-Headquarters memorandum expectations. Although the peer reviews are underway, the peer review at this site had not been completed at the time of this assessment. Although the peer reviews are underway, the peer review at this site had not been completed at the time of this assessment. The results of the peer reviews will be addressed in the final compilation report.

Positive Attributes

Waste Characterization

- The NTESS waste generator's procedures manual provides sufficient direction for managing each waste type and specifies training requirements for members of the workforce who generate, manage, accumulate, or complete disposal requests.
- Knowledgeable and experienced operators and technicians at the Radiation Protection Sample Diagnostics (RPSD) Laboratory and the Radioactive Mixed Waste Management Facility (RMWMF) Count Lab demonstrated thorough knowledge of detection technologies, processes, and equipment operation and properly evaluated data results to ensure accurate waste characterization.
- The conservative characterization estimates applied to container contents ensure that waste shipments do not exceed any Waste Acceptance Criteria (WAC) or Department of Transportation (DOT) regulations. For example, NTESS assigns tritium activity in waste packages based on the highest assay results.

Waste Stream Control

- Waste generators demonstrated appropriate knowledge of approved waste streams and controls to prevent the introduction of prohibited articles and improper waste constituents. Interviewed waste generators recognize their role as the first line of defense for proper waste characterization and control.
- The NTESS-automated Waste Description and Disposition Request (WDDR) process assists organizations in implementing program requirements to ensure proper waste management from generation through characterization, packaging, certification, and shipping. The WDDR process allows only currently trained/qualified personnel to submit requests for waste disposal.
- The online tools that support the WDDR process provide guidance to waste generators for proper characterization of waste streams. Organizational hotlinks direct generators to approved procedures and assigned waste subject matter experts (SMEs).
- The RMWMF personnel with extensive knowledge of classified waste observe the placement of nearly all (NTESS estimates about 90%) classified waste into waste containers, except for a few well characterized continuous classified waste streams. This significantly exceeds the requirement for independent visual verification of the contents of 5% of waste containers, providing confidence in waste conformance with the Nevada National Security Site (NNSS) disposal facility's WAC. This approach for inspection and control of classified waste streams reduce the likelihood of non-compliances similar to those associated with the recent Y-12 National Security Complex shipments.
- The detailed waste disposition task-specific work planning at RMWMF sufficiently supports waste management activities. Observed meetings included thorough, checklist-driven discussions of work scope and hazards, with all participants actively engaged and demonstrating questioning attitudes. RMWMF personnel completed the observed work activities as planned.

Packaging and Shipping

- RMWMF maintains sufficient qualified/certified shipping staff to ensure timely and compliant offsite waste shipments.
- The waste packaging and transportation program is mature and achieves the intended performance results. RMWMF personnel use multiple checklists and the RadTrack inventory program to ensure that shipping documentation is complete and compliant. An in-depth review of five shipping records, which compared the documented package and contents with the requirements and waste profiles, confirmed compliance with DOT regulations and disposal facility WAC.

Quality Assurance

- NTESS places primary responsibility and accountability for waste stream integrity on the radioactive waste generators through detailed process procedures (e.g., technical work documents), guidance, and thorough training and re-training that ensures proper waste generation and control.
- Information flow across organizations adequately communicates all waste constituents to ensure proper waste management.

Federal Oversight

- The SFO waste management SME is qualified to the Waste Management Technical Qualification Standard and works effectively with NTESS waste management personnel.

Findings

The assessment identified no findings.

Deficiencies

Deficiencies are inadequacies in the implementation of an applicable requirement or standard. Deficiencies that did not meet the criteria for findings are listed below, with the expectation from DOE Order 227.1A for site managers to apply their local issues management processes for resolution.

- **Deficiency D-NTESS-1:** Contrary to GN470110, *Managing Waste at Sandia National Laboratories*, not all members of the workforce who generate and accumulate radioactive waste have taken the required radioactive waste management training. Technical Area (TA)-4 Z Machine Mission Assurance, Execution, and Analytics department management did not require TA-4 Z Machine waste generator personnel to take this required training because management deemed other operational training a higher priority. In addition, radiological control technicians, who have not taken the required training, stated that they routinely place program-generated waste (e.g., used protective clothing) directly into final waste packages. As identified below in Deficiency D-NTESS-4, quality assurance (QA) oversight does not routinely assess generators; such oversight could have identified this issue. The impacts of not training personnel could allow missed opportunities to emphasize the importance of waste management segregation and control and to update personnel on the latest programmatic changes. Additionally, incompletely trained workers weaken the barriers that prevent the introduction of prohibited items into a waste stream.
- **Deficiency D-NTESS-2:** Contrary to PLA 06-03, *Radiological and Classified Waste Operations Waste Certification Program Plan*, the Waste Management and Pollution Prevention Department (WMPPD) has assigned two personnel multiple functions and responsibilities that pose potential conflicts of interest and lack of independence.

- The Alternate Waste Certification Official can certify the adequacy of his own performance as a Radiological Characterization Reviewer.
- The Waste Certification Official (WCO) verifies the implementation of the QA program for which the WCO is also designated as the QA Program Project Leader.
- WMPPD tasks the WCO to also serve as a Department Lead Auditor to conduct independent assessment of the WMPPD activities.

The deficiency occurred because WMPPD management has limited staff with specific expertise, necessitating multiple functional assignments. The impact of the lack of segregation of duties could allow individuals to verify their own work activities.

- **Deficiency D-NTESS-3:** Contrary to the NNSS WAC, Section 5.8, the NTESS waste management program procedures identified in the WAC implementation crosswalk do not specify requirements for conducting in-process inspections throughout the waste certification process, addressing waste management activities from the generator to final packaging. Also, RMWMF personnel do not routinely monitor and document generator waste segregation and control activities associated with NTESS's nine continuous LLW/MLLW streams. The lack of in-process inspection reduces the barriers that prevent the introduction of prohibited items into a waste stream.
- **Deficiency D-NTESS-4:** Contrary to DOE Order 226.1B, Contractor Requirements Document Section 2.b (2), the NTESS Institutional Quality and Performance Assurance organization's annual independent waste certification program assessments for 2018 and 2019 did not assess waste stream generators' processes or inspect waste generators' LLW/MLLW segregation and controls. These elements of the waste management processes provide the first line of defense that ensures control of the waste stream.
- **Deficiency D-SFO-1:** Contrary to DOE Manual 435.1-1, *Radioactive Waste Management Manual*, Chapter I, Section 2.F.(10), review of SFO assessment reports for radioactive waste management program activities since 2012 showed limited documentation of oversight of implementation of the approved radioactive waste management basis (RWMB) and the requirements of Manual 435.1-1. The SFO radioactive waste management SME has documented only one waste management safety management program (SMP) assessment in the past three years; however, that assessment did not evaluate NTESS's performance on elements of the approved RWMB. In addition, SFO's 2016 and 2018 self-assessments identified issues in the adequacy of oversight documentation and the need to improve SFO's processes for tracking and reporting oversight results. Corrective actions taken to date have not resolved this documentation issue.

Other Areas of Weakness

Other areas of weakness represent potential vulnerabilities that warrant site management's consideration but do not rise to the level of a finding or deficiency as defined in DOE Order 227.1A. The site should review these vulnerabilities and take appropriate actions. These weaknesses will be further reviewed against subsequent enterprise-wide site assessments to determine whether the vulnerability is cross-cutting and warrants an enterprise-wide response.

Waste Stream Control

- The counting equipment does not provide a unique alert when an individual vial exceeds the default waste stream activity limitations; the vials are counted in a batch arrangement and a computer printout of individual vial activities is generated. Currently, the activity results are not automatically compared to the default waste stream activity limits, but instead, the counting technician manually reviews results and sorts the batches to the proper waste stream. Given the large number of vials

counted, a high-activity liquid scintillation vial could be missed during review of counting results and thus introduced into the incorrect waste stream. (see OFI-NTESS-1)

- The current procedures and practices do not provide strong measures to prevent chemical interactions in final waste packages, as specified below: (see OFI-NTESS-2)
  - GN470110, Appendix I specifies the requirement for determination of chemical compatibility but does not provide guidance for waste generators to identify potential adverse chemical interactions.
  - The WDDR review and approval process (AOP 98-03, *Waste Characterization Team Disposition Request*, Section 4.3, *Chemical Characterization Review*) does not address chemical compatibility as an element of required reviews.

Federal Oversight

- Contrary to the NNSA Chief of Staff's memorandum of July 16, 2019, SFO did not conduct a collaborative self-assessment with its M&O contractor (NTESS) that addressed all requisite elements specified in the memorandum. Furthermore, the self-assessment conducted by NTESS was limited to reviewing findings and observations from NTESS's previously performed independent assessments and surveillances. The NTESS self-assessment did not review the waste shipment programs (policies, procedures and practices), contractor QA and oversight processes, or the root causes of previous incidents. SFO stated the self-assessment was limited to the scope conducted and credited this EA assessment to fulfill the NNSA-Headquarters memorandum expectations.
- The NNSA Chief, Defense Nuclear Security's biennial review determined that SFO conducts effective oversight of radioactive waste management, citing an SFO waste management SMP assessment as evidence of effective oversight. However, the assessment report lacks enough detail to support an adequate performance evaluation of NTESS.

Interim Recommendations

Interim recommendations are intended to capture the evolving need for possible DOE management attention based on identified conditions from a single or multiple-site assessment. Interim recommendations should be considered suggestions for improving program or management effectiveness.

- It is recommended that the Federal office and the M&O contractor increase their oversight focus on waste generator activities (i.e., at the point of waste origination) to ensure the adequacy of waste stream segregation and control to prevent introduction of prohibited items or incompatible materials.

Opportunities for Improvement

Opportunities for improvement are suggestions that are offered to assist cognizant managers in improving programs and operations.

- **OFI-NTESS-1:** NTESS should consider programming the RPSD Laboratory liquid scintillation vial counting equipment to provide a flag on the computer printout if a vial exceeds the default waste stream limit.
- **OFI-NTESS-2:** NTESS should consider reviewing and incorporating industry practices (e.g., 40 CFR 264, Appendix V and 40 CFR 265, Appendix V methods, or Environmental Protection Agency guidance 600-2/80-076) for ensuring chemical compatibility of waste container contents.

Appendix A
Supplemental Information

Dates of Office of Enterprise Assessments (EA) Onsite Assessment

September 16-26, 2019

Assessment Team

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Appendix B
Description of Waste Control Defense-in-Depth as Applied at SNL

This figure shows the various engineering and administrative controls implemented throughout the radioactive waste management process to ensure that waste shipped to a disposal site meets all waste acceptance criteria and that no prohibited items are accidently introduced into waste streams. Defense in depth is intended to reduce the likelihood of a non-compliant waste package by implementing a diverse defensive control strategy, so that if one layer of defense turns out to be inadequate, another layer of defense will prevent a non-compliance. In this figure, the generator is the point of origin of any waste stream. As waste progresses through the process, it can be accumulated and stored at various locations. Along the way, the waste is characterized and verified to be appropriate for the approved waste stream. Once finally packaged, the waste is certified to have met all requirements and is shipped to its final disposal site.