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ORPS Data Indicates Work Process Deficiencies at Active Deactivation and Decommissioning Projects

Introduction

The Office of Environment, Safety and Health Assessments (EA-30), within the Office of Enterprise Assessments (EA), performed a review of Occurrence Reporting and Processing System (ORPS) radiological events for recent deactivation and decommissioning (D&D) activities that had been identified by the site as having work process¹ deficiencies.

Background and Methodology

The U.S. Department of Energy's (DOE's) [Nuclear Safety Information \(NSI\) Dashboard](#) is a tool that enables users to easily identify, organize, and analyze nuclear safety-related events reported into ORPS. Among many of the available features, the NSI Dashboard can filter and provide event information by major groups of ORPS reporting criteria for all of DOE or by program organization, site or contractor, and by a list of cause codes and keywords assigned to individual ORPS reports.

For this review, in order to determine a manageable set of occurrences related to radiological events that had work process deficiencies at D&D sites, EA selected the following filters from the NSI Dashboard graphical user interface:

- Time: Calendar Years 2015 through 2019 (as of September 9, 2019)
- DOE Contractors² associated with [D&D Projects](#)
- Nuclear Safety Indicator Group from NSI Dashboard:
 - Loss of Control of Radioactive Material

- Spread of Radioactive Contamination
- Radiation Exposure
- Personnel Contamination
- Management Concerns

- ORPS Reporting Criteria: 6(A) through 6(D)
- Headquarters Keyword—Work Process Deficiency (14E)

EA reviewed and screened out the retrieved results from the NSI dashboard such that the remaining data set was the best representation of events at active D&D sites.

Figure 1 shows the number of radiological events with work process deficiencies at active D&D sites during the 2015 – 2019 time period.

These radiological events included: (1) loss of control of radioactive material, (2) spread of radioactive

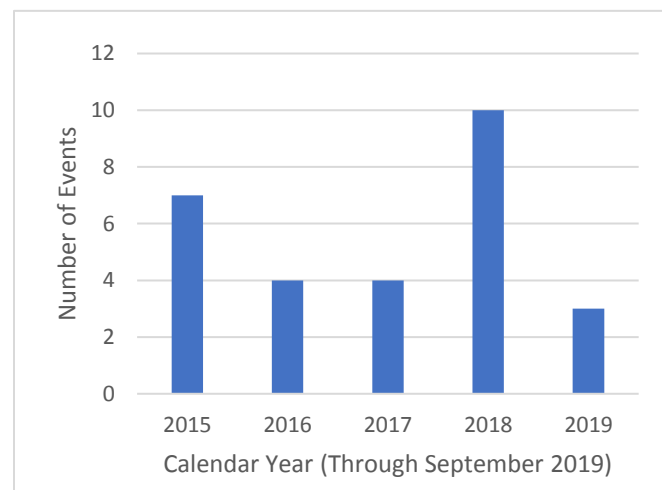


Figure 1- Number of Radiological Events that Included Work Process Deficiencies at D&D Projects

¹ Work processes are formal, documented processes for identifying and mitigating risks when planning, authorizing, releasing, and performing work.

² CH2MHill B&W West Valley, CHPRC; Fluor-BWXT Portsmouth; Fluor Idaho, North Wind Solutions; Savannah River Remediation; URS/CHRM Oak Ridge

contamination, (3) radiation exposure, (4) personnel contamination, and (5) management concerns.

Fluctuation in the number of reported events each year is less meaningful than the analysis of the diversity of causes involved in the events themselves. The recent examples summarized here illustrate how the radiological consequences of work process deficiencies can vary significantly.

Incident Descriptions and Analyses

Work Control Process Breakdown Leads to Plutonium Release at the Plutonium Finishing Plant

From December 14-19, 2017, contamination was discovered outside posted radiological boundaries at the Hanford Site Plutonium Finishing Plant (PFP) demolition zone (see Photo 1), resulting in contamination to personnel and spread to uncontrolled areas.



Photo 1. Demolition of the Plutonium Finishing Plant

This event resulted in a significant work stoppage from December 2017 to September 2018, where no major demolition activities were permitted by DOE until the site completed stabilization activities (e.g., causal analysis, extent of condition), and successfully completed a self-assessment to demonstrate the ability to safely conduct demolition operations.

Several factors contributed to the release and spread of contamination, including failure in expected performance with respect to decision making, rigorous use of processes, and work force communications. Significant factors included demolition activity rates exceeding work control specifications derived from computer modelling predictions of release plume migration, and diluting fixatives against manufacturer's recommendations when applying the contamination control agent at higher elevations at the Plutonium Reclamation Facility. Additionally, risks and

consequences associated with emerging and changing conditions were not adequately reviewed and evaluated, whereby the normalization of deviations became a recurrent, pervasive theme illustrated by the event.

The absence of negative performance indicators (e.g., detected airborne contamination), gave the organization a false sense of security, enabling it to increase the rate of demolition activities whose work control hazards were not adequately analyzed, documented, or controlled. (ORPS Report EM-RL--CPRC-PFP-2017-0018)

Click [here](#) for more operating experience information from this PFP event.

Clogged Roof Drain of a Deactivated Facility Contributes to the Spread of Radiological Contamination during Heavy Rainfall

On November 5, 2018, a completed radiological survey of the Waste Reduction and Packaging Area (WRPA) dock and adjacent paved work area indicated contamination with the highest direct reading of 105,299 disintegrations per minute (dpm) beta-gamma per 100 square centimeters (cm²). This area at the West Valley Demonstration Project had been previously controlled due to identified contamination from water found leaking from the Solvent Storage Terrace (SST) roof and through various places in the Main Plant Process Building (MPPB), eventually exiting the MPPB through the WRPA dock and running outside to uncontrolled paved work areas (see Photo 2). A radiation control technician observed that the water

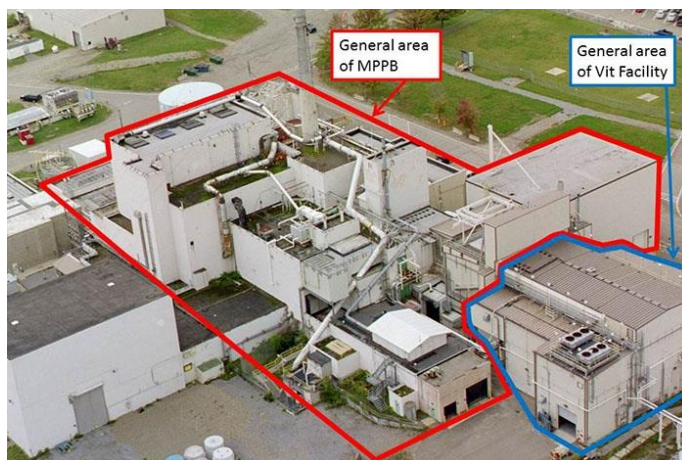


Photo 2. Deactivated Main Plant Process Building at the West Valley Demonstration Project

was tinted blue, indicating that it had come in contact with commercial-grade fixative recently applied to a facility within the MPPB. Staff identified that the water had flowed outside the WRPA dock, across the work area, and down to a drainage pipe that went under a roadway intersection. Notifications were made and controls (ropes and barricades) were put in place to control the water and restrict access. Operations personnel were dispatched to the MPPB roofs to inspect for plugged drains. It was discovered that the SST roof drain was plugged. Once it was unplugged, water drained normally. There had been heavy rainfall the previous five days which totaled approximately three inches. The lesson to be learned from this event is that the maintenance of facilities being deactivated for demolition must be carefully reviewed to consider the risks associated with reduced inspection or maintenance frequency. (ORPS Report EM-OH-WVDP-CHBW-CF-2018-0004)

Effects of the Transfer of Property from Other Entities to DOE without Thorough Evaluation of Radiological Conditions

On the morning of March 31, 2016, during the performance of a routine boundary survey of an outdoor concrete pad on the northeast corner of C-333 (which was posted as a Contamination Area, or



Photo 3. Application of dust palliatives for dust suppression

CA) at the Paducah Gaseous Diffusion Plant, several small areas of contamination were discovered on gravel and tar outside the boundary. Total contamination up to 950,000 dpm/100 cm² beta/gamma was discovered. Total alpha contamination was less than the administrative limits (the limits are 5,000 dpm/100 cm² total beta/gamma

and 1,000 dpm/100 cm² total alpha). The source of radioactive contamination was determined to have come from the maintenance and storage of contaminated items between 1952 and 1990, which spread from the pad to the surrounding area. After site characterization identified an area of outdoor contamination, the concrete pad was posted for contamination between 1995 and 2004. In 2004, the surrounding area was sealed with gravel and tar (see Photo 3). When responsibility of the Paducah Gaseous Diffusion Plant was transitioned from the previous U.S. Nuclear Regulatory Commission licensee back to DOE, the pad area was posted as a CA. However, the radiological conditions of the pad and surrounding area were not completely identified, documented, or communicated by the transferring entity to DOE through routine surveys, historical evidence, etc. It was apparent that the material discovered outside the CA boundary came from deterioration of the sealant placed over the contaminated pad, and had spread outside the confines of the boundary, making it imperative to monitor the conditions of outdoor radiological areas for deterioration prior to completing the transfer of property to DOE. (ORPS Report EM--PPPO-FPDP-PGDPDEAC-2016-0004)

Communication Errors and Control Process Breakdown Leads to Radioactive Contaminated Material Being Taken Offsite

On July 26, 2018, a spreader bar (see Photo 4) was removed for use by another site contractor without project authorization from the Plutonium Finishing Plant (PFP) (212Z) lag yard storage area (posted Radiological Buffer Area, or RBA). Craft personnel from another site contractor had coordinated directly with a radiological control technician (RCT) to perform a radiological survey, and coordinated with Mission Support Alliance, LLC (MSA) teamsters to transport the



Photo 4. Example of a spreader bar used for hoisting and rigging

spreader bar for inspection and installation of inspection tags. However, the RCT surveyed a different spreader bar in the same area, not understanding which spreader bar was being requested for movement. On July 26, 2018, the spreader bar (that had not been surveyed) was loaded onto a flatbed truck and exited the PFP RBA via the normal access route and received the standard tire surveys (hand and foot equivalent for RBA egress).

Upon exiting PFP on July 26, 2018, the teamsters drove the flatbed truck from PFP to Building 6290 (MSA Ironworker loft), where the spreader bar remained in the truck. On July 30, 2018, the truck containing the spreader bar was driven to Building 2355 Stevens Drive in Richland, Washington (an offsite facility) for an unrelated job task. The spreader bar remained in the truck at all times. The truck returned the same day to Building 6290. On July 31, 2018, the spreader bar was off-loaded into the Building 6290 yard. On August 6, 2018, the spreader bar was moved to the Building 6290 rigger loft high-bay (a non-radiological area), where it was inspected and tagged.

On August 7, 2018, due to an individual concern that the spreader bar had originated at the PFP facility, a radiological survey of the item was requested and performed. During the survey activity, one localized area of removable contamination was identified. The section of the bar was wrapped in plastic and placed into a Radiological Material Area.

This event illustrates the need to: (1) follow a formal process (including appropriate surveys) for removing equipment or material from an RBA, and (2) ensure proper communication, component identification, and control of equipment or material within radiologically controlled areas. (ORPS Report EM-RL--CPRC-PFP-2018-0006)

Conclusion

EA's analysis of ORPS data, through the use of the NSI Dashboard, indicates that recent radiological events involve work process deficiencies. As shown in the preceding examples, the deficiency with work processes range significantly in radiological event consequence. From a release of radioactive contamination outside of controlled areas to the unauthorized release of radioactive contaminated rigging equipment that was subsequently transported off-site to an uncontrolled facility, these events show

that attention to detail with work processes are critical no matter how big or small the job.

References

[DOE Nuclear Safety Information \(NSI\) Dashboard](#)

[DOE Office of Environmental Management Cleanup Sites](#)

[Discovery of Contamination Spread at the Plutonium Finishing Plant during Demolition Activities, EM-RL--CPRC-PFP-2017-0018, CR-2018-0022, Root Cause Evaluation Report](#)

[Over Reliance on Fixatives for Contamination Control](#)

ORPS Report EM-RL--CPRC-PFP-2017-0018. Discovery of Contamination Spread

ORPS Report EM-OH-WVDP-CHBW-CF-2018-0004. Contamination Discovered On Wall and Ground Outside WRPD Dock

ORPS Report EM--PPPO-FPDP-PGDPDEAC-2016-0004. Contamination Discovered Outside of Contamination Area Boundary

ORPS Report EM-RL--CPRC-PFP-2018-0006. Discovery of Contaminated Spreader Bar

The Office of Environment, Health, Safety and Security (AU), Office of ES&H Reporting and Analysis publishes the Operating Experience Summary to promote safety throughout the DOE Complex by encouraging the exchange of lessons-learned information among DOE facilities.

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