Assessment of Transuranic Radioactive Waste Management at the Los Alamos National Laboratory

Interim Report

April 2020

Office of Enterprise Assessments
U.S. Department of Energy

Assessment of Transuranic Radioactive Waste Management at the Los Alamos National Laboratory October 21-25, 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 performance of processes to characterize, package, and ship transuranic (TRU) waste, as implemented at the Los Alamos National Laboratory (LANL) by DOE National Nuclear Security Administration (NNSA) management and operating contractor, Triad National Security, LLC (Triad); the DOE Office of Environmental Management (EM) legacy waste contractor, Newport News Nuclear BWXT-Los Alamos, LLC (N3B); and the transuranic (TRU) waste characterization contractor, Nuclear Waste Partnership, LLC (NWP), which is the management and operating contractor for the Waste Isolation Pilot Plant (WIPP).

Due to operational limitations imposed by work pauses and ongoing inventory and accountability activities at LANL, the assessment team was unable to observe all planned TRU waste generation operations and complete an evaluation of some TRU waste characterization processes. Although the observations detailed in this report highlight important strengths and weaknesses at LANL, a follow-up EA assessment of the LANL TRU waste management program is essential in the near term in order to draw more definitive conclusions regarding waste characterization.

For TRU waste management, generators across the enterprise implement a centralized process for waste characterization and certification, primarily through the Central Characterization Program (CCP), which is coordinated by NWP, under the oversight of the Carlsbad Field Office (CBFO). The enhancement of this centralized structure for TRU waste management and the oversight thereof, which was initiated after the accident events at the WIPP facility in 2014, have resulted in program implementation that is generally consistent and uniform across the enterprise.

The assessment team, identified in Appendix A, examined a sample of radioactive waste operations that generate, characterize, or otherwise manage TRU waste streams at all LANL facilities performing work at the time of the onsite portion of this assessment. The diverse control strategy (defense-in-depth) used for LANL's TRU waste management processes, from the generator to final shipping, is illustrated in Appendix B.

This report provides the interim results of the assessment of TRU waste management at LANL, 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, Triad and N3B implement waste management programs that provide reasonable assurance of proper characterization, packaging, and shipping of TRU waste for disposal. NWP, through CCP, adequately characterizes TRU waste in support of both the Triad and N3B missions. The NNSA LANL Field Office (NA-LA) maintains adequate operational awareness of TRU waste management activities; however, for the EM Field Office (EM-LA), staffing limitations adversely impact oversight capabilities. This assessment found no findings, no interim recommendations, and three opportunities for improvement for consideration by DOE Federal and contractor management. This assessment also identified two deficiencies associated with the conduct of radioactive waste handling operations; however, prior to issuing this interim report, the contractor initiated corrective actions to resolve one of the deficiencies. Nevertheless, management attention is warranted to reduce the risks of moving waste containers. Due to the limitations noted in the Overview, EA as unable to was unable to sample as broad and diverse a number of Triad and N3B operations as planned, and with the information that has currently been provided, this assessment was unable to include a complete evaluation of Triad's TRU waste characterization processes. A follow-up EA assessment will be planned to address these technical areas.

This assessment found that the self-assessments performed by Triad and N3B, as required by NNSA and EM in memoranda issued on July 16, 2019, and July 23, 2019, by the NNSA Chief of Staff and EM Principal Deputy Assistant Secretary, respectively, were adequate. N3B reviewed its waste shipping process and identified five findings, six opportunities for improvement, and one noteworthy practice. However, EM-LA did not perform an independent or shadow review of N3B's waste management program or a self-assessment of its own Federal oversight. NA-LA and Triad performed a joint self-assessment of the radioactive waste management program to determine its effectiveness; the self-assessment was comprehensive, resulting in no findings, 7 deficiencies, 12 opportunities for improvement, and 3 noteworthy practices.

Although the Radioactive Waste Peer Review has concluded, the LANL peer review 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

- For TRU waste currently originating at LANL, Triad implements a robust characterization process that integrates processes for waste origination, generation, characterization, and packaging. Before and during characterization activities performed by CCP acceptable knowledge (AK) and visual examination (VE) experts, the Triad NPI-6 organization deploys AK specialists who perform a visual inspection of waste to help develop process knowledge and other waste characterization information. In addition, NPI-6 waste generators coordinate with waste originators to initiate the dispositioning of TRU waste.

- Triad AK specialists accurately document waste contents placed into containers to help ensure compliance with WIPP waste acceptance criteria (WAC). Visual inspections by AK specialists upstream help characterize waste contents accurately and adequately at the point of waste generation and segregate prohibited items for additional processing.

- The Waste Compliance and Tracking System (WCATS) Questionnaire used by Triad AK specialists provides a thorough accounting of bagged-out TRU waste at the point of generation. During waste generation (e.g., waste bagout), waste is visually inspected, and the AK specialist documents the contents, including chemical constituents, in a WCATS questionnaire. The WCATS questionnaire for a given waste container is scanned and uploaded into the WCATS database.

- Triad uses an Absorption Approval Form to capture characterization details about the chemical constituents of absorbed liquid radioactive waste at the point of generation; this information adequately facilitates compliance with WIPP's enhanced AK requirements. All free liquids are neutralized and absorbed for compliance with the WIPP WAC in accordance with LANL procedure PA-DOP-01665, *Characterization and Absorption of Liquids*. AK specialists use the data captured in the form to initiate an AK report in support of CCP processes to establish AK, perform chemical compatibility evaluations and basis-of-knowledge assessments, and certify TRU waste. Upon completion, the Absorption Approval Form is scanned and uploaded into the WCATS database.

- Triad's Off-Site Source Recovery Program (OSRP) implements a thorough process to characterize TRU sealed-source wastes and comply with the WIPP WAC. OSRP develops AK from extensive investigation of sealed-source manufacturer data and rigorous calculations of decay product in-growth. Triad personnel have also been qualified as visual examination experts to conduct examination operations for TRU sealed-source waste containers.

- CCP waste characterization operations performed at Technical Area (TA)-03 and TA-55 facilities include operation and calibration of High Efficiency Neutron Counter (HENC) and Mobile ISOCS Large Container Counter (MILCC) systems and operations in support of confinement vessel receipt, cleanout, and staging. These operations are controlled using a comprehensive set of CCP-specific procedures and Triad work control processes, such as Integrated Work Documents (IWDs). Operators operating these systems and performing this work demonstrated thorough knowledge of their work responsibilities and readily consulted with expert analysts when needed.

- CCP Flammable Gas Analysis personnel demonstrated good knowledge, experience, and conduct-of-operations proficiency. The Flammable Gas Analysis operators are qualified and available in adequate numbers. In addition, operators use effective place-keeping (i.e., marking off each step in the procedure as it is completed) when performing the work steps associated with operation of the gas chromatograph and mass spectrometer.

Waste Stream Control

- OSRP works with a commercial consolidation center to accumulate TRU sealed sources from materials licensees. Triad can therefore work through the certified CCP TRU waste program to retrieve the sources from a single location, and then perform the TRU waste characterization processes to support eventual disposal at WIPP.

Packaging and Shipping

- OSRP procures TRU waste containers directly from NWP at WIPP, thus facilitating compliance with the WIPP WAC.

- N3B demonstrated disciplined operations at the Radioassay and Nondestructive Testing (RANT) facility, including an interactive pre-job briefing and skilled movement of equipment via forklift inside and outside the RANT high bay. The pre-job briefing was thorough in covering the work scope, hazards, and controls and engaged workers regarding actions for various scenarios, such as a spill and alarms. An IWD, which includes a "critical lift" plan for payload movement, is in place for

assembling payloads for the CCP mobile loading unit. The IWD contains adequate instructions and controls to perform this activity.

Quality Assurance

- After Triad's review of the WCATS system showed that approximately 40% of the waste container locations had not been properly updated, Triad directed a wall-to-wall inventory of all waste containers to re-baseline the data and verify system accuracy.

- Following direction from EM-LA, N3B proactively performed an extent-of-condition review of its waste streams after the Idaho Cleanup Project ARP-V event, before being directed to do so by the EM Principal Deputy Assistant Secretary.

Federal Oversight

- In response to the July 19, 2019, memorandum from the NNSA Chief of Staff, NA-LA and Triad performed a joint self-assessment of radioactive and mixed waste shipping that comprehensively evaluated the effectiveness of the radioactive waste management program in meeting the applicable WAC. The self-assessment concluded that Triad's radioactive waste management program reflected a strong culture of continuous learning and improvement, and that NA-LA had established and implemented effective oversight processes for evaluating the effectiveness of the contractor's program.

- The NA-LA staff responsible for programmatic oversight of TRU waste operations are actively engaged with various Triad waste management activities (e.g., reviews of the radioactive waste management basis, shadow reviews, interface meetings). The Federal Waste Management Specialist for EM-LA has similar levels of active interface and oversight, predominantly with respect to operational awareness activities.

- Although challenged by shortages in staffing, prior to the ICP ARP-V event and this assessment, EM-LA performed a comprehensive self-assessment of contact-handled TRU conduct of operations in TA-54, Area G. The self-assessment identified 12 findings, 3 observations, 10 opportunities for improvement, and 2 noteworthy practices. In addition, EM-LA's 2020 Integrated Assessment Schedule (IAS) shows planned shadow assessments of N3B's management assessments of its contact-handled TRU waste program and WCATS/physical waste inventory.

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-Triad-1:** Contrary to DOE Order 422.1, *Conduct of Operations*, and a memorandum issued to supplement Triad procedure PA-DOP-01735, *TRU Outdoor Operations*, an individual designated as a "non-working Person in Charge (PIC)" was observed performing work to support a drum movement. In accordance with the memorandum, the sole responsibility of the non-working PIC is to provide oversight and manage the drum movement operation, not to perform work. DOE Order 422.1, Section p., *Technical Procedures*, requires that procedures be established with detail

sufficient for accomplishing the operation. The memorandum as issued, in lieu of a procedure revision, was insufficient to establish requirements for the PIC's activities.

- **Deficiency D-Triad-2:** Contrary to DOE Order 422.1, *Conduct of Operations*, Section p., *Technical Procedures*, Triad procedure PA-DOP-01735, *TRU Outdoor Operations*, did not provide hazard control guidance to ensure that loads are secure during pushing, pulling, or lifting of waste containers via a dolly or pallet jack. After a recent drum drop event when a pallet jack was used to move a drum over an uneven surface, procedure PA-DOP-01481, *Forklift Operations*, was revised to provide additional requirements for securing loads; however, these requirements were not applied to pallet jacks or dollies.

  Subsequent to this assessment, EA was provided with PA-DOP-01735, Rev. 7 (December 2019), and PA-DOP-01481, Rev. 6 (October 2019). Both procedures now address the concern specified in the aforementioned deficiency, D-Triad-2, and should ultimately resolve the issue. Nevertheless, this issue is still identified as a deficiency because an effectiveness review has yet to be completed.

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

- Triad does not provide WCATS user guidance for updating and inputting data in non-essential fields or for controlling free-form data input. WCATS is a multifunctional computer program that provides a central location for "cradle-to-grave" management of TRU waste at LANL, but it relies heavily on the accuracy of data entry processes and is therefore subject to human factors limitations. Inconsistent use of WCATS for providing and using waste container movement data contributed to the misidentification of approximately 40% of waste container locations. (See OFI-Triad-1.)

- Several hundred waste containers are moved each week to support various activities at TA-55 facilities. Currently, waste containers generated at various TA-55 facilities are stored as appropriate and as dictated by procedural considerations (e.g., material at risk, material of interest, criticality considerations). However, CCP later dictates the batch of waste containers on which NDA is to be performed for characterization (using the HENC, for example). This process routinely requires that waste containers be shuffled to comply with the CCP request, thereby increasing the risk of an incident involving container movements. (See OFI-Triad-NWP-1.)

Federal Oversight

- Due to regional competition, potentially high external salaries, and other factors, EM-LA has been unable to hire and retain adequate a full complement of Federal waste management staff. Inadequate EM-LA staffing levels have challenged its ability to adequately complete scheduled oversight activities for the waste management program. EM-LA IAS records show that the last self- and contractor assessment of Resource Conservation and Recovery Act (RCRA) compliance and radioactive waste management was performed in 2016. A similar assessment was again scheduled in October 2017; however, it has been rescheduled each subsequent year and has not been completed to date. To help compensate for the shortfall in Federal staff, EM-LA has hired government support service contractors.

- Though EM-LA conducts routine oversight activities and recently completed conduct of operation reviews of N3B operations, EM-LA did not perform a comprehensive self-assessment of Federal oversight and the contractor assurance systems to identify any programmatic gaps in radioactive waste management in accordance with the EM Principal Deputy Assistant Secretary direction and recommendations outlined in the July 23, 2019, memorandum. For example, functional areas outlined in the memorandum such as safety culture, work planning and control, and Federal oversight were not assessed. (See OFI-EM-LA-1.)

Interim Recommendations

No interim recommendations resulted from this assessment. 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.

Opportunities for Improvement

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

- **OFI-Triad-1:** Triad should consider specifying WCATS user guidance for updating and inputting data in non-essential fields and modifying the WCATS program interface to limit the use of free-form input fields and provide additional steps to verify the uniformity of data input.

- **OFI-Triad-NWP-1:** Triad should consider working with NWP to evaluate how to minimize movements of waste containers (e.g., "drum mining") in support of NDA characterization activities by CCP and other processes involving waste container movements.

- **OFI-EM-LA-1:** EM-LA should consider completing the assessment and identification of issues that impact performance of critical waste handling and processing, as directed by the EM Principal Deputy Assistant Secretary in the memorandum dated July 23, 2019.

Appendix A
Supplemental Information

Dates of Office of Enterprise Assessments Onsite Assessment

October 21-25, 2019

Assessment Team

Aleem E. Boatright, PE – Team Lead
Edgard Espinosa – Office of Environmental Management
Jaffet M. Ferrer-Torres – Office of Environmental Management
Joseph Lischinsky – Office of Enterprise Assessments
Gregory M. Schoenebeck – Office of Enterprise Assessments
Joseph J. Waring – Office of Enterprise Assessments

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

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.