DEFENSE NUCLEAR FACILITIES SAFETY BOARD
Washington, DC 20004-2901

July 7, 2025

Mr. Roger A. Jarrell
Principal Deputy Assistant Secretary
Office of Environmental Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585-1000

Dear Mr. Jarrell:

The Defense Nuclear Facilities Safety Board (Board) conducted an evaluation of nuclear operations and maintenance at the Savannah River Site (SRS) Defense Waste Processing Facility (DWPF). The objective of the evaluation was to review the effectiveness of corrective actions from the recent period of disciplined operations and an associated Department of Energy (DOE) Savannah River Operations Office (DOE-SR) assessment to improve performance.

DWPF and the associated liquid waste facilities must operate safely and at optimum capacities to achieve waste disposition and tank closure objectives, which are key to improving the safety posture of SRS and meeting site-wide hazard reduction goals. Considering the complex, high-hazard nature of liquid waste processing, rigorous adherence to using a formal and deliberate means to perform work (known as conduct of operations) is essential to ensure nuclear operations and maintenance activities are performed safely and in a manner that minimizes potential disruptions.

During the last several years there have been a series of conduct of operations issues at DWPF that demonstrate weaknesses in key attributes such as procedural compliance, management of abnormal facility conditions, and implementation of safety basis controls. These weaknesses not only have safety implications but have also led to work stoppages and equipment damage, showing that safe operations are closely tied to productivity.

Recognizing this fact, the SRS liquid waste contractor, Savannah River Mission Completion (SRMC), took corrective actions to improve workforce discipline in performing nuclear operations and maintenance, including developing a comprehensive performance improvement plan, increasing management safety oversight and workforce engagement, and implementing equipment improvements. DOE-SR also conducted its own assessments to identify needed improvements. The Board agrees with the approach and scope of action, and these efforts resulted in an overall improvement in operational performance. However, additional events potentially caused by similar underlying deficiencies indicate DOE-SR's and SRMC's corrective actions have not been fully effective.

Accordingly, the focus of the Board's review was to evaluate the effectiveness of implemented corrective actions, to better understand facility challenges, and to identify opportunities to assist DOE in driving performance sustainment and continuous improvement in disciplined operations. The Board concluded that DOE should consider focusing its efforts on addressing the impacts of non-ideal facility material conditions (i.e., out-of-service equipment and out-of-specification parameters) on operational performance, addressing inconsistencies in the performance of disciplined operations, and improving workforce training. Additionally, considering the importance of understanding workforce perspectives on operational safety and performance, DOE may want to consider the benefit of expanding on the safety culture survey conducted by the liquid waste contractor in 2024 to help identify additional actions that may be needed to support continuous performance improvement efforts.

The enclosed staff report is provided for your information and use as you continue to drive performance improvements at DWPF.

Sincerely,

Thomas A. Summers
Acting Chairman

Enclosure

c: Honorable Christopher Wright, Secretary of Energy
Mr. Edwin Deshong, Manager, DOE-SR
Mr. Joe Olencz, Director, Office of the Departmental Representative to the Board

DEFENSE NUCLEAR FACILITIES SAFETY BOARD

Staff Report

May 23, 2025

Evaluation of Nuclear Operations and Maintenance Activities at the Defense Waste Processing Facility (DWPF)

Summary. In response to a series of operational issues and events at the Savannah River Site's (SRS) Defense Waste Processing Facility (DWPF) dating back to 2022, a Defense Nuclear Facilities Safety Board (DNFSB) staff team reviewed the performance of nuclear operations and maintenance activities at DWPF to evaluate the effectiveness of actions taken by the Department of Energy Savannah River Operations Office (DOE-SR) and liquid waste contractor, Savannah River Mission Completion (SRMC), to improve performance. The staff team conducted document reviews, interviews, walkdowns, and observed field activities.

The staff team concluded that DWPF demonstrated an overall improvement in the performance of nuclear operations and maintenance activities through implementation of corrective actions by SRMC and DOE-SR. However, additional recent events that share similar underlying conduct of operations deficiencies indicate that corrective actions have not been fully effective. Coupled with staff team observation of inconsistencies in the implementation of conduct of operations principles [1], more work is needed to drive continuous improvement and performance sustainment. The staff team identified that additional effort should be focused in the following areas:

- Mitigating facility material condition impacts on nuclear operations and maintenance performance;
- Addressing inconsistencies in the performance of disciplined operations; and
- Improving training to meet the needs of the workforce.

Furthermore, DOE should consider expanding the 2024 SRMC safety culture survey to better understand workforce perspectives on operational safety and performance. SRMC and DOE-SR agreed that further effort is needed and are taking appropriate action to address areas identified by the staff team.

Background. DWPF personnel perform crucial aspects of the liquid waste mission at SRS, converting high level radioactive liquid waste from the Tank Farms into a stable form for long-term storage and processing residual effluent materials from the Salt Waste Processing Facility. These liquid waste facilities must operate at optimum capacities to achieve waste disposition and tank closure objectives at SRS.

DWPF experienced a series of operational events dating back to 2022 that SRMC characterized as resulting from weaknesses in disciplined operations and ineffective

implementation of Human Performance Improvement tools [2]. Disciplined operations broadly refers to the structured approaches for ensuring nuclear operations and maintenance activities are conducted safely, reliably, and effectively. This is predominantly implemented through the conduct of operations safety management program, which DOE implements to ensure work is performed within appropriate safety controls.

Considering the accumulation of operational events, culminating with a technical safety requirements violation, the dropping of an empty stainless-steel canister, and an inadvertent melter pour in August-September 2023, SRMC management entered deliberate operations at DWPF in October 2023 (Figure 1). Deliberate operations is a formally defined period and process established in the site conduct of operations manual [3] aimed at restricting performance of work during periods with higher potential for mistakes; this is a tool that SRS management can use to address disciplined operations performance issues and prevent significant safety-related impacts. During this period, increased management engagement is required, particularly through assignment of senior supervisory watches, and work activities are mandated to be performed in a very deliberate manner with more attention given to the critical steps. SRMC's DWPF Deliberate Operations Plan [4] established multiple phases, each of which included defined exit criteria. DWPF remained in deliberate operations until November 12, 2024, at which point SRMC management concluded the exit criteria had been fully met.

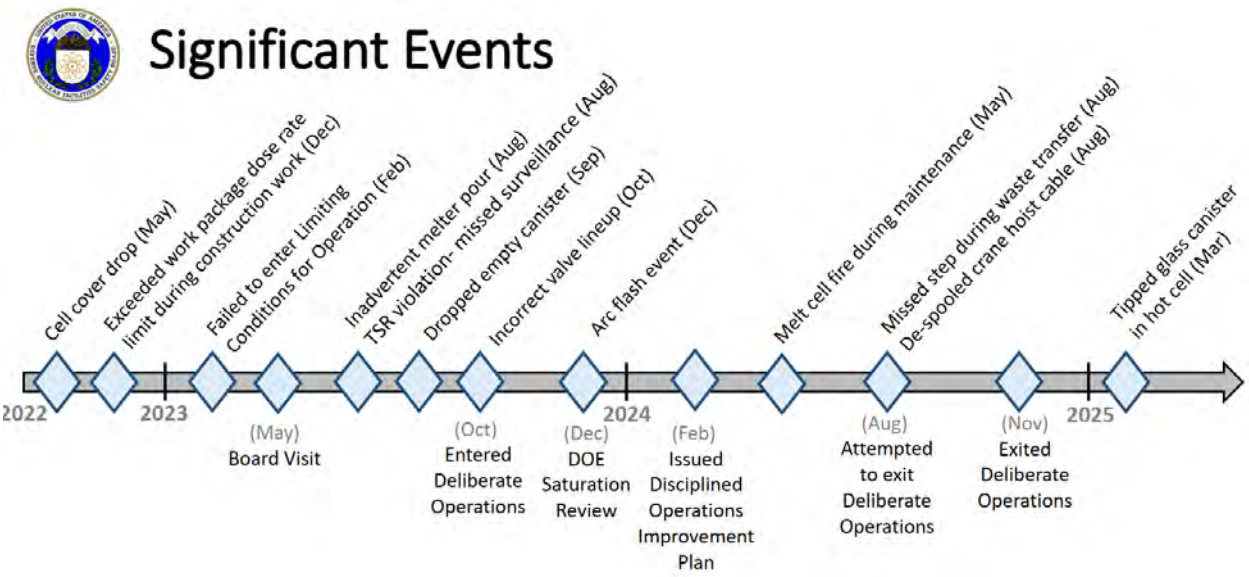

Figure 1. Significant Events Timeline

As part of its oversight of DWPF's entry into deliberate operations, DOE-SR personnel conducted a week-long series of assessments, known as a "saturation review," in December 2023, identifying several findings and opportunities for improvement. SRMC management incorporated corrective actions from this review and previous events into the DWPF Disciplined Operations Improvement Plan [2].

The Board's staff team conducted its review on a timeframe that ensured DWPF would have sufficient run-time to realize the benefits of corrective actions and collect data to better

understand performance trends. The review consisted of multiple interactions including a teleconference on September 12, 2024, on-site observations and interviews during the week of September 16, 2024, and two DWPF management interviews by teleconference on October 10 and 15, 2024. Interviews sought to probe personnel perspectives on the adequacy of operational improvements and underlying issues in a more informal setting. The review assessed the effectiveness of corrective actions taken by the contractor to improve disciplined performance of nuclear operations and maintenance activities.

Discussion. The staff team concluded that SRMC leadership identified a comprehensive suite of corrective actions that were effective in improving disciplined operations. Some of the most impactful actions included:

- Senior supervisory watches and conduct of operations coaches reinforced standards for safe operations;

- Revisions to rounds sheets and operating procedures improved clarity and executability;

- Facility management substantially addressed "red circle readings" (i.e., parameters that are out of limits) and prioritized equipment fixes; and

- Facility management developed and implemented a "fix-it-now" maintenance backlog plan.

Performance metrics [5] accordingly indicated a reduction in the overall number of operational events and there was alignment between corrective actions and the findings from the DOE-SR review in December 2023. DWPF met the objective criteria to exit deliberate operations in November 2024, and the staff team agreed with SRMC management's decision to do so.

The staff team also concluded that additional effort is warranted to achieve further performance improvement. The staff team recognizes general challenges with overcoming institutional inertia and sustaining performance improvements, particularly in conduct of operations. Key focus areas are discussed in detail in the following sections.

Mitigating Facility Material Condition Impacts on Operations—During its December 2023 saturation review, DOE-SR personnel identified safety concerns regarding DWPF's maintenance backlog and the associated negative impact on facility safety culture. For example, DOE-SR found that management did not prioritize correcting relatively minor deficiencies, which created a culture that is de-sensitized to the significance of warning lights, alarms, and indications [6]. DWPF facility management incorporated actions related to the maintenance backlog into the performance improvement plan and made considerable progress toward clearing persistent red circle readings from rounds sheets and addressing other out-of-service equipment issues.

Although facility material conditions appear to have improved and DWPF management continues to prioritize further improvements, the staff team observed in 2024 that facility conditions such as out-of-service equipment, out-of-specification parameters, poor housekeeping, and system leaks continue to challenge the workforce. For example:

- Rounds with parameters out-of-specification still number in the dozens. The expected presence of many red circle readings de-sensitizes the workforce to abnormal plant conditions.

- Melt cell area lighting and camera coverage do not meet minimum equipment availability to satisfy all operating procedure requirements.

- Crane deficiencies routinely cause planned work to be rescheduled.

- A long-standing chemical leak from a 3rd floor drain had conflicting postings and entry requirements at multiple ingress points.

- West dock area housekeeping (i.e., poor organization of materials and unnecessary accumulation of combustible debris) was below site-specified standards.

The staff team noted that these non-ideal conditions were causing non-trivial impacts to planned work activities. Such impacts result in day-to-day shifts in work priorities, cause cancelation of work activities, and generally appear to frustrate the workforce. The staff team is concerned that these frustrations may exacerbate weaknesses in disciplined operations.

Further, the practice of developing and implementing "workarounds" has become common at DWPF. When facility or system conditions preclude the execution of operating procedures or work instructions as written, to proceed with work, facility personnel often identify alternate approaches to accommodate the abnormal conditions. In many instances, the workaround is appropriately pursued through formalized processes such as a procedure modification, work request, or deviation request. In other instances, work proceeds without fully evaluating the safety risk. For example:

- During melter feeding and pouring, film cooler deposits led to intermittent low offgas condensate tank pressure alarms. Instead of cleaning the film cooler, a routine activity, control room operators were advised by engineering [7] to continue feeding and pouring from the melter at the risk of having to perform actions specified in the safety basis if the non-ideal operating condition persisted.

- Personal protective equipment for heat stress was not available during 117-ton crane brake maintenance activity, but maintenance personnel proceeded to complete the work instruction without additional evaluation.

- A temporary cooling system was not operational due to a failed generator, but maintenance personnel proceeded with electrical work in an area with a known safety concern for heat stress without additional evaluation.

Abnormal condition response is a fundamental aspect of nuclear operations, but the common application of the workaround concept at DWPF has normalized acceptance of some abnormal conditions and encourages workers to find ways to continue working, at times outside of formal processes. This sets unclear expectations for the workforce and dampens their sensitivity to operating outside approved procedures.

Acknowledging the challenges of addressing facility material conditions, the staff urges continued focus on mitigating the impacts of these conditions and continuing to emphasize the importance of stopping work and addressing abnormal conditions through formalized processes. SRMC management stated their intention to continue addressing equipment deficiencies, maintenance backlogs, and impacts on work execution.

Addressing Inconsistencies in Performance of Operations—The actions taken by DWPF management under the Deliberate Operations Improvement Plan resulted in improvements in the performance of nuclear operations and maintenance. The staff team did not observe indications of systemic issues but noted instances in which additional rigor in implementing disciplined operations principles should help with performance sustainment and continuous improvement.

Human Performance Improvement tools enhance repeatability and quality of work, but the staff team observed inconsistent usage of these tools during work execution. Peer-check and self-check were often identified during pre-job briefs but seldom observed in the field. Three-way communications were only observed to be rigorously implemented in the control room. Placekeeping of completed procedural steps was generally used, but methods varied widely, and the generally accepted best practice of "circle/slash" was seldom used.

Standing orders are a mechanism to implement short-term operational guidance based on unexpected plant conditions or an identified need to clarify expectations for the workforce. Not following procedurally required time limits [3] for formalizing such guidance normalizes operating the plant outside of expected conditions, which sends confusing signals to the workforce. The staff team identified some cases in which standing orders were revised and re-issued, or expired without the underlying condition being resolved, instead of being implemented via operating procedures in a timely manner.

Rigorous performance of pre-job briefs was stressed by SRMC management throughout deliberate operations. The staff team observed that DWPF personnel consistently used checklists to support nuclear operations and maintenance activities. In general, while the checklist ensures certain topics are covered, there is room for improvement in the quality of the briefings. Specifically, the work teams should apply more critical thought to key elements such as critical steps, lessons learned, and discussion of the associated hazards. The staff team provided specific examples to SRMC management that may or may not indicate a broader trend, but at a minimum indicate a degree of inconsistency in the overall quality of pre-job briefs.

SRMC management acknowledged the importance of continuing to drive rigor in implementing disciplined operating principles and have already taken action to address some of the safety concerns identified by the staff team. SRMC reviewed standing orders and dispositioned specific issues, ensuring all active standing orders now meet timeliness

requirements. In March 2025, SRMC management formalized the requirement to implement the circle/slash placekeeping methodology. SRMC also assessed pre-job briefs, identifying opportunities for additional coaching to improve effectiveness. These are important steps, though further emphasis is warranted to ensure continuous improvement.

Improving Training to Meet the Needs of the Workforce—The training program does not currently appear to meet the needs of the workforce, which exacerbates other contributors to disciplined operations performance. The staff team did not review the training program in its entirety, but interviews and observations indicated that the DWPF training program could be improved to better enable disciplined operations performance and tailored to improve level of knowledge regarding facility-specific operations, hazards, and procedures. Like other DOE facilities, DWPF has a shortage of experienced nuclear operators, and many individuals have limited industrial or nuclear experience. DWPF has unique hazards that require operators to receive specialized training from seasoned trainers and nuclear operations leadership. This is significant since the lack of specific field training can result in failure to understand the unique hazards of work and could jeopardize worker safety at a nuclear facility.

The staff team identified that SRMC also has a shortage of qualified trainers with DWPF-specific knowledge and experience. These shortages caused the SRMC training organization to suspend the continuing training program at the end of 2024 in favor of other training requirements, which likely negatively impacts disciplined operations performance. Additionally, conduct of operations coaches and senior supervisory watch personnel do not have formal training or qualifications specific to DWPF operations, which would improve their effectiveness.

DWPF management acknowledged the value of a robust training program to improve disciplined operations and stated their intent to broadly improve. For example, SRMC management intend to bolster an existing "worker to trainer" program, which would add considerable value and could set a best-in-class precedent. The staff team also acknowledges the positive impact of the DWPF Operations Supplemental Training Plan [8] for the first quarter of fiscal year 2025 to mitigate the suspension of continuing training.

Evaluating Safety Culture to Gain Additional Insights for Performance Improvement—In March 2025, a tipped radioactive glass canister event highlighted persistent issues at DWPF. A first line manager (FLM) and operator, while attempting to move a filled canister into the weld test cell, mistakenly caused the 4500-pound canister to tip over, ultimately coming to rest at a 40^{o} angle on a guard rail (Figure 2). The task requires two operators per the procedure, but only one (who had never performed the task) was assigned. Further, the procedure stated that a second operator should be stationed at the smear test station window to ensure proper grapple engagement, which was a lesson learned from a previous dropped canister event. When the operator requested assistance during the evolution, the FLM performed work rather than supervising and took over control of the crane to engage the grapple when the canister tipped over.

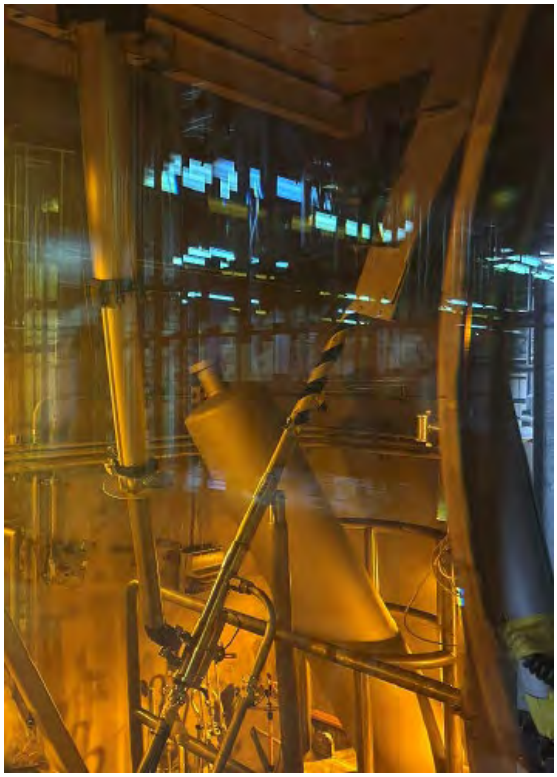

Figure 2. Tipped Canister from March 2025 Event

Contributing factors to this event align with the safety concerns identified by the staff team during this review, such as poor adherence to disciplined operations principles, facility material conditions, and training. During the issue investigation meeting, the FLM stated that operators routinely perform this operation solo. The workers also did not perform a pre-job brief, which is required. Visibility was limited due to out-of-service or poorly functioning cameras inside the cell. A review of training identified that the evolution was not explicitly covered in the training program and both individuals were relatively inexperienced in their roles.

Despite the comprehensive nature of corrective actions taken by SRMC and DOE-SR, continued operational issues, particularly this event in March 2025, highlight the significance of the challenge in achieving and sustaining improvements in the disciplined performance of nuclear operations and maintenance activities. The fact that personnel were not aware of the full extent of their roles and responsibilities and admitted to routinely doing work outside of procedures clearly challenges the health of the organization's safety culture and reinforces DOE-SR saturation review comments that elements of safety culture need improvement. There may be other factors that are hindering progress, and DOE should consider expanding on the 2024 SRMC safety culture survey to better understand the workforce perspectives on operational safety and performance.

Conclusion. Comprehensively improving conduct of operations and sustaining performance improvements are challenging tasks that require continuous management focus and complete buy-in from all components of the facility's workforce and management. There are many factors that can work against management efforts, as highlighted in this report. The staff team concludes that the facility is generally taking the right actions and that actions already taken

by SRMC should continue to drive a positive performance trend. However, additional focus on mitigating the impacts of material conditions on operational performance, driving additional rigor in the disciplined performance of operations, and improving training is warranted. Additionally, further insights may be gained by expanding upon the 2024 SRMC safety culture survey.

References

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2. Savannah River Mission Completion, *DWPF Disciplined Operations Improvement Plan*, SRMC-DWP-2024-00004, January 31, 2024.

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4. Savannah River Mission Completion, *DWPF Deliberate Operations Plan*, SRMC-DWP-2023-0022 Revision 2, 2024.

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6. WDOD-24-06, *Department of Energy Savannah River Operations Office (DOE-SR) Assessments Results of the December 2023 Defense Waste Processing Facility (DWPF) Saturation Review*, December 20, 2023.

7. E-mail from Control Room Manager, "OGCT Pressure," September 14, 2024.

8. Defense Waste Processing Facility, *Defense Waste Processing Facility (DWPF) Operations Supplemental Training Plan September 2024 through January 2025*, September 12, 2024.