

**Independent Assessment of the
Nuclear Maintenance
Management Program
at
Hanford Site
Tank Waste Facilities**

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Acronyms

CM	Corrective Maintenance
CRAD	Criteria and Review Approach Document
DFLAW	Direct-feed Low-activity Waste
DOE	U.S. Department of Energy
EA	Office of Enterprise Assessments
ETF	Effluent Treatment Facility
FCI	Facility Condition Inspection
FWS	Field Work Supervisor
H2C	Hanford Tank Waste Operations & Closure, LLC
HFO	Hanford Field Office
ITDC	Integrated Tank Disposition Contract
LERF	Liquid Effluent Retention Facility
M&TE	Measuring and Test Equipment
MEL	Master Equipment List
NMMP	Nuclear Maintenance Management Program
OFI	Opportunity for Improvement
PI	Performance Indicator
PM	Preventive Maintenance
PMT	Post-maintenance Testing
S/CI	Suspect and Counterfeit Item
SE	System Engineer
SHR	System Health Report
SS	Safety Significant
SSCs	Structures, Systems, and Components
TSCR	Tank-side Cesium Removal
USQ	Unreviewed Safety Question
WO	Work Order

INDEPENDENT ASSESSMENT OF THE NUCLEAR MAINTENANCE MANAGEMENT PROGRAM AT HANFORD SITE TANK WASTE FACILITIES

Executive Summary

The U.S. Department of Energy (DOE) Office of Enterprise Assessments (EA) conducted an independent assessment of the effectiveness of the nuclear maintenance management program at Hanford Site tank farms and other liquid waste facilities, which are managed and operated by Hanford Tank Waste Operations & Closure, LLC (H2C) for the DOE Hanford Field Office. The assessment was performed in March and April 2026.

EA identified the following strengths:

- H2C has effectively used several analytical tools to identify continuous improvement actions and develop a comprehensive maintenance improvement plan, which is being used to address identified organizational weaknesses.
- The master equipment list is maintained using a robust software tool, and ensures structures, systems, and components that are part of the facility safety bases are appropriately managed.

EA also identified several areas of concern, including two findings, as summarized below:

- H2C does not validate that all maintenance procedures and instructions include adequate direction to correctly accomplish work and can be performed as written prior to releasing work packages to the field. (Finding)
- H2C does not ensure that personnel who perform maintenance at H2C-operated nuclear facilities are adequately trained on all structures, systems, and components on which they may perform work, and has not developed a two-year fixed continuing training program for craft personnel to maintain their qualifications. (Finding)
- H2C personnel did not follow all requirements for using procedures during observed maintenance activities.
- H2C does not have a formal program with a consolidated procedure for facility condition inspections (FCIs) to ensure that all FCI requirements are met during each inspection cycle.

In summary, the nuclear maintenance management program at Hanford Site tank waste facilities is adequately designed and generally adequately implemented, with actions in progress to address identified organizational weaknesses. However, two findings were identified related to the inadequate quality of work instructions being released to the field and the training and qualification of maintenance craft. Additional exceptions include discrepancies in the implementation of requirements for procedure use and the description of FCI processes. Until the concerns identified in this report are addressed or effective mitigations are put in place, some risk remains in the continued reliable performance of structures, systems, and components that are part of the facility safety bases.

INDEPENDENT ASSESSMENT OF THE NUCLEAR MAINTENANCE MANAGEMENT PROGRAM AT HANFORD SITE TANK WASTE FACILITIES

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Office of Nuclear Safety and Environmental Assessments, within the independent Office of Enterprise Assessments (EA), conducted an assessment of the effectiveness of the nuclear maintenance management program (NMMP) at Hanford Site tank waste facilities. The tank farms and other liquid waste facilities are managed and operated under the Integrated Tank Disposition Contract (ITDC) by Hanford Tank Waste Operations & Closure, LLC (H2C) for the DOE Hanford Field Office (HFO). The assessment was conducted in March and April 2026.

H2C-managed waste facilities include all Central Plateau tank farms, retrieval operations, the 242-A Evaporator used for tank waste volume management, the Tank-side Cesium Removal (TSCR) facility used to pre-treat tank waste at AP Farm for direct-feed low-activity waste (DFLAW) processing, and the Liquid Effluent Retention Facility (LERF) and Effluent Treatment Facility (ETF) for final treatment of effluents from waste processing. The performance-based portions of this assessment focused on implementation of the NMMP at A Farm (including retrievals), AP Farm, and LERF/ETF. Maintenance activities were also observed at the 242-A Evaporator facility and additional A-complex tank farms.

Consistent with the *Plan for the Independent Assessment of the Nuclear Maintenance Management Program at Hanford Site Tank Waste Facilities, March 2026*, this assessment evaluated the effectiveness of H2C programs in managing and maintaining NMMP performance and focused on safety significant (SS) and defense-in-depth systems and design features. Because of limited opportunity to observe work on SS and defense-in-depth systems, performance-based observations extended to work on other structures, systems, and components (SSCs) using credited NMMP processes.

2.0 METHODOLOGY

The DOE independent oversight program is described in and governed by DOE Order 227.1A, *Independent Oversight Program*, which EA implements 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 requirements related to H2C’s implementation of the NMMP. Criteria to guide this assessment were based on the objectives and criteria of EA CRAD 30-06, Revision 0, *Conduct of Maintenance*.

EA examined key documents, such as system descriptions, work packages, procedures, manuals, analyses, policies, and training and qualification records. EA also interviewed key personnel responsible for developing and executing the associated programs; observed maintenance activities; and walked down significant portions of H2C-managed facilities, focusing on the implementation of NMMP requirements. The members of the assessment team, the Quality Review Board, and the management responsible for this assessment are listed in appendix A.

There were no previous EA findings to follow up on during this assessment.

3.0 RESULTS

3.1 Integration with Regulations and DOE Orders and Manuals

This portion of the assessment evaluated H2C's implementation and maintenance of a DOE-approved NMMP with changes approved through the unreviewed safety question (USQ) process.

The H2C NMMP is adequately described in TFC-PLN-29, *Nuclear Maintenance Management Program*, in accordance with DOE Order 433.1B, *Maintenance Management Program for DOE Nuclear Facilities*, attachment 2, section 2.a. As required by DOE Order 433.1B, attachment 2, section 1.e, the most recent DOE approval was appropriately documented in transmittal 24-NSD-0117 (*Contract No. 89303324DEM000096 – US Department of Energy, Hanford Field Office Response to Transition Deliverable TD-14 Blue Sheeted Nuclear Maintenance Management Program*) on December 16, 2024. Subsequent changes to the NMMP were either administrative and approved through the USQ process or are being reviewed for approval by HFO. TFC-PLN-29, table 1, *Program Plans Applicable to the NMMP*, adequately addresses the requirements of DOE Order 433.1B and identifies the associated NMMP implementing documents.

H2C adequately assesses NMMP implementation in accordance with DOE Order 433.1B, attachment 2, section 1.g, at least every three years. H2C satisfies this requirement by completing a series of assessments during the three-year period that collectively assess the rolldown of requirements of the 17 NMMP elements into implementing procedures and work packages. Reviewed assessment reports over the current three-year period were appropriately scoped. However, the assessments were strictly compliance based and did not include any observations of maintenance work being performed. (See **OFI-H2C-1**.) The lack of a performance-based component in periodic assessments reduces confidence in the validity of assessment conclusions.

Integration with Regulations and DOE Orders and Manuals Conclusions

H2C has an adequate DOE-approved NMMP description document denoting applicable implementing documents. H2C assesses the NMMP elements within the required three-year periodicity, but these assessments could be improved by adding performance-based observations.

3.2 Maintenance Organization and Administration

This portion of the assessment evaluated H2C's maintenance organization and processes to determine whether they have defined roles and responsibilities and sufficient resources to implement the NMMP.

Maintenance Organization

H2C has established and implemented an adequate nuclear maintenance organization structure defining management, craft supervision, and craft personnel, in accordance with DOE Order 433.1B, attachment 2, section 2.b. TFC-OPS-MAINT-C-01, *ITDC Work Control*, adequately describes organizational responsibilities for personnel conducting maintenance activities on SS or safety class SSCs. Reviewed records demonstrated that craft personnel are qualified to perform work as established in the H2C training program.

The H2C maintenance organization makes effective use of analytical tools, such as value stream analyses (VSAs), to address identified challenges. The results of the VSAs have been appropriately used to develop a maintenance improvement plan (MIP) with corrective actions. Observations of two biweekly MIP status meetings showed a strong organizational ownership of the actions, an appropriate level of

leadership engagement, and a commitment to provide support to ensure that actions are implemented on schedule.

While the maintenance organization has established and implemented an adequate nuclear maintenance program, document reviews and interviews with H2C managers revealed that maintenance processes do not ensure the effective use of engineering products. For example, the maintenance organization's corrective maintenance (CM) backlog currently does not include any risk perspective to inform prioritization. However, engineering personnel develop system health reports (SHRs), which include valuable information that could inform maintenance priorities. Also, the facility condition inspection (FCI) program does not include reviews of SHRs to aggregate, prioritize, and track facility degraded conditions. (See **OFI-H2C-2.**)

Resources

The H2C maintenance organization is appropriately staffed to perform its functions. The maintenance organization budgeted staffing level is 214 positions, of which 195 are filled. Maintenance craft and supervisors are appropriately assigned to effectively perform maintenance activities. The interviewed Maintenance Manager demonstrated a thorough understanding of staffing shortfalls, which are actively managed by sharing resources between maintenance teams to accomplish priority work. The reviewed fiscal year 2026 hiring plan shows that positions that are not fully staffed are tracked and backfilled, as needed. For example, requisitions have been posted to backfill a shortfall of 5 (approximately 20%) field work supervisor (FWS) positions while temporarily filled with individuals from staff positions with current FWS qualifications.

During interviews, H2C management explained that they had recently identified instances where workers were performing work without current qualifications. As a result, H2C issued a shift standing order on January 19, 2026, appropriately addressing roles and responsibilities associated with verifying craft qualifications. Further, H2C developed appropriate training for supervisors and craft on how to properly determine training status. Interviewed FWSs verified that they understood their responsibilities and demonstrated the ability to perform such training verifications.

Maintenance Organization and Administration Conclusions

H2C has established an adequate nuclear maintenance organization with implementing maintenance procedures. At the time of the assessment, H2C had sufficient maintenance craft and supervisory resources assigned to support the NMMP.

3.3 Master Equipment List

This portion of the assessment evaluated H2C's process for developing, implementing, managing, and maintaining a master equipment list (MEL) that identifies all SSCs that are part of the safety basis.

H2C has established and implemented an adequate MEL in accordance with DOE Order 433.1B, attachment 2, section 2.c, through TFC-ENG-FACSUP-C-23, *Equipment Identification and Data Management*. TFC-ENG-FACSUP-C-23 appropriately establishes the responsibilities for all involved organizations to develop and maintain the MEL using the SmartPlant[®] software system with custom modifications by H2C, making it a robust tool. Observed subassemblies and components were adequately identified in SmartPlant. Critical spare parts can also be tracked in SmartPlant. During SmartPlant demonstrations, the component number, the drawing and field label, and SSC designations for installed facility equipment were clearly specified.

Master Equipment List Conclusions

H2C has established and implemented an adequate MEL. The SmartPlant software system is a robust tool for managing the MEL.

3.4 Planning, Scheduling, and Coordination of Maintenance

This portion of the assessment evaluated whether H2C's work control process, with system engineer (SE) involvement, ensures that work planning, scheduling, coordination, and control of maintenance activities are carried out and that required tools and equipment are available.

H2C adequately plans, schedules, coordinates, and controls maintenance activities and emphasizes equipment availability through TFC-OPS-MAINT-C-01 and TFC-OPS-MAINT-STD-02, *Work Planning and Work Instruction Development*, in accordance with DOE Order 433.1B, attachment 2, section 2.d. The reviewed maintenance schedule adequately prioritized and managed maintenance activities and was sufficiently detailed to support organizational coordination and track progress. Operational coordination and teamwork to integrate and execute the scheduled maintenance was adequate during five observed plan-of-the-day and two plan-of-the-week meetings. Based on a review of 20 maintenance work orders (WOs) and interviews with a planner and 3 SEs, planned maintenance WOs were clear, concise, and sufficiently detailed to enable safe work performance. Hazards and identified controls were appropriately tailored to the respective work scope.

Planning, Scheduling, and Coordination of Maintenance Conclusions

H2C adequately plans, schedules, coordinates, and controls maintenance activities.

3.5 Types of Maintenance

This portion of the assessment evaluated types of maintenance (e.g., preventive, reliability-centered, and corrective) to determine whether they appropriately provide safe, efficient, and reliable operation of safety SSCs.

H2C has adequately implemented a program for different types of maintenance (e.g., preventive, reliability-centered, and corrective) to provide safe, efficient, and reliable operation of safety SSCs, in accordance with DOE Order 433.1B, attachment 2, section 2.e. TFC-OPS-MAINT-C-01 adequately addresses preventive maintenance (PM) and appropriately requires the use of engineering requirements and manufacturer recommendations in establishing PM activities. A review of 12 PM WOs and interviews with SEs demonstrated that periodic maintenance is adequately planned and tracked in accordance with TFC-OPS-MAINT-C-01. Reviewed PM completion metrics from January 2024 to February 2026 showed that PM activities were appropriately prioritized and timely completed.

SEs conducted adequate reliability analyses in accordance with TFC-ENG-FAC SUP-P-01, *System Engineer Program*. Three interviewed SEs demonstrated adequate knowledge of the reliability-centered maintenance (RCM) process and collected data. Two reviewed RCM analyses demonstrated that the process was adequately implemented.

A review of six CM work packages and interviews with SEs confirmed an adequate process for performing CM in accordance with TFC-OPS-MAINT-C-01. The reviewed CM work packages associated with safety SSC-related systems adequately included SE review and post-maintenance testing (PMT) acceptance criteria consistent with the safety basis. Each of the six CM work packages showed timely completion and verification that the work resolved the problem. For example, an SE worked with

maintenance staff to develop the innovative use of a spill blocker on a tank sluicer as CM to stop leakage and restore operability.

Types of Maintenance Conclusions

H2C has adequately implemented a program for different types of maintenance (e.g., preventive, reliability-centered, and corrective) to provide safe, efficient, and reliable operation of safety SSCs.

3.6 Maintenance Procedures

This portion of the assessment evaluated H2C's maintenance procedures to determine whether they provide appropriate direction for maintenance activities.

H2C has established and implemented a procedure process through TFC-OPS-OPER-C-13, *Technical Procedure Control and Use*, and TFC-OPS-OPER-STD-69, *Technical Procedure Use and Adherence*, in accordance with DOE Order 433.1B, attachment 2, section 2.f. These procedures define a generally adequate process to perform work, including hazard identification and control hold points, appropriate review and sign-offs, and PMT. TFC-OPS-OPER-C-13 appropriately requires changes to the NMMP and maintenance procedures to be evaluated through the USQ process. TFC-OPS-OPER-C-13 also institutes a graded approach by categorizing procedures with "use levels" (continuous use, reference use, routine use, or multi-use) and states that all procedures are continuous use unless designated otherwise. Continuous use procedures must be open, within view, and in use during performance of the activity, whereas reference use procedures need only be available in the work area for reference, if needed, and routine use procedures describe activities that rely on the training, skill, and experience of the worker. TFC-OPS-OPER-STD-69 appropriately requires the use of pre-job briefings to ensure that workers are prepared to safely perform work.

The H2C maintenance organization has appropriately initiated efforts to improve work package development. For example, H2C management established a dedicated work team at ETF (as a pilot) to include resources from industrial safety, industrial hygiene, engineering, and radiological planning in the maintenance work package development effort. H2C management explained that this approach is intended to reduce work package development cycle time and improve work package quality.

Reviewed procedures and observed work activities were inconsistent in the adequacy of work instructions. Some evaluated maintenance procedures or instructions adequately adhered to TFC-OPS-OPER-C-13. Three observed work activities were properly performed in accordance with the written maintenance instructions, without deviation. Closeout of the work packages associated with these three observed activities included appropriate review and approval by management, system engineering, and work control. Observed pre-job briefings were properly conducted by the maintenance supervisor and included the maintenance personnel involved in the work and appropriate supporting safety personnel. Generally, personnel participated fully in the pre-job briefings by answering supervisor questions and asking for clarifying information. However, contrary to DOE Order 433.1B, attachment 2, section 2.f, and TFC-OPS-OPER-C-13, section 4.2, several reviewed maintenance procedures could not be performed as written. (See **Finding F-H2C-1.**) Releasing work with procedures that cannot be performed as written could result in incorrect maintenance being performed on facility equipment. Specifically:

- WO 1230197, *Repair-Replace Primary Enraf Sight Glass*, included eight tasks to replace a sight glass on the tank level indicator for each of the eight AP Farm tanks. Tasks 1 and 3, which replaced sight glasses for tanks AP101 and AP103 respectively, were observed; three other replacements had already been performed several months earlier. For tank AP101, steps 5.11 through 5.17 (and the equivalent steps for the other seven tanks) are specific in the sequencing of removing and replacing

the sight glass and gasket, but omit direction for removing and replacing a required o-ring. Further, closeout steps for post-job notifications, radiation and contamination surveys and postings, housekeeping, and restoration of the system (steps 5.19 through 5.23 and equivalent) were necessarily performed concurrently rather than sequentially, contrary to requirements of TFC-OPS-OPER-C-13 for continuous use procedures. Additionally, data fields in section 6 (to perform a post-job review, if needed) had been filled in following completion of a previous task, with no provision for reperformance following subsequent tasks. (AP Farm)

- During the performance of 3-LDD-702, *Perform Functional Check of Rosemount 702 Wireless Leak Detectors*, five minutes were allowed for the sensor to respond; however, this time criteria was not written in the procedure. Additionally, the procedure steps and the data sheet did not align—the data sheet contained no detail linking to the steps in the procedure, only a data sheet item number. (AW Farm)
- Prior to planned performance of four wireless leak detector annual checks at AP Farm, a pre-job briefing was conducted and then work was cancelled or delayed because the procedure could not be performed as written. (AP Farm)
- De-winterization of valve pit heaters in accordance with 3-MISC-927, *Winterization/De-Winterization of Tank Farm In-Pit Heaters*, required personnel to de-energize power supplies, some of which were hard-wired and some of which were cord-and-plug. The procedure did not differentiate between the two. While workers appropriately ensured that power was secured by unplugging cord-and-plug heaters, this action was not directed in the work instructions, and instructions did not direct verification that power was secured for hard-wired heaters by ensuring indicator lights were extinguished on the heater control panel. (AP Farm)
- PM task EE-002158, *Inspection and Lubrication of Oilers at 242-A* (WO 1288880), was performed using a data sheet with no procedure or work instruction. The data sheet did not provide acceptance criteria, instructions for performing the task, or direction on how to record observed conditions. After significant discussion in the field by craft personnel and the FWS about what was intended, workers appropriately documented problems with the instruction in the work record. However, workers did not second-check two of the nine sight glasses that were inspected, and as-found conditions were inconsistently documented. (242-A Evaporator)
- Work procedure ETF-EL-18537, *Maintenance and Calibration of Mettler Toledo InPro 5500i Co2 Sensor*, contained steps 5.1.1 to 5.1.4 on page 5 and also had identically numbered steps 5.1.1 to 5.1.4 on page 8, which directed performance of different work; work was stopped to process a corresponding procedure change, resulting in a several hour delay to implement the eDARF process (an electronic document revision process for minor technical changes). A process for “Minor Inconsequential (Administrative) Changes” is available but was not used. (See **OFI-H2C-3.**) (LERF/ETF)

Overall, maintenance workers demonstrated strong adherence to work instructions when possible and stopped when instructions could not be performed as written. However, the following weaknesses were observed in adherence to conduct of operations and other requirements, which resulted in noncompliances with procedure use requirements of TFC-OPS-OPER-C-13 (see **Deficiency D-H2C-1** and **OFI-H2C-4**):

- TO-020-420, *Clean Level-Indicating Transmitter Tapes, Plummets, and Displacers*, is a continuous use procedure that was used during the performance of WO 1230197 but was not observed to be present in the field. Continuous use requirements (placekeeping by the individual performing the work or a reader-worker process) were not used as work was being performed. (AP Farm)
- During the performance of PM EE-108677, performed under WO 1300461 using 7-MISC-858, *Perform Bimonthly Checks of Oil Filled Lead Glass Shielding Windows*, the work package included waste planning checklist 2026-162, which stated, “Do not begin work if waste containers are not

available.” This requirement was not included in the work instruction. Work was partially performed and then stopped when workers identified that no waste container was available. (242-A Evaporator)

- During the performance of wireless leak detector functional checks per 3-LDD-702, gasket conditions were checked in the field but were not relayed to the control room for recording on the official work record. (AW Farm)
- During the performance of 3-LDD-702, step numbers were read (e.g., “Perform step 5.1.4”) by the worker providing direction and placekeeping in the continuous use procedure, but the actual work step was not (e.g., “Lift the Phoenix Contact knife switch on terminal 1”). This was performed for steps 5.1.3 through 5.1.21. (AW Farm)

Maintenance Procedures Conclusions

H2C has established and implemented a procedure process to perform work, including hazard identification and control points, review and sign-off, and PMT. However, a significant weakness relating to procedure adequacy was identified. Noncompliances with procedure use requirements were also observed.

3.7 Training and Qualification

This portion of the assessment evaluated whether H2C’s training programs for maintenance personnel ensure that they are appropriately trained and qualified.

H2C appropriately uses a systematic approach to training in accordance with DOE Order 433.1B, attachment 2, section 2.g, and DOE Order 426.2, *Personnel Selection, Training, Qualification, and Certification Requirements for DOE Nuclear Facilities*, to develop, implement, and maintain a training and qualification program for maintenance personnel. TFC-BSM-TQ-STD-10, *Maintenance Craft Qualification Requirements*, appropriately identifies the minimum requirements for initial and continuing training.

The H2C training implementation matrix identifies four positions (electricians, instrumentation and control technicians, millwrights, and pipe fitters) that can impact the safety basis. H2C’s hiring and selection process for maintenance personnel adequately addresses DOE Order 426.2, attachment 1, chapter II requirements regarding education and experience. Minimum requirements for hiring appropriately specify that individuals have achieved journeyman-level proficiency in their craft.

Training records are effectively managed electronically in the training record system, the Hanford Site Worker Eligibility Tool (HSWET). Maintenance training staff appropriately use HSWET and the Learning Management System to review workers’ training status and generate reports on required training due within 90 days. Maintenance training staff also send out reminders to managers and supervisors when training is due for any of their assigned workers. Interviewed FWSs demonstrated their understanding and ability to access records to assess current worker qualifications.

Interviewed training staff demonstrated a strong commitment to implementing and improving the training program. Reviewed training materials and observation of a training class on the work control process provided examples of well-developed lesson materials, innovative training methods, and prepared and knowledgeable instructors.

While the H2C maintenance training program is generally adequate to support the conduct of maintenance, the following significant noncompliances were identified (see **Finding F-H2C-2**):

- Contrary to DOE Order 426.2, attachment 1, chapter I, section 4, H2C does not ensure adequate worker knowledge and ability to perform maintenance on engineered safety features as identified in the facility

documented safety analysis for all H2C-operated nuclear facilities. Without adequate facility-specific training, the flexibility afforded by assigning workers to multiple facilities is limited. Maintenance craft are assigned to one of six facility-specific teams that principally work and develop expertise in systems and components in that facility but can be assigned to work in any facility. Multiple interviewed FWSs confirmed that this facility-specific teaming approach has resulted in supervisors at one facility cancelling work if they are unsure as to whether team members from other facilities have the necessary proficiency to do the job. Reviewed H2C training documentation revealed that there is no skill-specific initial or continuing training that raises the proficiency of each maintenance craft to a common level addressing such topics as new facility equipment, engineering print reading, facility-specific systems, troubleshooting, and use of computer systems (e.g., 3D views, SmartPlant, and work documents). Skill-based tasks on the job task analysis are designated as “skill of the craft” and, as a result, craft workers receive no additional initial or continuing training on those tasks to address the uniqueness of H2C facilities and systems.

- Contrary to TFC-BSM-TQ-STD-10, sections 3.2.3 and 3.4.1, H2C has not developed a two-year fixed continuing training program for craft personnel to maintain their qualifications. Without a continuing training program, management cannot ensure that craft personnel maintain their proficiency. The H2C training department performed a needs analysis that acknowledges this gap and has developed an informal document entitled *Maintenance Training Program Plan – 2025*. Additionally, the *H2C Maintenance Improvement Plan 2026* identifies specific plans to address continuing training.

Training and Qualification Conclusions

The H2C maintenance training program is generally adequate to support the conduct of maintenance. However, significant weaknesses were identified with the H2C training program for maintenance personnel in the areas of worker knowledge and ability to perform maintenance in all tank farm nuclear facilities and a formal continuing training program.

3.8 Configuration Management

This portion of the assessment evaluated whether H2C’s configuration management processes ensure controlled alignment of SSCs with technical basis documents, that changes are not inadvertently introduced, and that required system performance is not compromised.

H2C has adequately established and implemented a robust configuration management program, flowed down from the NMMP through TFC-PLN-23, *Configuration Management Plan*, in accordance with DOE Order 433.1B, attachment 2, section 2.h. This plan appropriately mirrors the requirements specified in DOE-STD-1073-2016, *Configuration Management*, which is invoked through DOE Order 413.3B, *Program and Project Management for the Acquisition of Capital Assets*. Two reviewed engineering change notices for current change packages contained adequate detail to document the change, were appropriately reviewed through the USQ process, and were approved by management. Five interviewed SEs were familiar with the requirement for changes to be reviewed by appropriate engineers and processed through the USQ process. Additionally, the interviewed configuration management program manager appropriately described the change process that has been established to ensure that system and document changes do not deviate from the established process in TFC-PLN-23. Configuration management problems are appropriately required by TFC-PLN-23 to be documented and tracked to closure using the H2C issues management system (integrated Contractor Assurance System [iCAS]).

Configuration Management Conclusions

Configuration management is well established through TFC-PLN-23. Configuration management problems are appropriately required to be entered into iCAS and tracked to closure.

3.9 Procurement

This portion of the assessment evaluated H2C's processes to determine whether parts, materials, and services are procured and made available when required.

H2C has established and implemented an effective procurement process to ensure the availability of parts, materials, and services for maintenance activities. TFC-BSM-CP_CPR-P-10, *Procurement Materials*; TFC-BSM-CP_CPR-C-06, *Procurement of Materials*; and TFC-BSM-CP_CPR-C-05, *Procurement of Materials and Services*, adequately address the implementation of the procurement process in accordance with DOE Order 433.1B, attachment 2, section 2.i. Four reviewed purchase orders demonstrated that items and services met requirements established in TFC-BSM-CP_CPR-C-05. The reviewed purchase orders also adequately included clauses addressing suspect and counterfeit materials and labeling of electrical items and equipment. H2C has adequately established and maintains a qualified supplier list that specifies acceptable items and services.

H2C effectively stores procured parts and materials. Observed storage facility racks were adequately labeled to identify the location of materials and parts. Items were appropriately segregated by quality level, and separate nonconformance report areas were adequately maintained. Items were appropriately labeled with quality assurance acceptance tags, which included the WO number, purchase order number, contents, end user designation, storage level, and quantity. Two reviewed receipt inspection records demonstrated adequate receipt inspections for visual damage, part number identification, and suspect and counterfeit item (S/CI) identification.

Procurement Conclusions

H2C has established and implemented an effective procurement process to ensure the availability of parts, materials, and services for maintenance activities. H2C effectively stores procured parts and materials.

3.10 Maintenance Tool and Equipment Control

This portion of the assessment evaluated H2C's processes to determine whether maintenance tools and equipment are controlled, maintained, and calibrated.

H2C appropriately controls measuring and test equipment (M&TE) through TFC-OPS-MAINT-C-03, *Maintenance Tool and Equipment Control*, in accordance with DOE Order 433.1B, attachment 2, section 2.j. This procedure thoroughly describes the calibration process for M&TE, which includes a robust return-of-equipment process to ensure that equipment checked out is returned to the tool crib each day.

TFC-OPS-MAINT-C-07, *Control and Calibration of M&TE*, adequately governs the handling, storage, and use of calibrated equipment in the maintenance process. During a walkdown of the tool crib, the control and tracking of calibrated equipment were proficiently demonstrated. The tool crib manager also demonstrated the electronic tracking system for all calibrated M&TE used in the maintenance process.

Maintenance Tool and Equipment Control Conclusions

H2C has established and implemented adequate processes to control maintenance tools and equipment, which includes a robust process to ensure that checked-out equipment is returned to the tool crib each day.

3.11 Suspect and Counterfeit Items

This portion of the assessment evaluated H2C's processes to determine whether S/CIs are detected, controlled, reported, and appropriately dispositioned.

H2C has established and implemented an adequate S/CI inspection process in accordance with DOE Order 433.1B, attachment 2, section 2.k, through TFC-ESHQ-Q-C_C-03, *Control of Suspect/Counterfeit Items*. TFC-ESHQ-Q-C_C-03 appropriately requires the involvement of maintenance, engineering, and quality assurance engineering personnel in identifying, evaluating, notifying, and dispositioning S/CIs to prevent the use of S/CIs. H2C has appropriately designated a quality assurance engineer as the S/CI subject matter expert. Reviewed training documentation demonstrated the use of adequate personnel training material for preventing entry of S/CIs into the DOE supply chain, and to ensure detection, control, reporting, and disposition of S/CIs. TFC-ESHQ-Q-C_C-03 also appropriately emphasizes S/CI identification by supply chain inspectors during the receipt inspection process. For example, H2C identified suspect parts on two occasions that were appropriately documented and resolved.

Suspect and Counterfeit Items Conclusions

H2C has established and implemented adequate processes to ensure that S/CIs are detected, controlled, reported, and appropriately dispositioned.

3.12 Maintenance History

This portion of the assessment evaluated H2C's use of documented and retrievable maintenance history to support work planning and performance analysis.

H2C personnel effectively document maintenance history through TFC-ENG-FACSup-D-01.1, *System Engineering Performance Monitoring and System Health Reporting*, in accordance with DOE Order 433.1B, attachment 2, section 2.l. Prompt responses to requested documents demonstrated the retrievability of maintenance records from the electronic document management system. Procedures adequately establish responsibilities for work planners to conduct maintenance history reviews and for SEs to implement performance trending, which are documented in SHRs. H2C personnel adequately conducted maintenance history reviews and performance trending, as documented in 13 reviewed SHRs.

Maintenance History Conclusions

H2C's maintenance history reviews and performance trending were adequately conducted, as documented in reviewed SHRs.

3.13 Aging Degradation and Technical Obsolescence

This portion of the assessment evaluated inspections performed by H2C to evaluate age-related degradation and technical obsolescence.

H2C has appropriately established and implemented a system evaluation process to evaluate SSC aging and technical obsolescence through TFC-ENG-FACSup-C-23, in accordance with DOE Order 433.1B,

attachment 2, section 2.m. This responsibility is appropriately performed by the SE in accordance with TFC-ENG-FACSUP-P-01. Systems are assessed monthly at a minimum, and results are documented in the SHR. Each SHR appropriately documents any identified aging degradation issues. A review of the three most recent SHRs (for three different systems) showed that no new aging/obsolescence issues were identified that are not already being tracked. Reviewed SHRs for five additional systems were current and up to date. System issues are also appropriately tracked on a real-time basis on the system status reports on the electronic engineering dashboard.

Aging Degradation and Technical Obsolescence Conclusions

Periodic system assessments were properly performed and documented in reviewed SHRs. Reviewed SHRs were current and up to date.

3.14 Seasonal Facility Preservation

This portion of the assessment evaluated H2C's seasonal facility preservation processes to prevent weather-related damage to safety SSCs.

H2C has established and implemented an effective seasonal facility preservation program through 3-MISC-927, *Winterization/De-Winterization of Tank Farm In-Pit Heaters*, in accordance with DOE Order 433.1B, attachment 2, section 2.n. This program establishes robust processes to perform a pre-cold weather assessment and a post-cold weather assessment following the winter season. The pre-cold weather assessment reviews the freeze protection PM, the adequacy of cold weather tours, and reviews any previous year events. The post-cold weather assessment appropriately evaluates how the facility performed during the cold season. Further, weekly verifications of heating equipment during winter are adequately performed through TO-040-745, *Perform Weatherization of Retrieval Buildings and Equipment*. H2C's seasonal facility preservation process has resulted in no freeze damage events in the last two years.

Seasonal Facility Preservation Conclusions

H2C effectively implements a seasonal facility preservation program through procedures, pre-cold and post-cold weather assessments, and weekly verification of heating equipment during winter.

3.15 Performance Measures

This portion of the assessment evaluated whether H2C uses performance measures to promote maintenance improvement.

Performance management is adequately executed through TFC-PRJ-PC-C-11, *Performance Indicator Program*, in accordance with DOE Order 433.1B, attachment 2, section 2.o. Performance measures are appropriately provided to two management oversight committees that assess safety management programs for crosscutting organizational impact. The Executive Safety Quality Review Committee (ESQRC) and the Management Performance Review Committee are governed by their respective charters. Interviews with the Performance Assurance management and the Maintenance Manager confirmed adherence to the requisite meeting frequencies as established by both charters. A review of several reports provided to the ESQRC showed that they appropriately included a quarterly Hanford tank waste operations and closure performance metrics report and an annual maintenance management safety management program health report. The reviewed *March 2026 Maintenance and Work Management - Management Performance Review* demonstrates effective communication of data to support appropriate decision-making.

During interviews, maintenance managers discussed the performance indicators (PIs) contained in reports provided to the management oversight committees and acknowledged that there is an organizational effort to improve PI reporting. A review of the metrics revealed the following examples of conditions that negatively impact the quality of the PIs (see **OFI-H2C-5**):

- The CM and PM backlogs did not include an assessment of risk; specifically, they did not provide any indication of the percentage of work packages that were related to the safety basis or technical safety requirements.
- PI formats were non-standard with multiple graphs on one page and conflicting data entries.
- PI analysis lacked specific corrective actions for non-conforming conditions (e.g., stated “continue to work to address the discrepancy”).
- Some PIs did not receive appropriate attention. For example, the hazardous energy-related events were rated as “meeting expectations” even though H2C experienced four events in the last two months. Also, no actions were taken in response to a 45% increase in fire protection impairments over the past year.

Performance Measures Conclusions

H2C’s use of performance measures to promote maintenance improvement is generally adequate. However, PIs do not always provide adequate information to appropriately guide corrective actions or support analysis of adverse conditions.

3.16 Facility Condition Inspection

This portion of the assessment evaluated H2C’s conduct of FCIs to identify issues related to operability, reliability, housekeeping, and general condition.

TFC-PLN-29 appropriately references various processes that generally meet the requirement for FCIs, in accordance with DOE Order 433.1B, attachment 2, section 2.p. These processes include PM and CM work package completion, work requests, service requests to prompt workers to evaluate facility conditions, SHRs, daily rounds and routines surveillances, and the double- and single-shell tank integrity project tank inspections. However, a May 2025 H2C NMMP self-assessment identified that a 2024 HFO finding that the FCI program did not meet the intent of DOE Order 433.1B remained open. In response, the *2025 H2C Maintenance Improvement Plan* appropriately contains a task to implement a new FCI program procedure by August 31, 2026. Additionally, H2C has no metric to track the completion of FCIs. (See **OFI-H2C-6**.)

Facility Condition Inspection Conclusions

H2C personnel perform a variety of activities that provide facility condition information. H2C has included an action in its maintenance improvement plan to implement a formal FCI program for the conduct of those activities.

3.17 Post-maintenance Testing

This portion of the assessment evaluated H2C’s use of PMT to determine the continued capability for credited SSCs to perform their intended function when returned to service.

H2C has established and implemented an adequate PMT WO process through TFC-OPS-MAINT-C-01, in accordance with DOE Order 433.1B, attachment 2, section 2.q, to verify that safety SSCs perform their intended function when returned to service. A review of 12 completed safety SSC-related WOs, as well as interviews with the associated work planners and SEs, confirmed appropriate coordination in developing the PMT scope, initial conditions and prerequisites, job instructions, hold points, test requirements, acceptance criteria, and post-test restoration. The reviewed PMT WO sections showed that testing results, including deficiencies, were properly documented, corrected, and met the acceptance criteria; final test results were formally reviewed and accepted for return to operability.

Post-maintenance Testing Conclusions

H2C has established and implemented an adequate PMT WO process to properly maintain safety SSCs and return SSCs to service.

4.0 BEST PRACTICES

No best practices were identified during this assessment.

5.0 FINDINGS

Findings are deficiencies that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. DOE line management and/or contractor organizations must develop and implement corrective action plans for findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 226.1, *Implementation of Department of Energy Oversight Policy*, to manage the corrective actions and track them to completion.

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Finding F-H2C-1: H2C does not validate that all maintenance procedures and instructions include adequate direction to correctly accomplish work and can be performed as written prior to releasing work packages to the field. (DOE Order 433.1B, att. 2, sec. 2.f; TFC-OPS-OPER-C-13, sec. 4.2)

Finding F-H2C-2: H2C does not ensure that personnel who perform maintenance at H2C-operated nuclear facilities are adequately trained on all SSCs on which they may perform work and has not developed a two-year fixed continuing training program for craft personnel to maintain their qualifications. (DOE Order 426.2, att. 1, ch. I, sec. 4; TFC-BSM-TQ-STD-10, secs. 3.2.3 and 3.4.1)

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.

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Deficiency D-H2C-1: H2C personnel did not adhere to all procedure use requirements during observed maintenance activities. (TFC-OPS-OPER-C-13, sec. 4.1.1)

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the OFIs shown below 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.

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OFI-H2C-1: Consider including field observations of maintenance work performance in the assessments of NMMP elements to provide a measure of the effectiveness of program implementing procedures.

OFI-H2C-2: Consider integrating engineering programs and products into maintenance activities to better prioritize backlogs and effectively use resources.

OFI-H2C-3: Consider evaluating the proper usage of the procedure minor change process, including methods for implementing minor changes during back-shifts or overtime.

OFI-H2C-4: Consider reinforcing conduct of operations requirements and expectations, including full review of work packages during pre-job briefings, methods for ensuring accurate recording of data on data sheets, and proper three-way communication when implementing continuous use procedures.

OFI-H2C-5: Consider establishing a standard for the format, quality of data, and content of analysis for PIs.

OFI-H2C-6: Consider including an inspection tracking PI in the new FCI program procedure.

Appendix A Supplemental Information

Dates of Assessment

March 3 to April 1, 2026

Office of Enterprise Assessments (EA) Management

Mark D. Barth, Acting Director, Office of Enterprise Assessments
VACANT, Deputy Director, Office of Enterprise Assessments
Jack E. Winston, Acting Director, Office of Environment, Safety and Health Assessments
Tamara D. Powell, Director, Office of Nuclear Safety and Environmental Assessments
David Olah, Director, Office of Worker Safety and Health Assessments
Dr. Wade W. Gough, Acting Director, Office of Emergency Management Assessments
Brent L. Jones, Director, Office of Nuclear Engineering and Safety Basis Assessments

Quality Review Board

William F. West, Advisor
Kevin G. Kilp, Chair
Christopher E. McFearin
Jacob M. Miller
William A. Eckroade

EA Site Lead for the Hanford Site

Eric A. Ruesch

EA Assessment Team

Eric A. Ruesch, Lead
N. Scott Dolezal
Thomas R. Hipschman
Frank A. Inzirillo