



Assessment of Radioactive Waste Management at the Idaho Cleanup Project

Interim Report

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Office of Enterprise Assessments
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Assessment of Radioactive Waste Management at the Idaho Cleanup Project November 18-21, 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 Idaho Cleanup Project Core (ICP) as implemented by the management and operating contractor, Fluor Idaho, LLC; the remote-handled transuranic (TRU) waste centralized characterization program (CCP) contractor, Nuclear Waste Partnership, LLC (NWP); the Naval Reactors Facility (NRF) contractor, Fluor Marine Propulsion, LLC; and the Idaho National Laboratory management and operating contractor, Battelle Energy Alliance, LLC (BEA). Waste management activities include characterizing, packaging, and shipping radioactive waste.

For TRU waste management, generators across the enterprise implement a centralized process for waste characterization and certification through the Central Characterization Program (CCP), which is coordinated by the Waste Isolation Pilot Plant (WIPP) contractor, 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 2014 accident events at the WIPP facility, have resulted in program implementation that is generally consistent and uniform. In addition to CCP, Fluor Idaho also implements another program, the Advanced Mixed Waste Treatment Project (AMWTP), that is certified to send TRU waste to WIPP. The AMWTP certified program implements different, but equivalent, processes and procedures to meet the WIPP waste acceptance criteria (WAC).

The assessment team, identified in Appendix A, examined a sample of radioactive waste operations at the Radioactive Waste Management Complex (RWMC) Accelerated Retrieval Project (ARP) facilities, AMWTP, the Idaho Nuclear Technology and Engineering Center (INTEC), the Materials and Fuels Complex (MFC), and NRF facilities, which represent the radioactive waste streams managed at ICP. The diverse control strategy (defense-in-depth) used for ICP's radioactive waste management processes, from the generator to final packaging, is illustrated in Appendix B.

This report provides the interim results of the assessment of radioactive waste management at ICP, 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, ICP's waste management program ensures proper characterization, packaging, and shipping of radioactive waste for disposal, and the Idaho Operations Office (DOE-ID), the Carlsbad Field Office (CBFO), and the NRF field office maintain adequate operational awareness of the radioactive waste management activities. This assessment found no findings, no interim recommendations, and six opportunities for improvement for consideration by DOE Federal and contractor management. This assessment also identified two deficiencies associated with the condition of TRU waste containers packaged for shipment and the management of these stored containers. Although these deficiencies ultimately did not result in mishandling of TRU waste, management attention is warranted to reduce the risk of mishandling in the future.

In addition, this assessment found that the self-assessment performed by Fluor Idaho, as required by the DOE Office of Environmental Management (EM) in a memorandum issued on July 23, 2019, by the EM Principal Deputy Assistant Secretary, was thorough and generally effective in reviewing ICP's management of low-level waste (LLW) and mixed-LLW (MLLW). A certification audit, which evaluated the ICP TRU waste certification programs, was planned and performed by CBFO in September 2019. 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

- Engineered controls, repurposed existing hot cell facilities, and innovative tooling to reduce reliance on personal protective equipment (PPE) and administrative controls are implemented at ICP to better apply the As Low As Reasonably Achievable (ALARA) radiation protection principle, and enhance the safety, effectiveness, and efficiency of radioactive waste management operations.
 - Drum packaging operations in RWMC building WMF-7866, Drum Packaging Station C-637, use gloveboxes specifically designed to examine trays of waste materials, as well as extensive engineered controls, such as negative air pressure, materials handling equipment, shielding, and air locks.
 - Waste sorting and bagout operations in multiple ARP facilities use a "soft-sided drum enclosure" to handle exhumed/excavated radioactive waste, instead of PPE, as a superior engineered hazard control.
 - Waste container examination operations in INTEC buildings CPP-659 and CPP-666 use retrofitted hot cell facilities to examine TRU waste and waste containers. Capabilities include video recording and observation cameras to assist visual examination (VE) activities.
 - Waste component handling performed in INTEC buildings CPP-659 and CPP-666 implement "Jaws of Life" devices to cut and segment components. This method reduces sparking and flying debris associated with traditional sawing equipment.
 - The current mission for the Advanced Mixed Waste Treatment Facility (AMWTF), building WMF-676, is concluding, and multiple uses of this versatile building are in discussion. AMWTF has multiple hot cell facilities, which are costly and challenging to newly design and construct, that can be repurposed for treatment of varied radioactive waste forms from across the Idaho Site.

- Real-time radiography (RTR), non-destructive assay (NDA), flammable gas analysis (FGA), and VE waste characterization processes are performed effectively at multiple well-equipped ICP facilities by highly trained and qualified personnel, using well-established and vetted procedures.
 - RTR processes procedurally require replicate scans and subsequent independent observation for verification.
 - AMWTP maintains current proficiency in the NDA Performance Demonstration Program, including CBFO approval to conduct measurements using eight drum assay systems and three box assay systems for shipments of TRU waste containers to the Waste Isolation Pilot Plant (WIPP) disposal facility.
 - The FGA process requires an independent technical review of previously recorded data.
- Rigorous TRU waste characterization processes, such as RTR, NDA, and VE, are also commonly applied to low-level waste (LLW) and mixed-LLW (MLLW) streams. These processes go above and beyond practices typically implemented at other sites.
- For NRF radioactive waste to be shipped to ICP, characterization is performed before it is generated, with few exceptions (e.g., spill cleanup). A Hazard Evaluation Form (HEF) is generated to identify hazardous elements in the proposed waste stream, and all information pertinent to the composition of the waste item is attached to the HEF. When details of the waste are not available, sampling is conducted. The governing procedure requires that characterization include hazard evaluations for Resource Conservation and Recovery Act (RCRA) hazardous waste, polychlorinated biphenyls (PCBs), asbestos, radiological materials, and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) waste.

Waste Stream Control

- ICP uses the electronic Integrated Waste Tracking System (IWTS) to provide accurate waste tracking, using information derived from the Waste Determination and Disposition Form, to assist organizations in implementing program requirements to ensure proper waste stream management from generation through characterization, packaging, certification, and shipping. IWTS is a Nuclear Quality Assurance (NQA)-1 compliant database operated by Fluor Idaho (and BEA) for waste dispositioned through ICP, which requires multiple levels of independent verification of data input.
- AMWTP uses the electronic Waste Tracking System (WTS) to track both contact-handled (CH) and remote-handled (RH) TRU waste container movements and results throughout the waste characterization process. WTS is an NQA-1 compliant database operated by Fluor Idaho for ICP, which requires multiple levels of independent verification of data input.
- An extensive collection of waste management program description documents and implementing procedures provides clear requirements and expectations for waste generators and supporting Waste Generator Services (WGS) personnel. Procedure appendices are used effectively to provide additional guidance (e.g., prohibited items, chemical compatibility), reference material, and bases for key procedure steps.
- Waste management activities demonstrated that assigned WGS representatives routinely engage with the generator. WGS personnel performing waste verification and packaging in various facilities demonstrated consistency in their approach and alignment across the organization.

- In the ARP facilities of the RWMC, operations involving CERCLA and RCRA waste are segregated to ensure compliance with applicable permits. The use of former CERCLA facilities for RCRA missions is also an effective use of resources.
- The ICP macroencapsulation process, including movement of the final bagged box was performed safely and effectively and resulted in compliant packaged waste. The ICP macroencapsulation methods represent an evolution over many years, and the current method, which has been shared with other DOE sites, has resulted in substantial cost savings.

Packaging and Shipping

- For shipments of TRU waste to WIPP, the Idaho State Police conducts independent pre-shipment inspections of the shipping cask, transport equipment, and shipping documentation, providing defense-in-depth to help ensure safe and compliant transport.
- The shipment loading area in INTEC building CPP-659 has enhanced material handling capabilities and multiple shielded locations to provide worker protection during RH-TRU container movement operations.
- Shipment loading operations observed in RWMC building WMF-635 implemented good conduct of operations and procedure adherence. In addition, good coordination and the skill and knowledge of technicians assigned to CH Packaging and Payload Assembly were evident.

Quality Assurance

- Closure of the corrective actions from the ARP-V drum over-pressurization event included review and acceptance of objective evidence by independent quality assurance staff before closure. Fluor Idaho tracked and closed action items using the TrackWise issues management system used by ICP. The corrective actions identified to prevent recurrence that were observed by the team were effectively implemented. For example, the “rake and hold” method, which is used to expose exhumed waste to atmospheric conditions and allow for a slow oxidation of reactive materials over a 24-hour period, was observed to be well-implemented and technically sound. The implemented corrective actions are adequate for processing of drums with well-characterized Acceptable Knowledge (AK). However, as noted later in this report, procedures and protective measures for processing drums with limited AK remain undefined.
- During the CCP recertification audit, CBFO reviewed NRF programmatic documentation for generating approved TRU waste streams, in addition to characterization data, to verify effective implementation.
- The Fluor Idaho Performance and Quality Assurance division has implemented several performance improvement initiatives that have demonstrably begun to show effectiveness:
 - The Performance and Quality Assurance group now reports directly to the ICP Deputy Program Manager.
 - Implementation of the 2019 ICP Core Quality Assurance Improvement Plan has begun to address programmatic weaknesses, including timeliness in resolving issues; corrective action processing and performance metrics; training to improve issue categorization, problem evaluation, resolution, and documentation of completion; and increase in quality assurance (QA) staffing.

- Implementation of the 2019 ICP Core Contractor Assurance System (CAS) Improvement Plan has begun to address programmatic weaknesses identified in routine DOE-ID Quarterly Evaluation Reports and during external reviews by improving management assessment performance and management workplace visits; establishing a Fluor Idaho Operational Health Dashboard “Metric Catalog” to provide senior management and DOE-ID improved indicators for action on trends; and establishing “quad charts” that provide immediate, site-wide dissemination of post-event information for awareness of lessons learned and extent of condition.

Federal Oversight

- The self-assessment that was directed by EM, following the discovery of the Y-12 National Security Complex issue, included planning additional assessments of particular areas identified during the self-assessment as needing more attention.

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-Fluor-1: Contrary to RWMC EAR-278, *Hazardous Substance and Waste Spill Control*, the November 19, 2019, discovery of an unknown liquid in RWMC building WMF-698 in the vicinity of a corroded waste drum did not result in isolation of the area prior to further evaluation initiated by ICP radiation protection and industrial hygiene personnel. The “entry conditions” for EAR-278 do not clearly communicate roles and responsibilities and the associated actions for facility isolation during the radiation protection and industrial hygiene evaluation that would determine the need for continued implementation of this emergency procedure.

Deficiency D-CCP-1: Contrary to DOE/WIPP 02-3122, *Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, Sections 3.2.1 and 4.2.1, the visual inspection process, which implements CCP-TP-003, *CCP Shipping of CH TRU Waste*, prior to shipment of CH-TRU waste containers stored at RWMC is insufficient to identify all waste containers that are not in “good and unimpaired condition” prior to download into the WIPP disposal cell. In response to a recent discovery of a degraded waste drum that arrived at the WIPP facility, Fluor Idaho investigated the cause and extent of condition and subsequently created TrackWise Action Item No. 130997, *Fluor Responses for Degraded Container Received at WIPP*, and initiated actions to evaluate their response to WIPP’s discovery of the drum. The implementation of subsequent recommendations by Fluor Idaho and actions taken by CCP may address this deficiency. Nevertheless, this issue is still being identified as a deficiency as an effectiveness review has yet to be complete and the full origin and extent of condition is still unclear.

- Many waste containers stored at RWMC that receive a visual inspection for integrity prior to final load assembly have qualitatively significant rust and may be subject to harsh shipping conditions and additional degradation. Such conditions can compromise the integrity of these impaired containers before they are unloaded at the WIPP facility. Consequently, waste containers that leave ICP intact may not meet the WIPP WAC upon unloading.

- TRU sludge waste and potentially other waste streams that are currently being packaged at RWMC may create corrosive conditions that degrade and cause significant rusting of standard waste drums faster than considered in the basis for visual inspection processes conducted before shipment. In addition, due to frequent and extended WIPP outages, these waste drums may be stored for longer durations than initially planned and in atmospheric conditions that are not fully controlled. As a result, many waste drums stored at RWMC are subject to impairment. (See OFI-NWP-Fluor-1.)

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 Characterization

- The INTEC RTR unit that supports CCP characterization processes has been out of service for over six months, allowing the system operators' qualifications to lapse because they could not process training drums as required for qualification. The significance of this weakness is mitigated by the current inactivity of RH-TRU waste shipping to WIPP.
- DOE/ID-11005, *ICDF Complex Operational and Monitoring Sampling and Analysis Plan*, requires sampling of the Idaho CERCLA Disposal Facility (ICDF) Evaporation Pond sediment for key radionuclides every five years. However, no action levels are specified to help ensure compliance with hazard category 3 nuclear facility threshold inventory limits and limits for fissile isotope buildup in the sediment. Due to facility WAC concentration limits and previous sample results, this weakness is not an immediate concern. (See OFI-Fluor-3.)

Waste Stream Control

- Lack of coordination among contractors presents a missed opportunity to reduce waste container handling and enhance efficiency. (See OFI-NWP-Fluor-BEA-ID-CBFO-1.)
- Thorough VE processes and evaluations of AK for TRU waste streams performed at MFC are not credited by the TRU waste characterization programs certified by CBFO for implementation at ICP. Therefore, multiple waste container packaging operations must be performed.
- Interfaces among contractors, such as Fluor Idaho, BEA, and NWP (CCP), and their integrated process for characterizing TRU waste in support of WIPP shipments has sometimes required multiple waste container handling operations that may have been unnecessary. For example, VE data gained from qualified VE experts for an RWMC waste container could not be used for CCP characterization, because the VE was conducted before the container was included in an approved waste stream with a complete AK assessment; CCP can only perform certified VE on waste that has been included in one of their certified waste streams.
- Characterization of a waste container initially began in AMWTP, but because the contents were determined to be RH-TRU waste, it was transferred to INTEC building CPP-659, where examination, characterization, and subsequent repacking into three daughter containers was completed by CCP. The original waste container could not be certified by the AMWTP program because AMWTP's approved certification program does not recognize RH-TRU characterization, which is done exclusively by CCP for ICP. In addition, if any of the daughter containers are

determined to be CH-TRU waste, they will then need to be shipped back to AMWTP for certification.

- DOE/ID-10881, *ICDF Complex Waste Acceptance Criteria*, Sections 4.4.4, *Package Labeling and Marking*, and 4.4.6, *Bulk Non-containerized Waste*, exempts bulk waste containers from labeling requirements; however, these sections do not specify that container identification labeling used by IWTS is not exempt. During this assessment, no waste container identification labels were observed to deviate from requirements. (See OFI-Fluor-2.)
- Duplicate waste management procedures exist for AMWTP and non-AMWTP LLW/MLLW activities (e.g., MCP-4025 and MCP-1390). This duplication was driven by the establishment of separate certification programs for the Nevada National Security Site disposal site (i.e., one for AMWTP and one for the balance of ICP). Procedure consolidation would reduce redundancy because the program requirements are similar.
- Procedures and protective measures for processing waste containers with limited AK (i.e., “red” drums) are not yet defined, and the full range of hazards has not been identified, due to the limited information about the drum contents. As a result, methods for dealing with waste having limited historic information have not yet been proposed, and ways to address the associated chemical compatibility have not yet been identified. ICP is aware of this issue and, in accordance with its requirements, will not process these drums until this weakness has been addressed.

Packaging and Shipping

- Procedure TPR-1757, *55-Ton Cask Discharge to RH LLW Concrete-Lined Vaults*, Revision 55, does not include steps for installing the lifting fixture on the cask. The procedure directs workers to “lift the cask in accordance with the rigging sketch,” which shows the lifting fixture installed on the cask but does not provide detailed steps. A review of the procedure by personnel familiar with the task would help ensure that all necessary steps are included in sufficient detail. Fluor Idaho immediately initiated TrackWise Action Item No. 130996, *TPR-1757 Update*, to address this specific issue.

Quality Assurance

- For the generation of approved LLW and MLLW waste streams, Fluor Idaho does not procedurally require independent assessment of NRF processes to verify effective implementation. (See OFI-Fluor-1.)

Federal Oversight

- DOE-ID waste management and environmental compliance organizations responsible for ICP oversight are significantly understaffed; at the time of this assessment, only 9 of the 17.75 approved full-time equivalent positions were staffed.
- DOE-ID does not implement a single, centralized work instruction to ensure consistency in the rigor, periodicity, and timeliness of each ICP facility radioactive waste management basis (RWMB) review, and EM has not established a DOE requirement to perform periodic and timely reviews of RWMBs. Field element oversight of RWMBs can involve several work groups and encompasses several functional areas, such as environmental compliance, operations, and change management. For DOE-ID, the review process has generally taken less than a few months to complete, but at times has taken longer than one year. Currently, no DOE enterprise-wide guidance exists to establish expectations for performing RWMB reviews. (See OFI-EM-1.)

- A review of 20 DOE-ID assessments of varying types (e.g., surveillances, contract oversight assessments) revealed that the information in the reports generally has sufficient detail and is consistent with the DOE-ID work instruction for conducting assessments and entering information into the Zeus issues management system. However, in five of the reviewed assessments, Observations, as defined by 03.PD.04, *Process Description for Oversight*, were not entered into Zeus. DOE-ID management was aware of this weakness and indicated that, in order to ensure contractor and DOE-ID management has the opportunity to review and respond to observations as appropriate, assessors will be given direction to enter these Observations into the system.

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-Fluor-1:** Fluor Idaho should consider implementing a procedural requirement for ICP WGS to periodically visit NRF to assess the implementation of LLW and MLLW generation processes and maintain operational awareness of ongoing activities that may affect the ICP radioactive waste management program.
- **OFI-Fluor-2:** Fluor Idaho should consider specifying in DOE/ID-10881, *ICDF Complex Waste Acceptance Criteria*, Sections 4.4.4 and 4.4.6, that the IWTS identification labeling for bulk waste containers is not exempt from labeling requirements.
- **OFI-Fluor-3:** Fluor Idaho should consider specifying action levels in DOE/ID-11005, *ICDF Complex Operational and Monitoring Sampling and Analysis Plan*, to identify radionuclide threshold concentrations at which compliance with hazard category 3 threshold inventory and fissile isotope buildup limits in the ICDF Evaporation Pond sediment would become a concern.
- **OFI-NWP-Fluor-BEA-ID-CBFO-1:** NWP, Fluor Idaho, and BEA should consider collaborating to establish a method for qualifying AK, VE, and other characterization processes to support programs certified to ship TRU waste. In addition, ID and CBFO should consider contract changes where feasible to facilitate alignment of processes to reduce waste container handling and enhance efficiency.
- **OFI-NWP-Fluor-1:** Fluor Idaho and NWP should consider collaborating to evaluate waste container integrity inspection processes and criteria to ensure that the basis supports adequate identification of waste container degradation issues typically found for packaged RWMC sludges.
- **OFI-EM-1:** EM should consider working through the Low-level Waste Federal Review Group (LFRG) to develop a consolidated, DOE enterprise-wide set of criteria to guide the performance of RWMB reviews. Such guidance should describe rigor, periodicity, and timeliness goals.

Appendix A Supplemental Information

Dates of Office of Enterprise Assessments Onsite Assessment

November 18-21, 2019

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

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 accidentally 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.

