Central Plateau Cleanup Company

UNREVIEWED SAFETY QUESTION – PISA DETERMINATION

PISA Determination Number: SWOC-23-010	PISA Process Entered *(Date)*: **2/01/2023**

Title: Evaluate Adequacy of the SWOC MDSA/TSR Control Set for Assuring Operability of the Fire Suppression Systems (FSS)

Applicable Facilities/Packaging System/Transportation Activity: Solid Waste Operations Complex (SWOC)

Scope: The scope of the PISA determination is a review of the control set for the SWOC fire suppression systems (FFS) to determine whether the stated controls are adequate to assure operability of the FSS.

Description: On January 18, 2023, dry pipe sprinkler system internal inspections were performed in 2402WF at Central Waste Complex (CWC), which is part of Waste Projects and Operations (WP&O). Potentially obstructing material and corrosion degradation was identified in the sprinkler system branch piping. In accordance with CPCC-PRO-FP-40426, Fire Protection System Discrepancies, an Emergency Impairment was declared (23-00037), and the system was subsequently determined to be inoperable (CPCC-00660, *Operability Evaluation of 2402WF Fire Suppression System Internal Piping Condition*).

On January 31, 2023, dry pipe sprinkler system internal inspections were performed in 2402WE at Central Waste Complex (CWC), which is part of Waste Projects and Operations (WP&O). Potentially obstructing material and corrosion degradation was identified in the sprinkler system branch piping. In accordance with CPCC-PRO-FP-40426, Fire Protection System Discrepancies, an Emergency Impairment was declared (23-00069), and the system was subsequently determined to be inoperable (CP-ENG-0203, *Operability Evaluation of 2402WE Fire Suppression System Internal Piping Condition*).

CP-ENG-0203 describes the effects of degraded condition as follows:

> The degraded fire sprinkler piping has the potential for the following effects:
>
> 1. Obstruction of flow through fire sprinklers
>
> - This applies only to the as-found condition.
> - The scale observed during the internal inspection could plug a sprinkler head during a fire event impairing the FSS's ability to perform its safety function.
>
> 2. Reduced hydraulic performance
>
> - Corrosion can cause increased pipe roughness and a reduction in pipe cross-section. This results in reduced hydraulic performance that could impair the FSS's ability to flow the designed density of water to the fire.
>
> 3. Pipe wall thinning
>
> - Corrosion reduced pipe wall thickness which can compromise the integrity of the pipe's ability to maintain the pressure boundary manifesting as leaks. Large leaks could impair the FSS's ability to flow the designed density of water to the fire.

As a result of the FSS degraded condition noted above and as required by CPCC-PRO-NS-062, Unreviewed Safety Question Process, SWOC facilities entered the PISA process on 2/01/2023 to evaluate whether the SWOC MDSA/TSR control set was adequate to assure operability of the credited Fire Suppression System (FSS). Facility log entries are as follows:

CWC (1415 hrs.) – Entering the PISA process in accordance with CPCC-PRO-NS-062, Section 3.3, to evaluate whether the hazard control set in the SWOC TSR is adequate to assure the operability of the credited fire suppression system.

T Plant (1630 hrs.) – Late Entry: PISA process entered for SWOC TSR credited fire suppression system. PISA to evaluate if MDSA & TSR (LCO/SR) control set adequately controls operability for these systems.

WRAP (1626 hrs.) – Late Entry ~1415 hrs.: WRAP is entering the PISA process to evaluate whether the hazard control set in the SWOC TSR is adequate to assure operability of the credited Fire Suppression System (FSS).

Further, as documented in Occurrence Report EM-RL--CPCC-SWOC-2023-0003 - Throughout the process of performing dry pipe system internal inspections at the Central Waste Complex, multiple buildings were identified with

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excess corrosion product/debris in the branch lines. The SWOC TSR (HNF-15280 Rev. 12C) identifies the fire suppression system as a Safety Significant SSC that is required to be operable in ALL MODES when RADIOACTIVE WASTE, with exception of O&M waste, or non-sealed sources are present in the FACILITY FIRE AREA. Flushing activities have been successful in providing the impaired systems with unobstructed flow path by removing corrosion products capable of obstructing the piping/sprinkler head. However, CWC/WRAP building FSS that have not had internal inspections or flushes performed have conservatively been determined to be inoperable, pending internal piping inspections and/or flushes.

As such, CWC/WRAP have categorized per CPCC-PRO-EM-060, Appendix C, Group 4, Subgroup A (1) L occurrence report for "Performance degradation of any Safety Class (SC) or Safety Significant (SS) Structure, System, or Component (SSC), or any support system that is required for safe operation of the SC or SS SSCs, which prevents satisfactory performance of its design function when it is required to be operable."

Immediate Actions Taken - 2402-WE, 2402WG, 2402-WH, 2402-WI, 2402-WJ, 2402-WK, 2402-WL, 2403-WA, 2403-WB, 2403-WC, 2403-WD, and 2336-W have been placed in LCO 3.2.1, Fire Suppression Systems. Internal inspections and/or flushes of the remaining buildings is ongoing. As part of an extent of condition, no waste is currently in 2706T, 2706TA, and 2706TB. As such, no entry into LCO 3.2.1 is required for the 2706 series buildings.

Safety Basis Discussion

HNF-14741, Section 2.7.2.1, *Fire Protection Systems*:

2402 W Mixed Waste Storage Buildings (Buildings 2402-W, 2402-WB through 2402-WL)

Fire suppression for Buildings 2402-W and 2402-WB through 2402-WL is provided by a single dry-pipe automatic sprinkler system in each building. Piping is sized in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, ordinary hazard pipe schedule or better. The sprinkler systems for the 2402 series buildings have been hydraulically calculated to provide 0.15 gal/min/ft² over 2,000 ft² area, which meets Ordinary Hazard Group 1 criteria. The system requires 401 gal/min at 64 psi at the base of the riser and 651 gal/min at 80 psi at the source, including the 250 gal/min hose stream allowance. The water supply is adequate to meet this demand.

HNF-14741, Section 3.4.2.6, *Medium Inside Facility Fires (FIR-6)*:

The CHA and CHPRC-03081 identify several facility fires for the SWOC facilities or operations initiated by events such as vehicle collisions, handling accidents, equipment malfunction, and maintenance activities. This section presents a generic bounding and representative medium fire postulated to occur inside SWOC facilities. The CHA identifies this accident scenario as FIR 6. This accident scenario is designed to bound all medium inside fires that occur outside primary confinement volumes (e.g., gloveboxes), as identified in CHPRC-03081.

HNF-14741, Section 3.4.2.6.1, *Scenario Development:*

As indicated in CHPRC-03081, a medium facility fire could result from a variety of initiating events. Independent of the initiating event, the facility mitigating systems and administrative programs or controls is, for the most part, common to all inside fire scenarios. These systems and controls include FSSs and the Fire Protection Program and its associated elements.

The size of a fire in a facility depends on the initial conditions that created the fire (e.g., the initial amount of combustible or flammable liquid present). In addition, the size of the fire could be dictated by the response of the mitigating system or implementation of SACs and ACs within the facility or both. This accident scenario postulated for the SWOC facilities is designed to represent a medium fire caused by ignition of liquid fuel or lubricating oil.

HNF-14741, Section 3.4.2.6.5, *Summary of Safety Structures, Systems, and Components and Technical Safety Requirement Controls:*

Preventive Engineered Controls

Fire Suppression System (SS SSC): This SS SSC is credited with reducing the likelihood of the postulated medium fires by one frequency bin. This control provides fire suppression of the inside fires, thus reducing or limiting fire size.

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Events Bounded by the Accident Scenario

Sprinkler systems, even though they may not be fully capable of suppressing a fuel fire, can control fire growth and temperatures inside the facility. Fires in the facility will not cause the building to collapse if the sprinklers actuate.

HNF-14741, Section 4.4.2, *Fire Suppression Systems*:

Fire is a principal contributor to risk at the SWOC. Automatic fire suppression provided in each of the main buildings at the Central Waste Complex (CWC), Waste Receiving and Processing (WRAP) Facility, and 2706-T & TA is a key control in minimizing this risk. These systems are SS and are protected through the application of a limiting condition for operation (LCO).

HNF-14741, Section 4.4.1, *Safety Function*:

The safety function of the automatic fire suppression systems (FSSs) is to minimize the effects of fire by reducing the potential for fire growth and thus reducing or limiting the potential release of radioactive and hazardous material. The FSS also reduces the leak path factor (LPF) for medium fires, but is not credited.

HNF-14741, Section 4.4.2.3, *Functional Requirements*:

The functional requirement necessary to fulfill the safety function stated above is that SWOC FSSs provide water flow and pressure sufficient to control evaluation basis fires as defined in the Master Documented Safety Analysis (MDSA).

HNF-14741, Table 4-2, *Performance Criteria and Evaluation for the Automatic Fire Suppression Systems*:

Performance Criteria

The performance requirements for these FSSs are as follows.

Hydraulically designed fire suppression sprinklers are installed such that they are capable of providing the minimum water specified below[a]:

Hydraulically Designed Systems	**Designed Water Density[b]**
CWC 2404	0.25 gpm/ft^2
WRAP (shipping and receiving area)	0.25 gpm/ft^2
WRAP (other areas)	0.20 gpm/ft^2
a. Sprinkler system hydraulic information is developed as required by NFPA 13. b. Hydraulic calculations are performed using methodology and calculations found in NFPA 13.	

Pipe schedule design sprinkler systems were hydraulically calculated to determine capability.

Pipe Schedule Systems:	**Hydraulically Calculated Density[a]**
CWC 2402	0.15 gpm/ft^2
CWC 2403	0.20 gpm/ft^2
2706-T & TA	0.20 gpm/ft^2
a. Hydraulic calculations are performed using methodology and calculations found in NFPA 13.	

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HNF-14741, Section 5.5.4, *Fire Suppression Systems - SWOC:*

The purpose of the fire suppression system (FSS) is to control the effects of a fire within the building. The FSSs are credited for prevention of consequences from fire scenarios (FIR-6 and FIR 8) in the CWC FIRE AREAS (all), 2706-T Complex FIRE AREAS, and WRAP FIRE AREAS (all). Evaluation of the hazardous conditions associated with inside fires identifies that the failure of installed FSSs is a common potential contributor to growth of larger inside fires. These failures provide opportunities for small fires to progress into large fires that can cause loss of structural confinement and the consequent release of airborne waste materials from burning waste containers involved in the fire, which leads to the potential for significant onsite and offsite consequences. The control provided by the sprinklers is credited by the MDSA to limit the initial fire to the area of origin and significantly limit the maximum fire temperature. Limiting the maximum fire temperature greatly reduces the number of material storage containers potentially ruptured by a fire. The FSS activates to control the effects of a fire, thus minimizing fire severity and spread, and the potential for co-located worker and offsite dose consequences.

HNF-15280, *LCO 3.2.1*:

FIRE SUPPRESSION SYSTEMS - SWOC

LCO 3.2.1 Fire sprinkler systems SHALL be OPERABLE as follows:

1. A static pressure of >70 psi.
2. Water supply isolation valves are open and either locked open or visual tamper device intact.

The MODE APPLICABILITY apples to all MODES when RADIOACTIVE WASTEs, with exception of O&M WASTE, or non-sealed sources are present in the FACILITY FIRE AREA. The LOCATION APPLICABILITY applies to CWC FACILITY FIRE AREAS (all), 2706-T Complex FACILITY FIRE AREAS, and WRAP FACILITY FIRE AREAS (all).

Surveillances are as follows:

SR 4.2.1.1	VERIFY static pressure is >70 psi at the gauges listed in Table 4.2.1.1-1.	WEEKLY

Table 4.2.1.1-1. FSS Pressure Gauge

Location	Pressure Indicator
CWC	286W-WATER-SW-GAGE-1 or 286W-WATER-SW-GAGE-2
T Plant	F-PI-2706-601 or CWC gauges stated above
WRAP	FW-PI-606 or CWC gauges stated above

SR 4.2.1.2	VERIFY water supply isolation valves listed in Table 4.2.1.2-1, “SWOC Post Indicating Valves/Control Valves,” are open and either locked open or visual tamper device intact.	MONTHLY

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HNF-15280 LCO 3.2.1 Bases:

LCO 3.2.1 is necessary to protect specified CWC buildings, 2706-T, and WRAP building structures and to minimize the impact of fire on radioactive material within the buildings. The FSS for the aforementioned facilities is a subset of the fire protection system and includes an adequate water supply, pressure, and flow capability. LCO 3.2.1 ensures that the system is maintained OPERABLE and available to control a fire upon demand.

The FSS is determined to be OPERABLE if FSS water is available from the 283WA or 283 EA storage tank at a minimum static pressure of 70 psi and isolation valves specified in Table 4.2.1.2-1, “SWOC Post Indicating Valves/Control Valves” are verified to be open.

The FSS must be supplied with an adequate water supply. At least one water supply path through the sanitary water supply loop exists, the valves between the loop and riser (SR 4.2.1.2) and any isolation valves to the sprinklers have been verified as being open. Analysis provided in HNF-16788, Sprinkler Systems Hydraulic Calculations demonstrates that a single feed to a SWOC facility is sufficient to meet demand requirements for the specified hazard category.

The SWOC FSSs are assumed to provide adequate pressure and flow by design. The FSSs functionality is assured by the design, construction, testing, and routine inspection performed per NFPA requirements.

The purpose of the SR 4.2.1.1 WEEKLY surveillance is to ensure that sufficient water supply and pressure is available from the sanitary water system for proper operation of the FSS. The pressure reading is taken at a gauge located upstream of the backflow preventer (Table 4.2.1.1-1). Only one gauge in Table 4.2.1.1-1 is required for determining OPERABILITY for each SWOC facility.

Acceptance Criteria: Pressure gauge must have a current CALIBRATION and show no signs of physical damage. Pressure gauge isolation valve is open and the pressure gauge must indicate that system pressure is within the normal operating range (>70 psi).

The purpose of the SR 4.2.1.2 MONTHLY surveillance is to ensure that the water supply loop valves are in the open position so that full water flow is provided to the FSS if activated.

Acceptance Criteria: Water supply isolation valves in Table 4.2.1.2-1, “Solid Waste Operations Complex Post Indicating Valve” are open as VERIFIED in facility surveillance procedures and either locked open or electronically supervised with a system that indicates valve position.

HNF-15280 TSR 5.5 - SAFETY MANAGEMENT PROGRAMS:

This section contains commitments to safety management programs (SMPs). These SMPs may not be specifically credited in the accident analysis, but all are an important part of defense-in-depth. Key elements of credited SMPs are included in specific TSR ACs. In addition to worker safety, the cumulative effect of the programmatic details is important to facility safety and is an integral part of safe operations.

5.5.1 Safety Management Program Requirements

a. The following SMPs, as described in HNF-11724, CH2M HILL Plateau Remediation Company Safety Management Programs, SHALL be established, implemented, and maintained as applicable to each nuclear facility, unless otherwise noted in the SWOC MDSA.

Prevention of Inadvertent Criticality* - as applicable per HNF-7098, Criticality Safety Program, (Chapter 6)

Radiation Protection* (Chapter 7)

Hazardous Material Protection* (Chapter 8)

Radioactive and Hazardous Waste Management* (Chapter 9)

Initial Testing, In-Service Surveillance, and Maintenance (Chapter 10)

Operational Safety* (Conduct of Operations/Fire Protection/Hoisting and Rigging) (Chapter 11)

Procedures and Training (Chapter 12)

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Human Factors - as applicable to major modifications of existing facilities (Chapter 13)

Quality Assurance* (Chapter 14)

Emergency Preparedness Program* (Chapter 15)

Provisions for Decontamination and Decommissioning (Chapter 16)

Management, Organization, and Institutional Safety Provisions (Chapter 17)

a. SWOC Management SHALL ensure the overall safety function of an SMP is maintained through implementation of all applicable program key attributes identified in HNF-11724, as modified by the SWOC MDSA. SWOC Management SHALL ensures facility level assessments are performed as required by the continuous improvement process of the Integrated Safety Management System.

b. For those SMPs identified above by an asterisk, the resulting facility-level assessment data will be provided to the appropriate program manager for tracking and trending, and corrective action management required by PRC-PRO-QA-052, Issues Management, or successor document.

HNF-15280, *TSR AC 5.7.1 - Fire Protection (AC) – SWOC*:

This AC defines specific measures to protect assumptions of the Fire Protection Program that ensure key elements are in place to prevent occurrence or minimize consequences of a fire in and around the SWOC.

This AC includes the following elements:

a. Water Supply Agreement - There must be a formal agreement between the SWOC Facility Management and the personnel responsible for the 200W Sanitary Water supply, in order to ensure that adequate water supply is available for the FSSs.

The interface agreement between SWOC facilities and water utilities id documented in *HNF-46148, Rev. 4, INTERFACE CONTROL DOCUMENT HNF-46148, Revision 4 between CH2M HILL Plateau Remediation Company and Mission Support Alliance, LLC for Water Systems Services.*

HNF-11724, Section 10.0, *Initial Testing, In-Service Surveillance, And Maintenance:*

This section provides a summary of the initial testing, in-service surveillance, and maintenance programs specified by DOE STD 3009 94. The programs described in this section are applicable within the scope of the CPCC. In summary, the applicable KAs of the CPCCo programs for initial testing, in-service surveillance, and maintenance for safety analysis purposes are as follows.

- KA 10-1: Procedures are developed that govern inspection and acceptance testing.
- KA 10-2: Tests are controlled, planned, performed, and documented. Inspection points are identified in the inspection procedures. Characteristics to be inspected, methods of inspection, and acceptance criteria are specified. Acceptance parameters and other inspection or acceptance test requirements are specified as part of the design documentation and work planning process. Technically qualified personnel, other than those who performed or directly supervised the work, perform inspections and acceptance tests.
- KA 10-4: CPCCo has a Nuclear Maintenance Management Program Description Document (CPCC-MP-MN-40443) that implements CRD O 433.1B, Maintenance Management Program for DOE Nuclear Facilities, which provides a high degree of confidence that facility equipment degradation is appropriately identified and corrected.
- KA 10-6: Post-maintenance testing is performed to verify that components fulfill their design function when returned to service after maintenance.

HNF-11724, *Section 11.0 - Operational Safety:*

This section provides a summary of the Operational Safety Program specified by DOE STD 3009-94. The Operational Safety Program described in this section is applicable within the scope of the CPCC. In summary, the applicable KAs of the Operational Safety Program for safety analysis purposes are as follows.

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- KA 11-1: CPCCo has a Conduct of Operations Program that implements the requirements of CRD O 422.1, Conduct of Operations, at nuclear facilities.
- KA 11-2: The fire hazards analyses (FHAs) for CPCCo nuclear facilities meet the requirements of CRD O 420.1C, Facility Safety. The fire hazards for the CPCCO nuclear facilities are defined and evaluated in the facility specific FHAs.
- KA 11-3: CPCCo implements a Fire Protection Program that meets the requirements of CRD O 420.1C, Facility Safety.
- KA 11-4: The Fire Protection Program includes maintaining a qualified fire protection engineering staff, and access to the Hanford Fire Department (operated under separate contract with RL) to provide a trained, properly equipped, and staffed fire department. The Hanford Fire Department staffing includes a properly trained and qualified fire protection system testing and maintenance staff.
- KA 11-5: CPCCo fire alarm and suppression systems are functionally tested, inspected, and maintained to meet NFPA and DOE standards and requirements.
- KA 11-7: Nuclear facilities control combustible material loading and ignition sources below levels assumed in the safety basis or FHA by performing periodic inspections, using specific quantitative criteria, if such criteria is specified in the safety basis or FHA.

Safety Basis Documentation Reviewed:

Documents Implemented at SWOC

SWOC Master Documented Safety Analysis (MDSA), HNF-14741 [Rev. 12B]

SWOC Technical Safety Requirements (TSR), HNF-15280 [Rev. 12C]

21-NSD-003047, Basis of Approval for ESS/JCO and TSR [Rev. 12C]

21-NSD-0013_RL, SER for MDSA/TSR Rev. 12B

19-NSD-0025_RL, SER for MDSA/TSR Rev 12A

17-NSD-0041_RL, SER for MDSA/TSR Rev 12

CPCCo Safety Management Programs, HNF-11724 [Rev. 17]

20-NSD-0026_RL, Basis of Approval for ESS Rev. 0

20-NSD-0022_RL, Basis of Approval for Downgrade of Trench 94 to LTHC-3

21-NSD-0004_RL, Basis of Approval for Downgrade of Core Barrels (CB1) to LTHC-3

CHPRC-04448, Rev. 1, Evaluation of Safety of the Situation for Operational Awareness DOE-ASMT-2020-4142, SWOC MDSA Review

21-NSD-0019_RL Basis of Approval for ESS Rev. 1

CPCC-00278, Rev 0, Evaluation of the Safety of the Situation/Justification for Continued Operation for 74 Inoperable Containers at the Central Waste Complex (CPCC-2103639A R1, Attachment 1)

Documents Submitted, Not Approved (SWOC)

Waste Handling Facilities Documented Safety Analysis, HNF-62923 [Rev. 0]

Waste Handling Facilities Technical Safety Requirements, HNF-62924 [Rev. 0]

T Plant Documented Safety Analysis, HNF-63063 [Rev. 0]

T Plant Technical Safety Requirements, HNF-63064, [Rev. 0]

Unless otherwise noted, the answers and bases provided are applicable to the approved and implemented safety basis, as well as the documents approved, but not implemented.

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Other References:

HNF-16788, *Sprinkler Systems Hydraulic Calculations*

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*

SW-23-006, CPCC-00660, Rev 0, *Operability Evaluation of 2402WF Fire Suppression System Internal Piping Condition*

SW-23-016, CP-ENG-0203, Rev. 0, *Operability Evaluation of 2402WE Fire Suppression System Internal Piping Condition*

1. Could the discrepant as found condition, operational event, or new information indicate that the facility (*system, structure, component, or transportation activity*) may not be fully capable of performing the safety function as described in the Safety Basis? [X] Yes [ ] No

   Basis: Safety systems affected by the discrepant condition include the credited fire suppression systems for CWC, T Plant, and WRAP. The safety function of the fire suppression system is to minimize the effects of fire by reducing the potential for fire growth and thus reducing or limiting the potential release of radioactive and hazardous material. The functional requirement necessary to fulfill the safety function is for the FSSs to provide water flow and pressure sufficient to control evaluation basis fires as defined in the MDSA.

   Evaluation of inside fires indicates that the failure of installed FSSs is a common potential contributor to growth of larger inside fires. These failures provide opportunities for small or medium fires to progress into large fires that can cause loss of structural confinement and the consequent release of airborne waste materials from containers involved in the fire, which leads to the potential for significant onsite and offsite consequences. The FSSs limit the maximum fire temperature greatly reducing the number of containers potentially ruptured by a fire. The FSS activates to control the effects of a fire, thus minimizing fire severity and spread, and the potential for co-located worker and offsite dose consequences.

   The discovery of potentially obstructing material and corrosion degradation inside the sprinkler system branch piping as documented in CPCC-00660 and CP-ENG-0203 initiated this PISA review. Corrosion degradation of dry pipe sprinkler systems and resulting obstructing materials a well-documented failure mechanism. NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. NFPA 25 Chapter 14 is entirely dedicated to internal piping inspections and obstruction investigations to prevent a condition that would impair the system. NFPA 25, Annex D, provides guidance for flushing of sprinkler piping to remove obstructing material when required.

   The SWOC FSS TSRs were structured to verify OPERABILITY by assuring an adequate water supply is available to the FSS by verifying system water pressure and valve positioning. The TSRs do not provide a specific surveillance (such as internal inspections) that would reveal whether there is potentially obstructing materials inside the pipes or corrosion degradation. Rather, TSR 5.5 requires compliance with the Key Attributes outlined in HNF-11724.

   Specifically, KA 11-5 requires CPCCo fire alarm and suppression systems be functionally tested, inspected, and maintained to meet NFPA and DOE standards and requirements. While the SMP requires performance of the NFPA required inspection it does not provide the same rigor for tracking and completion of the inspections as would be applied to a TSR surveillance requirement. For instance, a TSR surveillance not performed means the system would be declared inoperable and actions necessary to restore to OPERABLITY undertaken. The same methodology is not applied to the NFPA inspection, testing, and maintenance activities controlled by the SMP.

   As discussed in the referenced operability evaluations (CPCC-00660 and CP-ENG-0203), the lack of internal inspection of the fire sprinkler piping has the potential for the following effects to develop without detection or mitigation:

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- Obstruction of flow through fire sprinklers
  - The scale observed during the internal inspection could plug a sprinkler head during a fire event impairing the FSS's ability to perform its safety function.
- Reduced hydraulic performance
  - Corrosion can cause increased pipe roughness and a reduction in pipe cross-section. This results in reduced hydraulic performance that could impair the FSS's ability to flow the designed density of water to the fire.
- Pipe wall thinning
  - Corrosion reduced pipe wall thickness which can compromise the integrity of the pipe's ability to maintain the pressure boundary manifesting as leaks. Large leaks could impair the FSS's ability to flow the designed density of water to the fire.

The identified piping degradation and lack of comprehensive inspections and pipe flushings (where needed) indicate that the credited FSS safety function may be challenged. The degraded conditions listed above could result in the FSS not providing the requisite water flow and pressure on demand. Also, the existing TSR surveillances are inadequate to assure operability of the FSS and represent a condition outside that evaluated in the safety basis.

Thus, the discrepant as found condition, operational event, or new information indicates that the facility (system, structure, component, or transportation activity) may not be fully capable of performing the safety function as described in the Safety Basis.

2. Could the discrepant as-found condition, operational event, or new information indicate that parameters used or assumed in safety basis calculations or in calculations in supporting documents referenced in the Safety Basis may not be conservative with respect to consequence or frequency? [X] Yes [ ] No

   Basis: HNF-14741, Section 2.7.2.1, identifies that the fire suppression for Buildings 2402-W and 2402-WB through 2402-WL is provided by a single dry-pipe automatic sprinkler system in each building. Piping is sized in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, ordinary hazard pipe schedule or better. The sprinkler systems for the 2402 series buildings have been hydraulically calculated to provide 0.15 gal/min/ft² over 2,000 ft² area, which meets Ordinary Hazard Group 1 criteria. The system requires 401 gal/min at 64 psi at the base of the riser and 651 gal/min at 80 psi at the source, including the 250 gal/min hose stream allowance. The water supply is adequate to meet this demand.

   The SWOC FSS TSRs were structured to verify FSS OPERABILITY by assuring an adequate water supply is available to the FSS by verifying system water pressure and valve positioning. The TSR Basis section for LCO 3.2.1.2 identifies that the FSS must be supplied with an adequate water supply. At least one water supply path through the sanitary water supply loop exists, the valves between the loop and riser (SR 4.2.1.2) and any isolation valves to the sprinklers have been VERIFIED as being open. Analysis provided in HNF-16788, *Sprinkler Systems Hydraulic Calculations,* demonstrates that a single feed to a SWOC facility is sufficient to meet demand requirements for the specified hazard category.

   For the systems evaluated to date the FSS is credited with providing 0.15 gpm/ft^2 over a 2000 ft^2 remote area; the ability of the available water supply to meet this demand is documented in HNF-16788. The condition of the piping could have a minor impact on the hydraulic performance of the system because corrosion can cause increased pipe roughness and a reduction in pipe cross-section. This results in reduced hydraulic performance that could impair the FSS's ability to flow the designed density of water to the fire. As such, the discrepant as-found condition, operational event, or new information indicates that parameters used or assumed in safety basis calculations or in calculations in supporting documents referenced in the Safety Basis may not be conservative with respect to consequence or frequency.

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3. Could the discrepant as-found condition, operational event, or new information indicate there is a hazardous condition not considered in the Safety Basis that has the potential for significant impact to workers, the public, or the environment? [ ] Yes [X No

   Basis: The safety function of the automatic fire suppression systems is to minimize the effects of fire by reducing the potential for fire growth and thus reducing or limiting the potential release of radioactive and hazardous material. The functional requirement necessary to fulfill the safety function is for the FSSs to provide water flow and pressure sufficient to control evaluation basis fires as defined in the MDSA.

   Evaluation of the hazardous conditions associated with inside fires identifies that the failure of installed FSSs is a common potential contributor to growth of larger inside fires. These failures provide opportunities for small fires to progress into large fires that can cause loss of structural confinement and the consequent release of airborne waste materials from burning waste containers involved in the fire, which leads to the potential for significant onsite and offsite consequences. The sprinklers serve to limit the initial fire to the area of origin and significantly limit the maximum fire temperature. Limiting the maximum fire temperature greatly reduces the number of material storage containers potentially ruptured by a fire. The FSS activates to control the effects of a fire, thus minimizing fire severity and spread, and the potential for co-located worker and offsite dose consequences.

   The discrepant condition that initiated this review was the discovery of potentially obstructing material and corrosion degradation inside the sprinkler system branch piping as documented in Operability Evaluations CPCC-00660 and CP-ENG-0203.

   Although the as-found condition could potentially impact operability of the FSS, it does not indicate there are other hazardous conditions or accident initiators beyond that evaluated in the SWOC Safety Basis. As such, the discrepant as-found condition, operational event, or new information does not indicate there is a hazardous condition not considered in the Safety Basis that has the potential for significant impact to workers, the public, or the environment.

4. Could the discrepant as-found condition, operational event, or new information indicate the existing hazard controls may not provide the mitigation or prevention credit assigned to them within the Safety Basis? [X] Yes [ ] No

   Basis: Safety systems affected by the discrepant condition include the credited fire suppression systems for CWC, T Plant, and WRAP. The safety function of the fire suppression system is to minimize the effects of fire by reducing the potential for fire growth and thus reducing or limiting the potential release of radioactive and hazardous material. The functional requirement necessary to fulfill the safety function is for the FSSs to provide water flow and pressure sufficient to control evaluation basis fires as defined in the MDSA.

   The FSS is credited with reducing the likelihood of the postulated medium fires by one frequency bin. The FSSs serve to prevent consequences from fire scenarios (FIR-6) in the CWC FIRE AREAS (all), 2706-T Complex FIRE AREAS, and WRAP FIRE AREAS (all). Evaluation of the hazardous conditions associated with inside fires identifies that the failure of installed FSSs is a common potential contributor to growth of larger inside fires. These failures provide opportunities for small and medium fires to progress into large fires that can cause loss of structural confinement and the consequent release of airborne waste materials from burning waste containers involved in the fire, which leads to the potential for significant onsite and offsite consequences.

   The FSS serve to limit the initial fire to the area of origin and significantly limit the maximum fire temperature. Limiting the maximum fire temperature greatly reduces the number of material storage containers potentially ruptured by a fire. The FSS activates to control the effects of a fire, thus minimizing fire severity and spread, and the potential for co-located worker and offsite dose consequences.

Central Plateau Cleanup Company

UNREVIEWED SAFETY QUESTION – PISA DETERMINATION(Continued)

PISA Determination Number: SWOC-23-010	PISA Process Entered *(Date)*: **2/01/2023**

The identified piping degradation and lack of comprehensive inspections and pipe flushings (where needed) may preclude the system from performing its credited safety function and thus not control a small or medium sized fire. As such, the discrepant as-found condition, operational event, or new information indicates that the existing hazard controls may not provide the mitigation or prevention credit assigned to them within the Safety Basis.

Conclusion:

[The answers to all PISA Determination questions are NO. The condition does not represent a PISA.

[X] The answer to one or more of the PISA Determination questions is YES. The condition represents a PISA and actions required by CPCC-PRO-NS-062 must be initiated.

USQ Evaluator #1:		
J Masulonis	Masulonis, John U Digitally signed by Masulonis, John U Date: 2023.02.08 13:54:03 -08'00'	
Print First and Last Name	*Signature*	*Date*

USQ Evaluator #2:		
E Mart	Mart, Eva Digitally signed by Mart, Eva Date: 2023.02.08 14:12:12 -08'00'	
Print First and Last Name	*Signature*	*Date*

MANAGEMENT/PRC REVIEW (*as required*)

Meeting No.: *Date*

Responsible Manager/PRC Concurrence:

Print First and Last Name	*Signature*	*Date*

OTHER REVIEWS (*as required*)

Print First and Last Name	*Signature*	*Date*
Print First and Last Name	*Signature*	*Date*