



Independent Assessment of Work Planning and Control for Cleanup Work at the Oak Ridge Reservation

November 2022

Office of Enterprise Assessments
U.S. Department of Energy

Table of Contents

Acronyms.....	ii
Executive Summary.....	iii
1.0 Introduction.....	1
2.0 Methodology.....	1
3.0 Results.....	2
3.1 Work Planning and Control Institutional Programs.....	2
3.2 Work Planning and Control Implementation.....	5
3.3 Contractor Assurance System.....	11
3.4 Oak Ridge Office of Environmental Management Oversight.....	12
4.0 Best Practices.....	14
5.0 Findings.....	14
6.0 Deficiencies	14
7.0 Opportunities for Improvement	15
Appendix A: Supplemental Information.....	A-1

Acronyms

ARA	Airborne Radioactivity Area
AWP	Asbestos Work Permit
CA	Contamination Area
CAS	Contractor Assurance System
CFR	Code of Federal Regulations
DEAR	U.S. Department of Energy Acquisition Regulation
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
EMWMF	Environmental Management Waste Management Facility
ES&H	Environment, Safety, and Health
FR	Facility Representative
HCA	High Contamination Area
HRA	High Radiation Area
IH	Industrial Hygiene
ISM	Integrated Safety Management
ISMS	Integrated Safety Management System
JHA	Job Hazard Analysis
LL	Lesson Learned
LOTO	Lockout/Tagout
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
OREM	Oak Ridge Office of Environmental Management
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
RA	Radiation Area
RPT	Radiological Protection Technician
RWP	Radiological Work Permit
SME	Subject Matter Expert
STARRT	Safety Task Analysis and Risk Reduction Talk
UCOR	United Cleanup Oak Ridge, LLC
WP	Work Package
WP&C	Work Planning and Control
Y-12	Y-12 National Security Complex

INDEPENDENT ASSESSMENT OF WORK PLANNING AND CONTROL FOR CLEANUP WORK AT THE OAK RIDGE RESERVATION

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of work planning and control (WP&C) at the Oak Ridge Reservation in August 2022. This assessment focused on the United Cleanup Oak Ridge, LLC (UCOR) WP&C processes for cleanup work, elements of the UCOR contractor assurance system, and the Oak Ridge Office of Environmental Management (OREM) oversight processes for WP&C.

EA identified the following strengths, including one best practice:

- The UCOR training organization uses a state-of-the-art virtual radiological protection training program designed to enhance radiological protection technician effectiveness in personnel monitoring and surveys. (Best Practice)
- UCOR has established a well-documented and integrated WP&C process that is managed by experienced subject matter experts and workers are involved in the work planning process.
- UCOR's safety and health program is well supported by qualified and experienced industrial hygiene, safety, and radiation protection managers and staff who have many years of experience with DOE.
- UCOR has demonstrated safe usage of vehicles, with no vehicle incidents reported for the 2022 fiscal year through June.
- UCOR effectively uses advanced heat strain physiological monitoring technology to remotely monitor workers in real time to help prevent heat injuries and illnesses.
- OREM has established a program with clear functions, responsibilities, authorities, and processes for conducting safety oversight and is staffed with knowledgeable and experienced Facility Representatives and Subject Matter Experts.

EA also identified some deficiencies, as summarized below:

- UCOR's procedure on fall prevention and protection does not clearly specify when a fall protection hazard analysis is required.
- UCOR improperly performed the changeout of 8,500-pound excavator attachments as exempt (skill of the craft) work and did not include appropriate controls in the work control documents.
- UCOR did not adequately address the fall hazard created by removal of shield wall blocks below the second-floor opening inside building 3005 in work control documents. Further, the fall hazard present during loadout of material from the second-floor roof was identified, but no fall protection hazard analysis was conducted and no controls for this activity were detailed in the work package or job hazard analysis.
- UCOR has not properly positioned radiological perimeter air samplers to monitor expected worst-case airborne concentrations during Environmental Management Waste Management Facility waste placement and during demolition work at building 9213.
- UCOR has not conducted sufficient radiological contamination surveys to confirm whether any contamination has spread during or after intrusive radiological work at building 9213 demolition.
- UCOR closed an issue involving a high contamination spill before completing all corrective actions and did not perform an effectiveness review of the corrective actions after they were implemented.

In summary, UCOR has a WP&C framework that is well documented with program plans and detailed implementing procedures. However, EA observed weaknesses in the areas of fall prevention and protection; inappropriate exemption of work from WP&C requirements; improper worksite monitoring for radiological contamination; lack of specificity in required radiological contamination surveys in radiological work permits; and ineffectiveness of the issues management system in ensuring that issues are not prematurely closed. OREM has a comprehensive and integrated process for oversight. Until the concerns identified in this report are addressed or effective mitigations are put in place, workplace hazards may not be identified and addressed to sufficiently protect workers' safety and health during cleanup work at the Oak Ridge Reservation.

INDEPENDENT ASSESSMENT OF WORK PLANNING AND CONTROL FOR CLEANUP WORK AT THE OAK RIDGE RESERVATION

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Worker Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of work planning and control (WP&C) for cleanup work performed by United Cleanup Oak Ridge, LLC (UCOR) at the Oak Ridge Reservation. Planning calls and document collection began in June 2022, and the assessment was conducted on site August 1-4 and August 15-18, 2022.

The Plan for the Independent Assessment of Work Planning and Control for Cleanup Operations at the Oak Ridge National Laboratory Buildings 3005 and 3010, August 2022, initially limited the scope of the assessment to work within buildings 3005 and 3010 at the Oak Ridge National Laboratory (ORNL). However, due to the limited amount of scheduled work at these two buildings, the scope was modified with the agreement of the Oak Ridge Office of Environmental Management (OREM) and UCOR to include work activity across the Oak Ridge Reservation. This assessment evaluated the effectiveness of the implementation of the integrated safety management (ISM) core functions (define the scope of work, identify and analyze hazards, identify and implement controls, perform work safely within controls, and provide feedback and make improvements) for activity-level work involving cleanup activities. This assessment also evaluated elements of the contractor assurance system (CAS) and the oversight of WP&C provided by OREM.

Cleanup work is performed at the Oak Ridge Reservation at three sites inside a 32,000-acre area: ORNL, the East Tennessee Technology Park, and the Y-12 National Security Complex (Y-12). OREM has cleanup responsibilities at all three of these sites that involve deactivating and demolishing excess facilities, including former reactors and hot cell facilities. Some of these facilities are considered high risk. This work also includes remediating contaminated soil, water, and infrastructure, and treating, removing, and disposing of waste. The low-level radioactive and hazardous wastes generated from cleanup work are transported to the onsite Environmental Management Waste Management Facility (EMWMF) for disposal. Leachate from the EMWMF cells is collected and stored in nearby tanks and transported by tanker truck to ORNL for processing.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which is implemented through a comprehensive set of internal protocols, operating practices, assessment guides, and process guides. This report uses the terms “best practices, deficiencies, findings, and opportunities for improvement (OFIs)” as defined in the order.

As identified in the assessment plan, this assessment considered objectives and criteria from DOE Guide 226.1-2A, *Federal Line Management Oversight of Department of Energy Nuclear Facilities*, appendix D, *Activity Level Work Planning and Control Criterion Review and Approach Documents with Lines of Inquiry*. EA used elements of Criteria and Review Approach Document (CRAD) EA-30-07, Rev. 0, *Federal Line Management Oversight Processes*, to collect and analyze data on OREM oversight activities related to WP&C. EA also used objectives and criteria from EA CRAD 32-03, Rev. 1, *Industrial Hygiene Program*; CRAD EA-32-10, Rev. 0, *Construction Safety*; and CRAD EA-30-01, Rev. 1, *Contractor Assurance System*.

EA observed the planning and implementation of 20 onsite work activities associated with the cleanup of buildings 3003, 3005 and 3010 at ORNL; debris placement in cell 6 of EMWMF and leachate loading at EMWMF and unloading at ORNL; cleanup of building 9213 at Y-12; and soil remediation at East Tennessee Technology Park. EA examined key activity-level work control documents, such as WP&C plans and procedures, job hazard analyses (JHAs), work packages (WPs), manuals, analyses, and policies. EA also interviewed key personnel responsible for developing and executing the associated programs and walked down relevant portions of specific facilities.

Appendix A lists the members of the assessment team, the Quality Review Board, and management responsible for this assessment.

There were no findings from previous assessments for follow-up addressed during this assessment.

3.0 RESULTS

The objective of this assessment was to verify that UCOR manages and performs work in accordance with a documented safety management system that defines the scope of work, identifies and analyzes hazards associated with the work, develops and implements hazard controls, performs work within controls, provides feedback on the adequacy of controls, and continues to improve safety management. These are in accordance with the DOE requirements for an integrated safety management system (ISMS) as defined in 48 CFR 970.5223-1(c), *Integration of Environment, Safety, and Health into Work Planning and Execution*, and DOE Policy 450.4A, *Integrated Safety Management Policy*.

This section provides assessment results in the areas of WP&C institutional programs, WP&C implementation, CAS, and OREM oversight.

3.1 Work Planning and Control Institutional Programs

This portion of the assessment evaluated whether UCOR has established WP&C programs and processes at the institutional level that enable the safe performance of work.

UCOR implements contract requirements for WP&C through established WP&C program documents and procedures that address DOE ISM requirements with support from other institutional programs, including staffing, personnel training and qualification, and environment, safety, and health (ES&H) disciplines, such as radiation protection, industrial hygiene (IH), industrial safety, and electrical safety, as described in this section.

UCOR WP&C processes are written in accordance with DOE Policy 450.4A with some exceptions identified later in this section. The Oak Ridge Reservation Cleanup Contract appropriately includes the ISMS DOE Acquisition Regulation (DEAR) clause, DEAR 970.5223-1, as well as clause DOE-H-2053, *Worker Safety and Health Program in Accordance with 10 CFR 851 (Oct 2014)*. ISMS and worker safety and health are appropriately addressed in POL-UCOR-020, *Integrated Safety Management*; PPD-EH-1400, *ISMS Program*; and PPD-EH-1745, *Worker Safety and Health Program*.

UCOR's safety and health program areas are well staffed with qualified and experienced professional and technical staff. The IH, safety, and radiation protection managers and staff have many years of experience with DOE, including some with advanced degrees and/or certifications in their areas of discipline. To meet the growing need for skilled entry-level technical workers, UCOR has effectively partnered with other local DOE contractors and a university consortium to provide such personnel to the Knoxville/Oak Ridge area. This successful initiative is providing well trained personnel, including IH

technicians, to support ongoing and future UCOR projects. Several IH technicians who graduated from this program are now on UCOR's staff.

UCOR's training program supports the safe performance of work through appropriate workforce training and qualification processes. PRO-TC-0702, *Training Program*, and PRO-TC-0722, *Site Access Requirements and Site Access Cards*, adequately describe the processes for ensuring that workers are appropriately trained and that their training is up to date. Reviewed training records and qualification cards for work planners, craft workers, and ES&H subject matter experts (SMEs) are comprehensive and cover appropriate safety and health topics. The block scheduling system and biennial consolidated training approach are efficient processes for providing refresher training. The Local Education Administrative Requirements Network system provides supervisors ready access to a worker's training status to help ensure they are current on training prior to work; also, workers wear site access cards, which display training status and refresher due dates.

The UCOR training organization recently improved its training program with state-of-the-art virtual technology and topical instruction modules to enhance radiological protection technician (RPT) personnel monitoring and survey effectiveness. These improvements included procuring the VIZRAD® virtual frisking mannequin that can be programmed with virtual contamination, obviating the need for radioactive sources. VIZRAD provides real-time quantitative evaluation of trainees' whole body frisking effectiveness based on probe speed and distance from the source. Trainees also practice locating simulated contamination on the mannequin using survey meters equipped with radio frequency technology. Also, RPTs are now cycled through various topical radiological survey performance training modules, which change quarterly, to enhance and maintain expert knowledge and skills. EA considers the virtual radiological protection mockup capability to be a Best Practice.

PROC-FS-1001, *Integrated Work Control Program*, provides adequate direction for WP&C. PROC-FS-1001 adequately addresses work scope contents and a scoping walkdown; hazards identification, analysis, and controls through the job hazards analysis (JHA) process; work performance instructions; work authorization and release; worker briefings (pre-evolution and/or safety task analysis and risk reduction talk (STARRT)); and WP closure. The types of work (exempt and planned) are adequately defined. Exempt work is skill-of-the-craft work, and approved exempt work is included in UCOR Form 2313, *Exempt List*. Planned work includes Type 1 and 2 work packages. A Type 1 work package is developed for a single activity and requires step-by-step instructions. A Type 2 work package may be used for multiple activities and does not require step-by-step instructions. Type 3 work is like exempt work in that it is low hazard work that is addressed by UCOR general health and safety documents and training, does not require a JHA, and is not considered planned work. Since it is not on the exempt work list, the form for Type 3 work determination (Form 789) must be completed.

The JHA process is led by trained and qualified work planners and appropriately involves craft workers and ES&H SMEs to identify hazards and controls. The qualification process for UCOR work planners is comprehensive. It appropriately includes formal training, required reading, oral board evaluation of knowledge level for numerous topics, and a practical factors section requiring the development of WPs. Additionally, participation in JHAs and pre-evolution briefings are required. A candidate work planner is required to demonstrate leadership of a JHA team composed of craft workers and ES&H SMEs. JHA teams are appropriately involved in the identification and analysis of hazards and control selections through a JHA walkdown and JHA tabletop review.

UCOR maintains a mature radiation protection program that includes a comprehensive document hierarchy consisting of plans, technical basis documents, and procedures. These flow down the radiological requirements of 10 CFR 835, *Occupational Radiation Protection*, to the working level in support of WP&C, including the UCOR radiation protection program (PPD-RP-4000, *Radiological*

Protection Process/Program Description) and detailed implementing procedures governing radiological performance in key WP&C areas. These documents effectively address such subjects as entry control, radiological work permits (RWPs), as low as reasonably achievable (ALARA) review development, posting and labeling, radiological surveys and monitoring, air sampling, radiological incident reporting, and related functions.

The UCOR IH program provides adequate programmatic guidance for the identification and analysis of IH hazards. This includes a thorough document hierarchy including hazard identification, analysis, and control development procedures that flow down 10 CFR 851, *Worker Safety and Health Program*, requirements to the working level. These processes and procedures are comprehensive, well written, and effectively integrated into the work control process as established by PROC-FS-1001.

UCOR PPD-EH-2009, *Electrical Safety Program*, effectively integrates the requirements of 10 CFR 851, including National Fire Protection Association (NFPA) 70-2020, *National Electrical Code*; NFPA 70E-2018, *Standard for Electrical Safety in the Workplace*; and Occupational Safety and Health Administration (OSHA) 29 CFR 1910, subpart S, *Electrical*. These requirements are implemented effectively through two procedures: PROC-DE-1023, *Preparation and Maintenance of Arc Flash Hazard Analysis for AC and DC Electrical Systems*, which appropriately requires that arc flash and shock information be communicated to all affected workers either by use of the arc flash warning label or by information provided in work procedures; and PROC-EH-2002, *Hazardous Energy Control Lockout Tagout*, which effectively incorporates the lockout/tagout (LOTO) requirements of OSHA 29 CFR 1910.147, *The control of hazardous energy (lockout/tagout)*, OSHA 29 CFR 1910.333(b), *Working on or near exposed deenergized parts*; and NFPA 70E-2018, article 120, *Establishing an Electrically Safe Work Condition*. An electrical safety committee is staffed with SMEs and Authorities Having Jurisdiction who are qualified in all aspects of electrical safety in accordance with the requirements of PPD-EH-2009, sec. 2.3, *Electrical Safety Committee* and UCOR-4350, *Training Requirements Matrix*. The committee maintains the currency of the electrical safety program, appropriately adjudicates any concerns or issues regarding electrical safety, and serves in an advisory capacity.

The vehicle safety program provides the necessary requirements for safe driving on and off site. PROC-EH-2020, *Safe Use of Vehicles*, appropriately addresses this topic. The performance metrics for vehicle usage demonstrate excellent performance in this area, with no vehicle incidents reported for fiscal year 2022 (through June 2022). PROC-FO-1073, *Vehicle Construction Equipment Spotter*, requires that spotters be trained on each specific piece of equipment. EA observed an innovative virtual reality training course for spotters that is planned to be rolled out in January 2023. It includes separate modules for spotters, telehandlers, forklifts, boom lifts, dump trucks, trucks and trailers, backhoes, and excavators. Each module contains training for hazard recognition, completing a spotter form, blind spot identification, and signal assessment.

While most UCOR WP&C institutional programs are adequate, EA identified four weaknesses:

- Contrary to PPD-EH-1745, sec. 3.1.8, some existing fall protection direction in PROC-EH-2006, *Fall Prevention and Protection*, is unclear and conflicting. (See **Deficiency D-UCOR-1**.) PROC-EH-2006 does not clearly specify when a fall protection hazard analysis is required. Also, the Type 3 work determination form provides conflicting fall protection guidance by excluding work using secondary fall protection (personal fall arrest systems) but allowing unprotected elevated construction work at heights over six feet. Unclear and conflicting fall protection requirements can result in unprotected workers being exposed to fall hazards.
- The process for exempt work (i.e., skill of the craft) in accordance with PROC-FS-1001 and using UCOR Form 2313, *Exempt List*, does not always ensure this work is appropriately coordinated,

authorized, and performed. The Facility Manager is only required to authorize exempt work verbally. No documentation is required, and exempt work is not required to be identified on the daily work authorization list. However, the daily work authorization list for some facilities, such as EMWMF, includes exempt work, and some Facility Managers document release of work daily on their narrative logs, although log documentation is not required. Also, some categories of exempt work were not sufficiently defined to prevent work scope creep. For example, EWL-035, *Vehicle and Equipment Fueling, Inspection, Maintenance and Basic Repair*, does not state whether it is applicable to heavy equipment, and EWL-024, *Pipefitting/Plumbing NOT Requiring Configuration Control*, does not state that hot work activities, such as brazing and welding, cannot be performed. (See **OFI-UCOR-1.**)

- The “What If Analysis” process required by PROC-FS-1001 is informal, and no training is provided to ensure proper implementation. PROC-FS-1001 states that “The JHA process uses a ‘What If Analysis’ approach to look at the hazards presented by the work and workplace.” Training Module 31212, *UCOR Job Hazards Analysis for Planners*, directs work planners to use the “What If Analysis” process but does not include training on the process. UCOR’s training library does not include any training courses on hazard analysis techniques. (See **OFI-UCOR-2.**)
- PROC-RP-4030, *Radiological Area Entry Control*, which governs RWP development, does not ensure appropriate linkage and tailoring of RWPs to the specific work tasks and activity level radiological hazards associated with Type 1 and Type 2 WPs developed under PROC-FS-1001. Specifically, PROC-RP-4030 does not address requirements associated with the WP types identified in PROC-FS-1001. This lack of linkage can result in assigning RWPs that are too broad to convey the specific information required by PROC-RP-4030. An example of this concern is discussed below in sec. 3.2. (See **OFI-UCOR-3.**)

Work Planning and Control Institutional Programs Conclusions

UCOR’s WP&C framework is well documented with program plans and detailed implementing procedures, consistent with DOE Policy 450.4A. UCOR’s safety and health program areas are staffed with qualified and experienced professional and technical staff. UCOR’s training program supports the safe performance of work through appropriate workforce training and qualification processes, including a best practice for the virtual radiological protection mockup training program. Workers are appropriately involved in the work planning process. Supporting institutional programs, including radiological protection, IH, electrical safety, and vehicle safety, are effectively integrated into the WP&C processes. However, EA identified weaknesses in the areas of fall protection, exempt work, training for hazards analysis, and the development of RWPs that are linked and tailored to the work.

3.2 Work Planning and Control Implementation

This portion of the assessment evaluated UCOR’s implementation of the WP&C institutional programs through the core functions of ISM: defining the scope of work, identifying and analyzing hazards, developing and implementing hazard controls, and performing work within controls.

Defining the Scope of Work

Work scopes in reviewed activity level work control documents developed under the UCOR WP&C process were generally sufficiently detailed to permit analysis of hazards and specification of necessary controls. For example, WP2-22-EF2274, *ORNL- Reactor Shield Wall Removal at Building 3005*, contained a detailed description of work scope, including shield wall removal instructions from engineering, silica dust emissions and beryllium controls from IH, and associated work activities.

Similarly, technical procedures PROC-EMWMF-OP-017, *Transfer of Leachate to Tankers*, and PROC-LGWO-607.1, *5000 Gallon Waste Tanker*, adequately scoped transferring leachate from EMWMF holding tanks to a tanker vehicle and from a tanker vehicle to ORNL's liquid and gaseous waste operations receiving system, respectively. WP3-22-OR3005, *Installing Timing Relays at 2651 Emergency Generator*, effectively referenced DCN-22-1532-2651, *Upgrades to 2651 Power System*, for details of component changes to support heat trace work. Finally, exempt carpentry work outside building 3005 was performed within the bounds described in Form 2313, *UCOR Exempt List*, including appropriate use of hand tools.

While the work scopes in most reviewed activity level work control documents were adequate, contrary to PROC-FS-1001, sec. C, exempt work associated with the changeout of 8,500-pound excavator attachments under WP2-22-EF2285, *Y-12 Demolition of Building 9213, Associated Buildings and Slabs*, was conducted as an integral part of Type 2 work but was not included in the Type 2 WP and did not meet the defined criteria of EWL-035. (See **Deficiency D-UCOR-2.**) Excluding exempt work from a WP can result in unclear roles and responsibilities, and inappropriate use of the exempt list to exclude activities from work planning can result in unidentified hazards and lack of appropriate controls.

Three specific concerns were noted. First, WP2-22-EF2285 did not include the hydraulic excavator attachment changeout activity in the scope of work. PROC-FS-1001 states: "If Exempt Work will be conducted as an integral part of Type 2 work, the required actions should be included in the Work Package." Second, UCOR exempt list item EWL-035 was inappropriately used as the basis for not planning a work evolution to change out the hydraulic excavator attachments. This work is not consistent with the work description in EWL-035 and is not addressed by general JHA-19-UCOR-GEN001, *General Work Activities Hazards Analysis*. Lastly, the use of a forklift to move the excavator attachments was incorrectly excluded from the STARRT card for the demolition work and the STARRT card for the maintenance mechanics. Performing the excavator attachment changeout activity as exempt work exceeded the scope of work included in EWL-035 and led to unclear responsibility for oversight of the forklift work with WP2-22-EF2285.

Identifying and Analyzing Hazards

With one exception discussed below, UCOR adequately identified and analyzed hazards for observed work. For example, a job specific JHA was prepared and adequately identified hazards for the following WPs:

- WP2-22-EF2302, *ORNL Building 3010 Footprint Cut, Cap and Plug Slab Penetrations and Utilities and Build Berm*
- WP2-22-EF2285, *Y-12 Demolition of Building 9213, Associated Buildings and Slabs*
- WP2-19-EF2050, *WC22 ORNL Building 3003 Asbestos Removal*
- WP2-21-EF2257 WC-15, *Biology Complex EU5 SWPPP Clean Slab Removal – Slab 9211*
- WP2-21-EF2257 WC-14, *Biology Complex EU5 SWPPP Clean Slab Removal – Slab 9208*
- PPD-KD-1685, *Horizon Center Clean Backfill Operation*.

EA also observed a JHA team walkdown conducted for WP2-22-EF2343, ORNL 3010, *Vent and Remove Valves on Helium and Nitrogen Cylinders*. Two work planners led the walkdown, and the JHA team members included the superintendent, foreman, craft workers, and ES&H SMEs. They appropriately identified relevant hazards and controls associated with this work.

UCOR adequately identified and analyzed hazards for most of the observed work. However, contrary to 29 CFR 1926.501(b)(1), *Unprotected Sides and Edges*, UCOR did not identify, analyze, or control fall

hazards greater than six feet for observed work associated with WP2-22-EF2274. (See **Deficiency D-UCOR-3**.) Unidentified, unanalyzed, and/or uncontrolled fall hazards can result in significant worker injuries or fatalities. A fall hazard created by removal of shield wall blocks below the second-floor opening inside building 3005 was not identified; consequently, controls for this fall hazard were not specified. Also, the fall hazard present during loadout of material from the second-floor roof was identified, but no fall protection hazard analysis was conducted and no controls for this activity were detailed in the WP or JHA. During this work, an employee was exposed to an uncontrolled fall hazard. Upon witnessing this exposure, a UCOR safety representative immediately informed the job foreman. UCOR properly paused work, conducted a “The Rest of The Story” meeting the day the issue was identified, and paused all elevated work across UCOR projects at the Oak Ridge Reservation to perform an extent-of-condition review to ensure that the appropriate work control requirements were in place. UCOR subsequently revised applicable WPs and JHAs to address these fall hazards.

Developing and Implementing Hazard Controls

Hazard controls were generally effectively developed and implemented through reviewed WP instructions, JHAs, and hazard specific permits, such as RWPs, IH work permits, asbestos work permits (AWPs), and LOTO. Job-specific JHAs for the reviewed WPs included hazard control measures for each identified hazard (except for the fall protection hazard discussed above), and the proper hierarchy of controls was noted – engineered, administrative, and personal protective equipment (PPE). For example, WP instructions for access to the west control room roof of building 3005 identified load limits, which appropriately included use of plywood to spread the roof load, limiting roof access to two people or 500 pounds, and restricting the telehandler from placing the waste box or pallet on the roof. RWPs for leachate loading at EMWMF and leachate unloading at the ORNL liquid and gaseous waste operations facility were adequately tailored to the technical procedures and included the radiological information required by PROC-RP-4030, *Radiological Area Entry Control*. IH work permits were also included in reviewed WPs and were comprehensive and adequate to address the identified hazards and required controls. A LOTO for WP3-22-OR3005 was properly identified as a single source LOTO.

Despite generally effective development and implementation of hazard controls, EA identified the following five weaknesses:

- Contrary to PROC-RP-4514, *Workplace Air Monitoring for Radioactivity*, and UCOR-4390, *Technical Basis for the Air Monitoring Program*, UCOR has not properly positioned radiological perimeter air samplers to monitor expected worst-case airborne concentrations during EMWMF waste placement and demolition work at building 9213. (See **Deficiency D-UCOR-4**.) The lack of representative air sampling during intrusive radiological work can result in undetected airborne excursions and/or radioactivity concentrations that may require work area boundaries to be posted as an airborne radioactivity area (ARA).

Specifically, PROC-RP-4514, sections B.3 and B.5 require mandatory air samples for work located in contamination areas (CAs) at the perimeter of work areas for demolishing or decontaminating buildings or other structures, and during radioactive waste disposal/burial operations. UCOR-4390 sec. 2.4 states that such air samplers are to be placed in locations expected to be representative of worst-case airborne concentrations. RWP 38819, *General Waste Disposal Operations*, and RWP 39924, *Demolition of Building 9213*, specifies these areas as CAs and requires “perimeter” air sampling. However, air sampling equipment at EMWMF and building 9213 was observed at positions along the site perimeter instead of the work area/posted CA boundaries, which are more representative of potential elevated airborne radioactivity. A reviewed UCOR documented technical position paper, intended to justify current air sampling practices for EMWMF that deviate from PROC-RP-4514 requirements, addresses only the historical and current practices that have reduced

the number and frequency of personal (breathing zone) air samples; it does not address the positioning of air samplers at more distant locations beyond the work area/posted CA boundaries.

- Contrary to PROC-RP-4513, *Workplace Monitoring*, section A.3, which requires verification of the effectiveness of engineered and administrative controls in containing radioactive material, UCOR has not performed sufficient radiological contamination surveys to determine whether contamination from intrusive radiological work at building 9213 demolition has spread. (See **Deficiency D-UCOR-5.**) Not performing proper contamination surveys during and after radiological work can result in unnecessary spread of contamination to clean areas.

Specifically, PROC-RP-4513 requires the maintenance and verification of controls to prevent the inadvertent transfer of removable contamination to locations outside of designated radiological areas under normal operating conditions. However, RWP 39924 did not require verification contamination surveys, nor were such surveys performed to demonstrate that liquid runoff from rainfall or windblown deposition of radioactive material beyond posted CA boundaries had not occurred during or after intrusive work at building 9213.

- One of the five RWPs governing observed radiological work did not adequately tailor the radiological controls to the job-specific radiological hazards and governing work control document (a Type 2 WP). UCOR used RWP 39362, *Intrusive Work in CAs/RAs, HCAs/ARAs, and HRAs at ORNL*, for the Type 2 WP (WP2-22-EF2274) activities. Instead of preparing a new job-specific RWP aligned with the WP work scope, hazards, and controls, UCOR used the broader RWP 39362. Although this RWP lists a task for “removal and disposal of shielding,” it exhibits the following weaknesses: (See **OFI-UCOR-3.**)
 - The RWP does not specifically address the concrete block shielding removal being performed in building 3005, which entails reducing the disposal material size and considering the associated airborne radiological hazards.
 - Some radiological information that PROC-RP-4030 requires is missing from RWPs, including details of the specific work locations/building numbers and the actual and expected radiological conditions based on recent survey data.
 - The RWP unnecessarily includes all types of posted radiological areas that could be encountered at ORNL (e.g., CA, RA, HCA, ARA, HRA) and the associated PPE requirement for each, when some of these were not applicable to the work.
 - Because RWP 39362 does not refer to WP2-22-EF2274, and WP2-22-EF2274 does not reference RWP 39362, workers would have no easy way of verifying that the correct RWP was used for the work.
- A Hanford Site lesson learned (LL), *2020-KBO-0002 Excavator with a Metal Shear Attached Sustained a Broken Lower Windshield*, appropriately attached to WP2-22-EF2285, recommended the use of level 1 ballistic (shatterproof) glass for excavators using metal shears. Discussions with UCOR management determined that UCOR uses an inferior glass recommended by the equipment rental company instead of level 1 ballistic glass. (See **OFI-UCOR-4.**)
- One AWP for WP2-19-EF2050 improperly identified the controls for removing flooring and mastic as “Not Applicable” when this was the scope of work to be performed. The AWP was corrected when the error was identified, and the observed work was performed as required with proper controls in place. UCOR addressed this concern and has implemented a professional IH peer check to reduce the risk of additional mistakes on AWPs.

Performing Work Within Controls

UCOR adequately performed observed work within defined work controls by effectively implementing work planning, pre-evolution briefings, stop/pause work authority, and work status logs with supporting radiological, IH, material handling, and electrical work activities.

UCOR effectively conducts daily plan-of-the-day meetings and daily work authorization list meetings to review planned work. Appropriate representation was observed at these meetings. Planned work is generally appropriately authorized and released. Observed work was authorized and released by the Facility Manager, as noted on the *Daily Work Authorization List* and on the WP work status logs. However, one observed exempt carpentry work activity (modifications to pallet handrails) was performed at building 3005 without the release of the Facility Manager.

Pre-evolution briefings and STARRT cards are effective tools used to inform workers of work scope, hazards, and controls. The observed pre-evolution briefings were well attended, covered appropriate topics, and used a reverse briefing methodology to encourage group participation. The foreman/supervisor led the briefing, and the industrial safety, IH, and radiological protection SMEs addressed hazards and controls in their areas. The observed STARRT card briefings demonstrated effective interactions and participation when the supervisor/foreman asked questions of workers and supplied answers or direction as needed. General hazards and task-specific information from the RWP, IH work permit, AWP, and waste management were also covered well.

Stop/pause work authority is emphasized throughout the WP&C processes, and the interviewed workers were aware that they had this authority. Multiple examples of pause work were observed:

- During a STARRT card briefing, the start of work activities was appropriately delayed until the morning fog had cleared enough to allow a safe level of visibility.
- The silica competent person correctly paused work at area EU5 when dust was observed during excavation and loading of concrete debris into trucks. A water truck subsequently provided dust suppression, and loadout resumed.
- Work was appropriately paused when mastic was found during shield wall block removal for WP2-22-EF2274. Asbestos sampling was conducted, and work resumed after negative sample results were obtained.

The reviewed WP work status logs provided excellent documentation of daily activities for all reviewed Type 2 WPs. Work status logs were up to date, were appropriately documented, legible, and included the daily activities, events, and work release by the Facility Manager. The work status logs for WP2-21-EF2257, performance pages WC-14 and WC-15 identified suspect asbestos-containing material and an excavator windshield crack, respectively.

Radiological practices associated with donning and doffing PPE, radiological job coverage, surveys, and contamination control for observed work were effectively implemented. For example, workers were diligent and followed appropriate donning and doffing practices in accordance with RWPs during observed radiological work. Workers were also observed to properly wear required PPE, including personal air purifying respirators, as well as radiological and IH breathing zone air samplers. RPT job coverage for the observed work was appropriate, and survey reports were legible and properly documented. In addition, RPT whole body frisking of workers exiting CAs was performed diligently.

IH practices associated with hazard identification, evaluation and control, and work execution for various contaminants and hazards (e.g., asbestos, beryllium, solvents, noise, heat stress) for the observed work were effectively implemented. UCOR has adequately staffed the IH organizations with technically qualified staff. Each observed work activity had IH technician staff on the scene through all work evolutions. The IH technicians assisted in the PPE donning and doffing activities, affixed sampling pumps as required, dressed out, and actively observed/supported the craft executing work, allowing emerging issues to be addressed quickly and appropriately. Interviewed IH lead technicians were knowledgeable and technically competent in administering IH sampling equipment for silica, asbestos, and beryllium. The sampling pumps were managed appropriately, and sampling cassettes were controlled as required by procedure and standard practice. Having IH technicians in the field and involved with ongoing operations ensures that they have real time information that can be used for adjusting monitoring strategies and interpreting sample results. Data management and recordkeeping was appropriate.

As a part of its IH practices, UCOR has also implemented a strong heat stress control program. The risks of heat-related injury and illness and the means to control them were emphasized at all pre-evolution and STARRT card briefings. Generous supplies of chilled water were available at each observed work location. The program requires the use of a card (Form 1165, *Heat Evaluation and Work-Rest Regimen*) whenever the ambient temperature is expected to exceed 80 °F. UCOR is also using advanced heat strain physiological monitoring technology to remotely monitor worker physiological strain in real time. Multiple workers can be monitored from a central location, and employees receive a tactile alarm as their stress levels increase. A significant benefit to worker health and safety is the ability to recognize initial heat injury or illness indicators before workers become at risk so they can be moved to a place where they can recover.

Material handling requirements were also implemented effectively. Equipment operators and vehicle/construction equipment spotters were appropriately trained. Pre-shift equipment inspections and vehicle/construction equipment spotter safety checklists were properly completed, and material was handled safely for all observed operations.

Electrical work practices and LOTO requirements were implemented effectively for the observed electrical work for Type 3 WP, WP3-22-OR3005. Hazards were properly controlled by barricading the work area, appropriate shock and arc flash PPE was used, a single source LOTO was correctly installed, and the absence-of-voltage test was performed effectively. Final terminations of the newly installed leads were not completed until an Authority Having Jurisdiction inspection could be completed, as required by the electrical safety procedure.

While UCOR adequately performed most of the observed work within defined work controls, EA identified one isolated example of a contamination control weakness during leachate tanker loading at EMWMF. A worker wore outer leather work gloves to handle the fill nozzle and five-gallon drip pail when taking a swipe sample after leachate pumping was complete. Although he appropriately held the handrails with his gloved hands while descending the stairs from the elevated platform (a clean area), he could have contaminated the handrails because the RPT surveyed his hands only when he reached ground level.

Work Planning and Control Implementation Conclusions

UCOR is generally effective in defining the scope of work, identifying and analyzing hazards, developing and implementing hazard controls, and performing work within controls. However, EA identified four deficiencies. These included performing exempt work that exceeded exempt work scope and not integrating the work into the Type 2 WP; not identifying and controlling fall hazards at greater than six feet; not properly positioning radiological perimeter air samplers to monitor expected worst-case airborne

concentrations; and not specifying in RWPs or conducting required radiological contamination surveys to determine whether contamination from intrusive radiological work areas has spread.

3.3 Contractor Assurance System

This portion of the assessment evaluated whether UCOR has established a CAS to plan and conduct risk-based assessments, analyze and manage WP&C related issues and associated corrective actions, review performance (including feedback and improvement), and share LLs.

UCOR has established a generally effective CAS as required by Clause H.50 of the Oak Ridge Reservation Cleanup Contract. OREM approved the current UCOR CAS Description document on April 20, 2022. The UCOR Performance Management, Quality Assurance, WP&C, and ES&H organizations provide satisfactory corporate processes, assessments, issues management tools, training, and periodic performance reports to support CAS implementation.

UCOR plans and conducts a generally effective set of assessments. PROC-PQ-1420, *Assessments*, and PROC-PQ-1401, *Independent Assessments*, provide adequate guidance on processes and requirements for conducting assessments. UCOR uses Form 3433, *Risk Informed Scorecard*, to assign an appropriate risk value to each (non-regulatory driven) assessment being considered for inclusion in the integrated assessment schedule. Lead assessors are formally trained with annual proficiency reviews. Formal assessments include independent assessments and management assessments. In fiscal years 2021 and 2022 (through June 2022), UCOR conducted 572 formal assessments, with 100 (17.5%) addressing WP&C. An interviewed performance assurance manager explained that out of those 100 WP&C related assessments, 82 appropriately included observations in the field. Reviewed assessments included seven management assessments and five independent assessments. These assessments were generally robust and self-critical, with findings/corrective actions tracked in the Corrective Action Management System. However, UCOR does not perform periodic independent assessments to determine how well applicable LLs, OFIs, and worker feedback are captured, analyzed, shared, and subsequently implemented in applicable work control documents. (See **OFI-UCOR-5**.)

UCOR uses a generally systematic and appropriate approach for event and issue analysis, development of corrective actions, and tracking of corrective action status. PROC-PQ-1210, *Issues Management Program*, and PROC-PQ-1220, *Occurrence Notification and Reporting*, provide requirements and effective guidance for managing events, issues, extent-of-condition reviews, corrective actions, effectiveness reviews, OFIs, and LLs. The Corrective Action Management System effectively supports tracking of issue/event causal analyses, corrective action tracking, extent-of-condition reviews, LLs, and effectiveness reviews. Causal analysts are formally trained and qualified at two levels (apparent cause analysis and root cause analysis). Three reviewed Occurrence Reporting and Processing System (ORPS) reports demonstrated adequate causal analyses and corrective action development. UCOR has appropriately established a corrective action review board consisting of senior managers to approve, monitor, and track significant corrective actions.

Most of the reviewed issues management activities were adequate, but contrary to PROC-PQ-1210, UCOR closed issue number IF-2022-0016, *High Contamination Spill in Contamination Area (CA) and Contamination Found Outside Posted CA*, before completing all corrective actions. (See **Deficiency D-UCOR-6**.) Closing issues before all corrective actions are complete may allow issues to persist. Also, contrary to PROC-PQ-1250, *Management Control Plan*, UCOR did not perform a required effectiveness review for issue number IF-2022-0016. (See **Deficiency D-UCOR-7**.) Not performing an effectiveness review results in a lack of assurance that the associated corrective actions will prevent recurrence of the event. UCOR-5502, *Management Control Plan for ORREC/ORNL Projects at Isotope Row, 3038*

Building and 3026 East Cell Bank, does not identify the expectation to perform an effectiveness review in accordance with PROC-PQ-1250; accordingly, no effectiveness review was performed.

UCOR has generally effective processes and tools for reviewing performance, sharing LLs, and collecting worker feedback. Periodic performance reviews and reports include appropriate monthly corrective action review board metrics; monthly performance reports; monthly contract performance evaluation management plan updates; monthly ISMS performance, objectives, measures, and commitments reports; and quarterly contractor assurance reports. Interviewed workers confirmed that worker feedback and improvement recommendations solicited through the local safety improvement teams' safety observation cards are appropriately tracked and acted upon. Although UCOR bins significant and adverse events according to applicable ISM core function, it does not track and trend them as WP&C metrics and has not identified a specific set of key leading and lagging performance metrics for WP&C. (See **OFI-UCOR-6**.)

PROC-PQ-1240, *Operating Experience/Lessons Learned Program*, (OPEX/LL) provides adequate guidance on collecting and distributing LLs. The LL program coordinator appropriately distributes DOE operating experience LLs, event LLs, and other LLs generated locally. The UCOR weekly operating experience/LL summary reports are well-written and distributed throughout the organization. OPEX/LL coordinators provide valuable assistance to project and functional managers with the identification, origination, distribution, response, and feedback of LLs. Relevant and timely LLs are appropriately shared with the workforce through the direct inclusion of LLs into WPs and the distribution of daily plan-of-the-day notes that include LLs. The number of LLs used to improve work planning and work documents is calculated at the end of each month and appropriately tracked as a formal metric in UCOR's contractor assurance quarterly report. LLs are assigned to SMEs for review as manager condition reports in the quality assurance system. Changes (e.g., work control document modifications), when required, are entered into the Corrective Action Management System for appropriate tracking and accountability.

Post-job review checklists (Form 771) and STARRT cards are used effectively to identify worker feedback on topics related to WP&C. However, such feedback is not formally collected and analyzed (e.g., binned according to applicable ISM core function) and trended across UCOR projects. Worker feedback is an essential element of an organization's continuous improvement in WP&C. (See **OFI-UCOR-7**.)

Contractor Assurance System Conclusions

UCOR has established a generally effective CAS that provides appropriate corporate processes, assessments, issues management tools, and periodic performance reports. The reviewed independent assessments and management assessments were generally robust and self-critical. UCOR uses a generally systematic and appropriate approach for event and issue analysis, development of corrective actions, and tracking of corrective action status. UCOR has effective processes for periodic performance reviews, and LL communications are well-written and effective. However, weaknesses were identified in the areas of completing corrective actions prior to closure, conducting required effectiveness reviews, assessing implementation of LLs and worker feedback, developing metrics for WP&C, and collecting and analyzing worker feedback.

3.4 Oak Ridge Office of Environmental Management Oversight

This portion of the assessment evaluated the adequacy of the OREM WP&C oversight process for overseeing and evaluating cleanup operations performed by UCOR and the implementation of specific OREM programs, including assessments, operational awareness activities, performance planning, and performance.

OREM procedures provide an effective overall approach to oversight by establishing the functions, responsibilities, authorities, and processes for conducting safety oversight. OREM-OM-IP-09, *Oversight Program*, contains the safety and health requirements necessary for achieving ISM objectives and establishes functional responsibilities and authorities for the execution of authorized work. OREM-OM-PL-02, *Functions, Responsibilities, Authorities, and Accountabilities*, adequately describes the roles and responsibilities of oversight personnel.

Through interviews and document reviews, the Facility Representatives (FRs) and SMEs demonstrated knowledge of assigned facilities, and both the FRs and SMEs perform effective operational awareness oversight. FRs and safety and health SMEs routinely conduct operational awareness oversight of assigned OREM facilities using a risk-based approach. FRs and the Safety, Security, and Waste Management branch staff conduct routine operational awareness activities and planned assessments that are documented in the OREM issues management system. FRs review the contractor's work schedule and plan, and they attend the contractor's plan-of-the-day meetings, weekly operations calls, and monthly performance meetings. The staffing plan has been calculated on an annual basis but is not fully implemented. OREM currently has filled 12 of the 19 FR positions and is making an effort to fill the vacant positions.

OREM-TQ-IP-01, *Facility Representative Training and Qualification Program*, adequately establishes the training and qualification requirements for OREM FRs and FR candidates. At the time of this assessment, two of the 12 FRs responsible for oversight activities had not received full FR qualification. OREM-TQ-IP-01 requires that initial qualification be completed 18 months from the issuance of the FR assignment memorandum unless an extension is granted by the OREM Manager/Federal Technical Capability Panel (FTCP) Agent. In FTCP Decision Paper 2021-01, *Allowable Extension of Initial Qualification Timeline*, the FTCP Board approved supervisors to extend technical qualification program participants' nominal qualification time of 18 months for up to six additional months (for a total time of 24 months). The two FRs had not received qualification within 24 months of the issuance of their qualification assignments, however, since work activity had shifted to a remote and telework posture during the COVID 19 pandemic, the OREM Site Manager granted extensions to complete qualifications within 30 months. Delayed completion of qualification could result in knowledge gaps and a reduction in oversight effectiveness.

OREM-OM-PL-03, *Integrated Safety Management System Description*, effectively describes the OREM ISMS, outlining how the principles and core functions of ISM are implemented to ensure that work is performed safely. Through interviews, OREM demonstrated effective oversight planning. The OREM Quality Assurance branch consists of a cadre of SMEs who perform contractor oversight, coordinate the development of annual plans for self-assessment and contractor oversight activities, review the CAS, and maintain performance indicators. The Quality Assurance branch develops the annual assessment plan with input from the Safety, Security, and Waste Management branch and the FRs; the fiscal year 2021 included elements of both ES&H and WP&C, 2022 Integrated Assessment Schedule included elements of ES&H only.

Oak Ridge Office of Environmental Management Oversight Conclusions

Overall, OREM has a comprehensive and integrated process for Federal line oversight of WP&C. Moreover, OREM implements effective assessment planning and performance, in addition to operational awareness activities. However, due to COVID-19 OREM had difficulty qualifying all new FRs and took acceptable steps to extend the FR qualification beyond 24 months.

4.0 BEST PRACTICES

Best practices are safety-related practices, techniques, processes, or program attributes observed during an assessment that may merit consideration by other DOE and contractor organizations for implementation. The following best practice was identified as part of this assessment:

Best Practice: The UCOR virtual radiological protection mockup capability provides innovative, real-time, quantitative evaluation of the trainee's radiological survey and personnel monitoring effectiveness. UCOR uses a computerized mannequin and radiological survey equipment with radio frequency technology that allow trainees to practice various radiological scenarios with realistic meter response.

5.0 FINDINGS

No findings were identified during this assessment.

6.0 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.

United Cleanup Oak Ridge, LLC

Deficiency D-UCOR-1: UCOR procedure PROC-EH-2006, *Fall Prevention and Protection*, does not clearly specify when a fall protection hazard analysis is required, and the Type 3 work determination form provides conflicting fall protection guidance. (PPD-EH-1745, sec. 3.1.8)

Deficiency D-UCOR-2: UCOR performed excavator attachment changeout work as exempt work under WP2-22-EF2285 without integrating the work into the Type 2 WP and without the work meeting the defined criteria of EWL-035. (PROC-FS-1001, sec. C, and EWL-035)

Deficiency D-UCOR-3: UCOR did not identify, analyze, or control fall hazards greater than six feet for work associated with WP2-22-EF2274. (29 CFR 1926.501(b)(1))

Deficiency D-UCOR-4: UCOR has not properly positioned radiological perimeter air samplers to monitor expected worst-case airborne concentrations during EMWMF waste placement and during demolition work at building 9213. (PROC-RP-4514 and UCOR-4390)

Deficiency D-UCOR-5: UCOR has not conducted sufficient radiological contamination surveys to determine whether any contamination has spread during or after intrusive radiological work at building 9213 demolition. (PROC-RP-4513)

Deficiency D-UCOR-6: UCOR closed issue number IF-2022-0016 before completing all corrective actions. (PROC-PQ-1210)

Deficiency D-UCOR-7: UCOR did not perform an effectiveness review for issue number IF-2022-0016. (PROC-PQ-1250)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified seven OFIs to assist cognizant managers in improving programs and operations. While OFIs may identify potential solutions to findings and deficiencies identified in assessment reports, they may also address other conditions observed during the assessment process. These OFIs are offered only as recommendations for line management consideration; they do not require formal resolution by management through a corrective action process and are not intended to be prescriptive or mandatory. Rather, they are suggestions that may assist site management in implementing best practices or provide potential solutions to issues identified during the assessment.

United Cleanup Oak Ridge, LLC

OFI-UCOR-1: Consider formalizing exempt work release to include formal verification that work limitations associated with each exempt work list item's "considerations and guidelines" have been met prior to authorizing the work. Also, consider improving exempt work list descriptions to be complete, accurate, and bounding.

OFI-UCOR-2: Consider adding training courses on hazard identification and analysis processes. The Argonne National Laboratory virtual micro-learning sessions, effectively covering WP&C topics through focused, 30-minute (or less) training sessions, may provide a useful example.

OFI-UCOR-3: Consider revising PROC-RP-4030 to ensure that RWPs for Type 1 and Type 2 WPs are appropriately linked and tailored to the work defined in the WP, including accurate information on work locations, specific radiological hazards and associated controls, and work package numbers.

OFI-UCOR-4: Consider evaluating and implementing the recommendation to use level 1 ballistic (shatterproof) glass for excavators using metal shears.

OFI-UCOR-5: Consider conducting periodic independent assessments to determine how well applicable LLs, OFIs, and worker feedback are captured and subsequently implemented through changes to work control documents. Similar assessments conducted by the LL coordinator at Four Rivers Nuclear Partnership, LLC at the Paducah Gaseous Diffusion Plant may provide useful examples.

OFI-UCOR-6: Consider identifying a set of leading and lagging indicators for monitoring WP&C performance. Review of WP&C related metrics developed by Lawrence Livermore National Laboratory WP&C program management may be useful.

OFI-UCOR-7: Consider collecting and analyzing worker feedback from post-job review checklists and STARRT cards to enable identification of WP&C related organizational weaknesses and to contribute to continuous learning and improvement of WP&C. Review of the feedback collection and analysis processes used at Lawrence Livermore National Laboratory may be useful.

Appendix A Supplemental Information

Dates of Assessment

Onsite Assessment: August 1-4 and 15-18, 2022

Office of Enterprise Assessments (EA) Management

John E. Dupuy, Director, Office of Enterprise Assessments
William F. West, Deputy Director, Office of Enterprise Assessments
Kevin G. Kilp, Director, Office of Environment, Safety and Health Assessments
David A. Young, Deputy Director, Office of Environment, Safety and Health Assessments
Kevin M. Witt, Director, Office of Nuclear Safety and Environmental Assessments
Kimberly G. Nelson, Director, Office of Worker Safety and Health Assessments
Jack E. Winston, Director, Office of Emergency Management Assessments
Joseph J. Waring, Director, Office of Nuclear Engineering and Safety Basis Assessments

Quality Review Board

William F. West, Advisor
Kevin G. Kilp, Chair
Robin M. Keeler
Joseph Lewis
Michael A. Kilpatrick

EA Assessment Team

David Olah, Lead
Thomas M. Wirgau
Gumi Mabvuta
James C. Cantwell
Roby D. Enge
Daryl D. Magers
Dennis K. Neitzel
Terry B. Olberding
Mario A. Vigliani