

**Office of Enterprise Assessments
Review of the
Los Alamos National Laboratory
Weapons Engineering Tritium Facility
Safety Significant Fire Suppression System**



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Table of Contents

Executive Summary	iii
1.0 Purpose.....	1
2.0 Scope.....	1
3.0 Background	2
4.0 Methodology	3
5.0 Results.....	3
5.1 Engineered Design Features	3
5.2 TSR Surveillance and Testing.....	7
5.3 Configuration Management.....	8
5.4 Cognizant System Engineer	11
5.5 Review of Previous Los Alamos Field Office Findings and Corrective Action Effectiveness.....	12
6.0 Conclusions.....	13
7.0 Opportunities For Improvement.....	13
8.0 Items for Follow-up.....	14
Appendix A: Supplemental Information.....	A-1
Appendix B: Documents Reviewed, Interviews, and Activities.....	B-1

Acronyms

AHJ	Authority Having Jurisdiction
CM	Configuration Management
CRAD	Criteria, Review, and Approach Document
CSE	Cognizant System Engineer
DOE	U.S. Department of Energy
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
FHA	Fire Hazard Analysis
FSS	Fire Suppression System
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LCO	Limiting Condition for Operation
MDL	Master Document List
MPFL	Maximum Possible Fire Loss
NA-LA	National Nuclear Security Administration Los Alamos Field Office
NFPA	National Fire Protection Association
NNSA	National Nuclear Security Administration
O&M	Operations and Maintenance
OFI	Opportunity For Improvement
P&ID	Piping and Instrumentation Diagram
PFITS	Performance Feedback Improvement Tracking System
PMI	Preventive Maintenance Instruction
psi	Pounds per Square Inch
psig	Pounds per Square Inch Gauge
SDD	System Design Description
SHR	System Health Report
SR	Surveillance Requirement
SSCs	Systems, Structures, and Components
TSR	Technical Safety Requirement
WETF	Weapons Engineering Tritium Facility

Executive Summary

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an independent assessment of the safety significant fire suppression system (FSS) at the Los Alamos National Laboratory (LANL) Weapons Engineering Tritium Facility (WETF). The WETF mission is to perform research and development and to process tritium to meet the needs of the present and future stockpile stewardship program, while providing protection for LANL workers, the public, and the environment. WETF is classified as a hazard category 2 facility and the fire suppression system is classified as safety significant.

EA conducted this assessment as part of an ongoing program of reviews of vital safety systems, including fire protection systems, at DOE sites with hazard category 1, 2, and 3 nuclear facilities. The onsite portion of the EA assessment occurred during March 17-21, 2014. EA performed this assessment concurrently with a National Nuclear Security Administration Los Alamos Field Office assessment of the WETF FSS.

The assessment team identified deficiencies in design and calculation processes, configuration management, corrective action management, and testing and surveillance procedures. The system design lacks redundancy and has longstanding issues such as seismic qualification that impact its ability to meet performance expectations. Portions of the LANL combined fire water supply and utility system that support the WETF FSS are aging and do not meet some DOE and National Fire Protection Association Code requirements for design and redundancy.

Overall, the results of this EA assessment indicate a need for increased management attention in two areas. First, more attention is needed to resolve issues with the WETF FSS, including the legacy design issues and the current deficiencies in LANL processes and procedures in such areas as design, surveillance testing, and configuration management. These actions are essential to assure that the fire suppression system can perform its intended safety function. Second, LANL needs to improve its contractor assurance and oversight process to provide for better and more timely identification of deficient conditions. The LANL issues management process needs to provide more confidence that corrective action plans are adequate to correct the identified problem, determine and address the entire extent of condition of the problem, and are effectively implemented before identified deficiencies are closed.

Office of Enterprise Assessments Review of the Los Alamos National Laboratory Weapons Engineering Tritium Facility Safety Significant Fire Suppression System

1.0 PURPOSE

The U.S. Department of Energy (DOE) Office of Environment, Safety and Health Assessments, within the independent Office of Enterprise Assessments (EA), conducted an independent assessment of the safety significant fire suppression system (FSS) at the Weapons Engineering Tritium Facility (WETF), located within Technical Area 16 of the Los Alamos National Laboratory (LANL). EA conducted this assessment as part of an ongoing program of reviews of vital safety systems, including fire protection systems, at DOE sites with hazard category 1, 2, and 3 nuclear facilities. The onsite portion of the EA assessment occurred during March 17-21, 2014.

EA examined the LANL processes that are used to ensure the operability and reliability of the FSS and assessed LANL corrective actions taken in response to issues identified in previous assessments. EA performed this assessment concurrently with a National Nuclear Security Administration Los Alamos Field Office (NA-LA) planned vital safety system assessment of the WETF FSS. EA deferred completion and issuance of its report until NA-LA issued a final report. NA-LA issued its report, *Safety System Oversight Independent Assessment Report for the WETF Fire Protection System Vital Safety System Assessment*, on July 30, 2014.

This report discusses the scope, background, methodology, results, and conclusions of EA's independent assessment. In cases where the observations and findings documented in the NA-LA review reflected EA's perspectives, EA summarized and referred to the NA-LA results.

2.0 SCOPE

This EA assessment was structured to:

- Evaluate the processes for operating and maintaining the performance of the WETF safety significant FSS.
- Review engineering design features, surveillances, and configuration management (CM) specific to the WETF FSS against requirements established in the safety design basis and applicable DOE technical standards.
- Evaluate implementation of the LANL cognizant system engineer (CSE) program.
- Identify and evaluate selected LANL corrective actions resulting from previous technical reviews, including the NA-LA report *Safety System Oversight Assessment – Weapons Engineering Tritium Facility Wet Pipe Sprinkler System*, dated September 2010.

Previous external assessments by EA and other organizations and internal LANL assessments and safety basis reviews have identified major issues that impact the FSS at WETF and other LANL facilities. For example, the seismic capacity of certain components to withstand the current evaluation basis earthquake has not been demonstrated and the qualification of the firewater storage tanks and supply piping is in question. Although not resolved, LANL and NA-LA are aware of these longstanding issues, so EA did not re-visit the previously identified issues during this assessment.

The detailed focus of the independent assessment is described in the *Plan for the Independent Oversight Targeted Review of the Los Alamos National Laboratory Weapons Engineering Tritium Facility Safety Significant Fire Protection System*, dated March 2014. Since this was a concurrent assessment, efforts were made to align some EA review activities with the *NA-LA Safety System Oversight Independent Assessment Plan for the WETF Fire Protection System Vital Safety System Assessment*, dated February, 2014.

3.0 BACKGROUND

The DOE independent oversight program is implemented by EA, which has no line management or policy-making responsibilities or authorities. The independent oversight program is designed to enhance DOE safety and security programs by providing DOE and contractor managers, Congress, and other stakeholders with an independent evaluation of the adequacy of DOE policy and requirements, and the effectiveness of DOE and contractor line management performance in safety, security, and other critical functions as directed by the Secretary. The independent oversight program is described in and governed by DOE Order 227.1, *Independent Oversight Program*, and a comprehensive set of internal protocols, operating practices, inspector guides, and process guides.

LANL's primary mission is to develop and apply science and technology to ensure the safety, security, and reliability of the U.S. nuclear deterrent; reduce global threats; and solve other emerging national security challenges. For more than 60 years, LANL has served as a research center for science, technology, and engineering, and has made achievements that focus on safety, security, environmental stewardship, nuclear deterrence, threat reduction, operations, communications, and community involvement.

The mission of WETF is to perform research and development and to process tritium to meet the requirements of the present and future stockpile stewardship program, while providing protection for LANL workers, the public, and the environment. Typical WETF tritium-processing activities include repackaging tritium into smaller quantities, removing helium-3 decay products and other impurities from gaseous tritium, mixing tritium with other gases, analyzing tritium mixtures, loading tritium onto getter materials, repackaging tritium and other gases to user specifications, loading targets, performing various user-defined experiments with tritium, unloading (depressurizing) containers of tritium, and functionally testing weapons components that contain tritium. The systems and equipment used to perform tritium-processing activities are located in the tritium processing areas of Buildings 205 and 450. The tritium processing areas are controlled for radiological protection purposes. WETF is limited to a total inventory of 400 grams of tritium, classified as material-at-risk. Based on this inventory, WETF is categorized as a hazard category 2 nuclear facility.

The FSS is classified as safety significant. It uses heat activated sprinklers to perform fire suppression in most areas of buildings 205 and 450. Water is supplied from two tanks, each rated at 1,000,000 gallon capacity, through shared utility/firewater supply piping. The sprinklers are fed by two risers, one in each building.

Los Alamos National Security, LLC (LANS), a partnership that includes the University of California, the Babcock and Wilcox Company, Bechtel National, Inc., and URS Corporation, has held the contract for managing and operating LANL since June 2006. NA-LA oversees LANS and is responsible for administering the performance-based contract, executing assigned NNSA and DOE programs, and conducting oversight of work performed at LANL in support of NNSA requirements and priorities.

4.0 METHODOLOGY

EA evaluated the FSS against the requirements established DOE Order 420.1B, *Facility Safety*; DOE-STD-1189, 2008, *Integration of Safety into the Design Process*; DOE-STD-1073, 2003, *Configuration Management*; and other documents specific to LANL's WETF. EA designed this independent assessment of the WETF FSS to evaluate selected core fire protection elements and to provide NNSA line management with information to benchmark site program effectiveness.

EA adapted existing criteria, review, and approach documents (CRADs) to establish a focused set of inspection criteria, activities, and lines of inquiry. EA based FSS-specific portions of this assessment on sections of CRAD 45-34, Revision 1, *Fire Protection Inspection Criteria, Approach, and Lines of Inquiry*. Specific review criteria included:

Section III	Engineering Design Features
Section IV	TSR Surveillance and Testing
Section V	Configuration Management

The EA team also used CRAD 45-11, Revision 3, *Safety Systems Inspection Criteria, Approach, and Lines of Inquiry*, Section VII, as part of the scope of this assessment. Section VII provides review criteria for CSEs.

The CM review used DOE-STD-1073, *Configuration Management*. WETF is committed to compliance with DOE-STD-1073 as a means of meeting the requirements of DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*.

In addition to document reviews, EA observed a surveillance activity, performed a walk down of the facility focusing on the fire suppression design, and interviewed key facility personnel.

The members of the EA team responsible for this assessment are listed in Appendix A. A detailed list of the documents reviewed, personnel interviewed, and activities conducted during this review—relevant to the findings and conclusions of this report—is provided in Appendix B.

5.0 RESULTS

The criteria from CRAD 45-34, Section III, *Engineered Design Features*, Section IV, *TSR Surveillance and Testing*, and Section V, *Configuration Management*, are addressed in Sections 5.1, 5.2, and 5.3, respectively. CRAD 45-11, Section VII, *Cognizant System Engineer and Safety System Oversight*, is addressed in Section 5.4. Section 5.5 addresses the effectiveness of LANL corrective actions resulting from a September 2010 NA-LA assessment of the WETF FSS.

5.1 Engineered Design Features

Review/Inspection Criteria:

- *Within the scope of the review, the safety authorization basis consistent with the fire hazards analysis demonstrates the adequacy of controls provided by the fire protection systems to eliminate, limit, or mitigate identified hazards, and defines the process for maintaining the controls current at all times and controlling their use.*

- *Technical, functional, and performance requirements for the systems are specified in (or referenced in) the facility authorization basis documents consistent with the facility fire hazards analysis. Safety/authorization basis documents identify and describe the system safety functions, and these criteria are translated into design calculations and procedures.*
- *Items and processes are designed using sound engineering/scientific principles and appropriate standards.*
- *Items are designed, installed, tested, and maintained to assure they can satisfy the required safety functions under appropriately analyzed and plausible accident or incident conditions.*

Design Basis Documents

Engineering design for this safety significant system must demonstrate compliance with all requirements established in the safety basis, as well as with all applicable codes and standards. The EA team reviewed various design input and output documents including calculations, drawings, and the system design description (SDD) to evaluate compliance. The assessment identified significant issues with the design calculations, including incorrect methodology, errors, and non-conservative input assumptions:

- Calculation 16-205-CALC-F-0001, Rev. 2, *TA-16-205/450 WETF Sprinkler System Hydraulic Calculations*. This calculation is intended to demonstrate the hydraulic performance capability of the wet pipe sprinkler system, and determines the water flow and pressure required to supply the existing automatic wet pipe fire sprinkler systems for all areas in WETF Buildings 205 and 450. EA identified anomalies and non-conservative inputs including incorrect friction loss coefficients, incorrect pipe material and internal diameter, inline components that were not modeled, and pipe run length variations that could not be validated. These anomalies directly affect the calculation results and challenge the validity of the calculation.
- Calculation WETF-CALC-FPS-12-020, Rev. A, *Fire Protection Water Demand at WETF*. This calculation determines the minimum acceptable riser pressure at WETF. The results are used as acceptance criteria for the Technical Safety Requirement (TSR) surveillance requirement (SR) 4.2.1 weekly surveillance test. EA identified flaws in the methodology used for the calculation, which credits the differential static water height between the facility riser pressure gauge and the water tank low level set point and does not consider the frictional losses incurred through the water supply piping delivery system. This results in calculation of a non-conservative TSR surveillance test acceptance criteria. Inadequate acceptance criteria for surveillance tests are a long standing issue previously identified by EA in a January 2008 report entitled, *Independent Oversight Inspection of Environment, Safety, and Health Programs at the Los Alamos National Laboratory*.
- Calculation TSE-CAL-08-01. This calculation developed the 60 pounds per square inch (psi) riser pressure TSR limit. EA found the calculation methodology to be non-conservative because it only considers static conditions and does not appropriately account for the dynamic pressure losses from the tank to the riser, especially to sustain residual pressure for the required 120 minute flow duration. This calculation is also based on Revision 0 of the hydraulic calculation (see first bullet above) and has not been updated to reflect hydraulic demands in Revision 2 of that calculation, nor does it reflect current fire hydrant test data indicating degradation of water supply lines.

LANS/WETF responded appropriately to these issues by declaring a potential inadequacy in the safety analysis, walking down the system to verify configuration, and updating the hydraulic calculations. Revised calculations submitted with an evaluation of the safety of the situation have addressed some of

the above items; however, these calculations still contain inconsistencies, non-conservative assumptions, and unclear information. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-01 in the NA-LA assessment report to document this deficiency. (See **OFI-NALA-1**.)

Other design information important to establishing the system design basis and configuration control is missing or has not been identified. Basic design input and output documentation for the physical design of the FSS is unavailable within the document control system. Some legacy information exists. Un-dimensioned overview drawings are available showing the general routing of the sprinkler piping. Efforts are underway to reconstitute hanger drawings. However, there is no system piping and instrumentation diagram (P&ID). No physical layout drawings or isometric drawings show the dimensions and routing of the pipe itself or the locations of pipe hangers. Without these drawings, the development of design loads on pipe hangers and preparation of FSS hydraulic calculations used to estimate flow losses and validate system functionality are hindered, as noted above. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-08 to document this deficiency.

EA reviewed the current FSS SDD against requirements established in the documented safety analysis (DSA). EA noted no discrepancies, although the DSA contains assumptions regarding combustible material control that are not specifically addressed in the SDD. The DSA notes that a combustible loading program will control combustible loading in susceptible areas. The TSR implements the limits in section 3/4.6 and establishes surveillance requirements.

Fire Water Containment Design

Contrary to requirements in DOE Order 420.1B and National Fire Protection Association (NFPA) 801, the WETF fire water containment system does not have sufficient volume to prevent an accidental release of significant quantities of contaminated firefighting water into the environment. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-02 in the NA-LA assessment report to document this deficiency.

DOE Order 420.1B requires a means to prevent an accidental release of contaminated firefighting water into the environment. This requirement is reflected in the DSA and the fire hazard analysis (FHA). NFPA 801 also requires a means of drainage or containment to control potentially contaminated firewater. Building 450 basement collection capacity is insufficient to prevent runoff external to that building. Building 205 has a 1,500 gallon wastewater collection tank located in a buried concrete vault east of the building. The tank overflows into the vault. The vault is used as part of the fire water containment system for the building and can overflow into the surrounding environment. This vulnerability lacks a clear resolution path, such as an exemption or corrective action. The DSA and FHA offer conflicting information as to the containment capability of the existing vault and tank configuration. This issue is discussed further in Section 5.3 of this report. NA-LA documented this concern in OBSERVATION SSO-WETF-FSS-O-14-03 in the NA-LA assessment report.

WETF calculation TSE-CAL-08-09, *TA-16-205 WETF Waste Water Tank Vault Volume Calculation*, determines the vault and tank volume capacity to be 11,793 gallons; however, this calculation neglects the volume displaced by existing contents of the vault, such as structures, supports, ladder, tank walls, sump pump, and drain piping. Considering the combined capacities of the wastewater collection tank and the vault, there is insufficient available volume to contain potentially contaminated firewater per the requirements of DOE Order 420.1B, NFPA 801, DSA, and the FHA. This issue was previously identified in an independent oversight assessment in 2007.

The DSA states in Section 2.7.3.2.1 that the tank is used to collect wastewater from other sources and is normally emptied before it reaches 75% capacity. As a result, most of the tank capacity may be unavailable to collect FSS discharge water. LANL has not established controls provisions to minimize

the use of the underground tank for wastewater from other sources or controls that ensure the tank is emptied at a low threshold in order to maximize capacity available for firewater and minimize the potential for an overflow release to the environment from the vault. NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-02 in the NA-LA assessment report to document this deficiency.

System Design Redundancy

Contrary to requirements of DOE Order 420.1B for facilities with a maximum possible fire loss (MPFL) exceeding DOE established limits, WETF does not have redundant fire protection systems. DOE Order 420.1B, Chapter II, 3.c.(5)(b) requires “Redundant fire protection systems in areas where the maximum possible fire loss (MPFL) exceeds limits established by DOE.”

DOE-STD-1066-99, Sections 5.1 and 6.2, establish the MPFL monetary limits as follows:

- “When the Maximum Possible Fire Loss (MPFL) exceeds \$50 million, a redundant fire protection system should be provided that, despite the failure of the primary fire protection system, will limit the loss to acceptable levels as determined by the Authority Having Jurisdiction (AHJ).”
- “When the MPFL exceeds \$150 million, a redundant fire protection system and a 3-hour fire barrier should be provided to limit the MPFL to acceptable levels as determined by the AHJ.”
- “Facilities having a Maximum Possible Fire Loss (MPFL) in excess of \$100 million and significant nuclear facilities (Category 1 Hazard) should be provided with an additional, independent source of fire protection water.”

The MPFL at WETF as documented in the FHA exceeds the \$150 million threshold specified in DOE-STD-1066-99, and as a result requires a redundant FPS, but WETF does not have redundancy. Additionally, when the MPFL exceeds \$100 million, DOE-STD-1066-99 recommends an additional independent source of fire protection water. The internal fire barriers at WETF have a fire rating of only 1 hour. The MPFL assumes a total loss of the building and contents in a fire area that has a 2-hour fire rated barrier around it. Since no 2-hour fire rated interior walls are in the facility, for the purposes of loss potential limitation, the loss of the entire facility must be considered in order to determine MPFL. The DSA does not identify any exemption or other resolution path for this concern. Additionally, the DSA does not reference the latest MPFL as referenced in the 2013 WETF FHA. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-03 in the NA-LA assessment report to document this deficiency.

FSS Water Supply

Contrary to DOE Order 420.1B requirements for a reliable water supply, the WETF FSS is supplied by a single water utility main. DOE Order 420.1B, Chapter II, 3.c.(1) requires that the fire protection design is provided “A reliable and adequate supply of water for fire suppression.”

The only water supply to WETF is a single combined domestic and fire water supply line with fluctuating pressure. Additionally, the single supply line does not meet the facility looped system requirement of DOE-STD-1066-99, which presents a vulnerability to the FSS at the facility. The safety basis documents reviewed did not provide a full evaluation of the vulnerability, and LANL has not identified corrective or mitigating actions. DOE-STD-1066-99 requires distribution systems of the looped grid type, providing two-way flow with sectional valve arrangements that provide alternate water flow paths to any point in the system. In addition, sectional control valves are to be provided to limit the number of hydrants and individual sprinkler systems made inoperative during a single line break. Previous internal and external

assessments have identified concerns with the water supply. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-04 in the NA-LA assessment report to document this deficiency.

Other Design Issues

The WETF loading dock does not have full fire suppression coverage as required by NFPA 13. The lack of automatic fire suppression in the outside loading dock area near the gas cylinder storage area does not meet NFPA 13 requirements and is inconsistent with the highly protected risk concept. LANL safety documents do not provide a sufficient explanation or justification for omitting sprinklers in this area. This lack of fire suppression in this area is particularly significant because Storage Room 124 (where nuclear materials are stored) is adjacent to the loading dock. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-05 in the NA-LA assessment report to document this deficiency.

5.2 TSR Surveillance and Testing

Review/Inspection Criteria:

- *Surveillance and testing of the system demonstrates that the system is capable of accomplishing its safety functions and continues to meet applicable system requirements and performance criteria.*
- *Surveillance and test procedures confirm that key operating parameters for the overall system and its major components remain within safety basis, NFPA, and applicable consensus standards operating limits.*
- *The acceptance criteria from the surveillance tests used to confirm system operability are consistent with the safety basis.*
- *Instrumentation and test equipment for the system are calibrated and maintained.*

LANS surveillance and testing activities did not fully demonstrate that the WETF FSS is capable of performing its safety function, or of meeting system requirements and performance criteria. Contrary to the requirement of DOE Order 420.1B, there is no verification of the adequacy of the water volume in the fire water storage tanks. DOE Order 420.1B, Chapter II, 3.c.(1) requires that “A reliable and adequate supply of water for fire suppression” is provided in the fire protection design. NA-LA issued FINDING SSO-WETF-FSS-F-14-06 in the NA-LA assessment report to document this deficiency.

The LANL utility department maintains the two storage tanks that provide domestic, service, and fire water to WETF. The FSS performance requirements in part require an unobstructed flow path from the water storage tanks to the WETF sprinkler distribution system and the capability to provide an adequate water supply for the sprinkler system combined with water necessary for manual firefighting operations. Demonstration or verification of safety function performance requirements is required.

NA-LA and EA identified the following surveillance and testing issues:

- SR 4.2.1 – Verification that the building riser static pressure is greater than 60 pounds per square inch gauge (psig) at the base of the riser. LANL used a flawed methodology to determine the basis for the acceptance criteria, as noted in Section 5.1.
- SR 4.2.1 – The implementing procedure for the riser pressures allows averaging of momentary fluctuations of the pressure gauge to obtain the static pressure reading that is used for pass or fail

criterion. Observation of the performed SR showed that the gauge needle fluctuates sometimes near the minimum SR limit of 60 psi. A momentary dip below 60 psi would not fail the SR because the average would pass.

- SR 4.2.2 – Verification that the gauge pressure at hydrant #601 during the functional test is at least 48 psig. There is no apparent basis for the acceptance criteria.
- SR 4.2.4 – Verification that the riser supply pressure responds appropriately during the main drain test to indicate no obstructions. SR 4.2.4 and related TSR Bases do not provide measurable criteria to meet the intent of the surveillance test.

NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-11 to document these deficiencies.

The TSR document does not specify an SR to verify a freeze free delivery system for the FSS as required by the DSA and the TSR limiting condition for operation (LCO). From DSA Section 5.5.3.1 and LCO 3.2, a freeze free delivery system is required. However, no SRs exist to protect this operability condition. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-12 to document this deficiency.

The 5 year internal inspection of piping for obstructions required by NFPA 25 is not being performed at WETF. NFPA 25, Chapter 5, indicates that “Obstruction, internal inspection of piping” is done every 5 years. The completed preventive and predictive maintenance forms required by AP-MNT-006, *Preventive and Predictive Maintenance*, have been completed for the 5 year testing and call out LANL Preventive Maintenance Instruction (PMI) 40-35-099. PMI 40-35-099 is based on the LANL Operations and Maintenance (O&M) Manual Criterion 721. O&M Criterion 721 does not address the 5 year inspection of piping for obstructions and the required inspections are not performed for the WETF FSS. Because Criterion 721 is an institutional requirement, other LANL facilities may also be affected by the deficient inspection criteria. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-10 to document this deficiency.

The water supply path from the water tanks to the FSS is not managed at the appropriate level for safety significant fire systems. No valve alignment procedure exists to ensure an unobstructed path to WETF from the water supply tanks. NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-01 in the NA-LA assessment report to document this deficiency.

5.3 Configuration Management

Review/Inspection Criteria:

- *Configuration management process adequately integrates the elements of system requirements and performance criteria, system assessments, change control, work control, and documentation control, as required by DOE Order 420.1B.*
- *Configuration management is used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the systems, structures and components (SSCs) within the scope of the program.*
- *System design basis documentation and supporting documents are kept current using formal change control and work control processes.*

- *Changes to system requirements, documents, and installed components are formally designed, reviewed, approved, implemented, tested, and documented.*

DOE-STD-1073-2003 states that the objectives of CM are to establish consistency among design requirements, physical configuration, and documentation (including analysis, drawings, and procedures) for the activity, and to maintain this consistency throughout the life of the facility or activity, particularly as changes are made. Five key elements of a CM program are identified: design requirements, work control, change control, document control, and assessments. Design requirements were addressed in Section 5.1. This portion of the EA assessment focused on documents that govern the CM program and elements of the program that address change control, work control, and document control.

Configuration Management Plan

WETF CM Plan WETF-AP-21, Rev A, 5/12/10, details CM requirements established by LANL. The WETF CM plan states that it “WILL ensure compliance with DOE-STD-1073-2003, Configuration Management.” The WETF CM Plan further requires the planning and implementation of CM using the following process:

- Establish and document the facility and design requirements.
- Establish and document the facility baseline.
- Capture and maintain documentation and data with information management systems.
- Apply change control to maintain the facility baseline and information management systems.
- Routinely assess the process.

The WETF CM Plan has various inconsistencies, omissions, and outdated information that could increase the likelihood of implementation challenges:

- The WETF CM Plan notes that the master document list (MDL) is the mechanism utilized to document a list of technical baseline documents. It is also used to track changes pending against those documents, and as such is the tool to be used in identifying pending changes during the development of subsequent change packages. The WETF CM Plan notes that changes to the MDL are identified using two procedures: AP-341-505, *Design Change Package*, and AP-341-517, *Design Change Form*. However, AP-341-517 notes in Section 3.3 that it replaces AP-341-505.
- The WETF CM Plan notes in Section 4.3 that “Documents potentially impacted by configuration changes are also tracked in the MDL as described in Section 4.9, *Out of Service*. This reference is incorrect because “Out of Service” is actually Section 4.8. In addition, the “*Out of Service*” section does not discuss document control for configuration changes. It appears that the correct reference section would be Section 4.4, *Master Document List*.
- Attachment A of the WETF CM Plan discusses the process for incorporating changes into issued drawings and outlines a step-by-step process. However, the process only covers the actual drawing update process and does not address:
 - How are markup drawing changes produced for inclusion in change packages?
 - At what point do the proposed changes get incorporated in the issued drawing?
 - How many extant changes are allowed before drawings are updated?

The WETF CM Plan, Section 3.8, notes that TSR Chapter 5, Section 5.6.6, contains an administrative control that states that configuration management procedures must remain consistent with LIR240-01-0.

The WETF CM Plan then notes that LIR240-01-01 has been replaced with PD341, *Engineering Processes Manual*. In fact, the current TSR does not contain a specific administrative control for CM, but notes that CM is a portion of the overall quality assurance program. Any reference to LIR240-01-01 has been deleted from the TSR.

NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-05 in the NA-LA assessment report to document these issues.

Change Control

Although the WETF CM Plan is facility-specific, WETF personnel use LANL-wide procedures to perform Change Control activities (using LANL PD341, *Engineering Processes Manual*). Although WETF does not use a change control board to review changes, change packages require approval by the responsible engineer, the design authority representative, the engineering manager, and the safety basis representative. This process provides adequate control of change approvals. In practice, physical modification activities at WETF have been very limited since 2008.

As noted in Section 5.1, contrary to the requirements of DOE Order 420.1B, fundamental system design basis information for the FSS is unavailable. DOE Order 420.1B, Attachment 2, Chapter V, 3.c.(1) requires that “Configuration management must be used to develop and maintain consistency among system requirements and performance criteria, documentation, and physical configuration for the SSCs within the scope of the Program.” The table on page 5 of 22 of the LANS WETF VSS Assessment performed by NA-LA in 2013 notes a “Yes” for the column “in MDL” for the categories P&IDs and Piping Layout Drawings. The same list of drawings is provided for each. Those drawings do not meet DOE guidance for P&IDs as established in DOE-HDBK-1016/1-93. During this EA assessment, LANS did not provide any drawings for this system that could be categorized as P&IDs.

Calculation TSE-CAL-08-09, TA-16-205, calculated the volume of the waste water vault. The vault is below ground, just outside the facility, and contains a tank provided to capture fire suppression water in the event of an FSS actuation. In reviewing several documents, NA-LA and EA determined that the size of the underground vault is reported with differing values in various source documents as shown below:

Document	Vault Size (gallon)
DSA Chapter 2 page 27	3000
DSA Chapter 2 page 36	15000
DSA page A-303 (Appendix A Hazard Analysis)	3000
Fire Hazard Analysis page 52	11600
Fire Hazard Analysis page 80	9000
System Design Description page 33	11793
System Health Report, January 2014, page 18	9000
TSE-CAL-08-09, TA-16-205 WETF Waste Water Tank Vault Volume Calculation	11793

NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-03 in the NA-LA assessment report to document this deficiency.

Procedure AP-341-608 does not limit the number of extant changes against a technical baseline drawing before formal revision is required to incorporate outstanding changes. This gap in the procedure increases the difficulty of determining the actual design basis and increases the risk of new work being performed

using inadequate or outdated information. NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-06 in the NA-LA assessment report to document this deficiency.

Work Control

NA-LA and EA's review of a work package indicated weaknesses in combustible loading implementation and post maintenance testing. NA-LA and EA reviewed Work Order 473046-01 as a sample of physical work recently performed on the FSS. The unreviewed safety question determination in the work order package stated that the scope was to replace riser gauges on both fire protection sprinkler systems for WETF in Buildings 205 and 405 and to perform semi-annual maintenance. The precautions section states "NO unattended TRANSIENT COMBUSTIBLES or UNATTENDED VEHICLES within the 30ft standoff distance." This statement conflicts with a requirement for "zero" transient combustibles within the 30 foot limit documented in the TSR WETF Combustible Loading Limits LCO 3.6 and the WETF Combustible Loading Limits bases; those documents do allow attended vehicles within the 30 foot zone. The work package appeared to include a robust return-to-service process, although the CSE expressed concerns with the post-maintenance testing for the replaced gauges. NA-LA appropriately issued OBSERVATION SSO-WETF-FSS-O-14-04 to document this issue.

Document Control

Contrary to the requirements of DOE Order 420.1B, the WETF CM Plan does not provide adequate requirements and/or guidance to ensure that, when changes are made to technical basis documents, the impacts of those changes on both predecessor and successor documents are properly assessed and those documents modified as necessary. When a technical basis document, such as the hydraulic calculation, is revised, all other technical basis documents (e.g., drawings, calculations, SDDs, hazard analyses) affected by the revision need to be identified and the impacts captured. The WETF CM Plan did not meet this provision. As one example, calculation TSE-CAL-08-01, which forms the basis for the 60 psi pressure requirement documented in TSR SR 4.2.1, uses information derived from the hydraulic calculation (see Section 5.1). However, the hydraulic calculation has been revised twice since it was used as input for calculation TSE-CAL-08-01. WETF did not adequately document a review of changes to the hydraulic calculation to determine whether calculation TSE-CAL-08-01 was impacted. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-09 to document this deficiency.

Additionally, EA and NA-LA found no process to track interrelationships between documents to identify those impacted by changes. A MDL is maintained, but not used in any manner to track interrelationships between documents. In the absence of a rigorous tracking mechanism, change management and identification of the impacts of a change rely too much on the knowledge of individual contributors. This approach is not robust or reliable and is exacerbated by such factors as personnel turnover. LANL engineering administrative procedure AP-341-519 documents a more rigorous process for design revision control, notably through review by other parties such as the safety basis representative and the facility design authority representative. However, as in the example noted above, technical basis documents are subject to change outside the process established by that procedure. (See **OFI-LANL-1**.)

5.4 Cognizant System Engineer

Review/Inspection Criteria:

The DOE contractor has established an effective system engineer program as defined in DOE Order 420.1B to ensure continued operational readiness of identified systems to meet their safety functional requirements and performance criteria.

DOE Order 420.1B requires that hazard category 1, 2, and 3 facilities implement a CSE program for all safety class and safety significant SSCs. This order is applicable to the WETF FSS. EA examined several areas related to this portion of the order and found that the CSE program was being adequately implemented and is in compliance with the requirements of DOE Order 420.1B.

LANL assigns a primary CSE to each system. The primary CSE for the WETF FSS is fully qualified in accordance with LANL requirements and periodically walks down the system. The CSE is an integral part of system CM including maintenance, surveillances, and change package development and implementation. LANL has developed a system health reporting basis for the WETF FSS with appropriate metrics and criteria for determining system functionality.

Semi-annual system health reports (SHRs) assess system function against those metrics and criteria, providing a meaningful tool for tracking the status of system components, maintenance activities, surveillances, and open issues. These SHRs are also used to track corrective action commitments. EA reviewed several SHRs found them to be in accordance with procedure AP-341-802, *System Health Reporting*. The most recent SHR, WETF-SHR-FPS-13-019, covered the period from July 1, 2013, until December 31, 2013. Operability of the system was reported as 99.2% and availability was 100%. (LANL exempts outages due to planned maintenance from calculation of system availability.) The LANL report appropriately noted that an update to the master equipment list has been submitted to add sprinkler information, which was previously missing. The SHR further noted that change package WETF-DCF-FPS-012-017 has been prepared to correct sprinkler deficiencies identified in previous assessments (that package is in the approval process at the time of the assessment, so EA was not able to evaluate the effectiveness of its implementation). The SHR also discussed sprinkler coverage within the TA16-450 equipment room and noted that additional sprinkler coverage is necessary. A design change package was planned for that issue. Although the CSE noted issues with timeliness in getting work package closure to the CSE for review, EA determined that the CSE role in maintenance activities is being appropriately implemented and that the SHRs are an effective tool for managing issues and reporting on system health.

5.5 Review of Previous Findings and Corrective Action Effectiveness

In 2010, NA-LA performed a safety system oversight assessment of the WETF FSS, which identified 14 findings and 9 observations. Several of the identified findings challenged system operability. This review team performed a status review of the 2010 findings in the Performance Feedback Improvement Tracking System (PFITS), and an evaluation of the corrective action effectiveness for the findings using PFITS records. The assessment of the effectiveness of corrective actions was based on the answers to three questions as follows:

- Q1) Did the proposed action adequately address the original issue?
- Q2) Did the actual actions taken correct the issue?
- Q3) Do the PFITS attachments provide evidence that addresses the issue and demonstrates the corrective actions completed?

Detailed results were provided in the NA-LA report. Contrary to DOE Order 226.1B, ten of fourteen corrective action plans for findings from the previous NA-LA FSS assessment did not effectively address the problems identified. This lack of effectiveness was not identified by the assurance system process.

For example, finding WETF-2010-FPS-F-011 (PFITS 2010-1255) documented that some FSS sprinkler riser gauges were not calibrated as required by NFPA 25 - 2008, Section 5.3.2. The corrective action taken was to revise the PMI to add provisions for documenting future calibrations. However, no action was taken to go calibrate the gauges themselves.

Finding WETF-2010-FPS-F-004 (PFITS 2010-1248) found a surveillance to be inadequate in that it did not evaluate the "maximum 100 pound fuel package within 1 foot of the fire barrier" requirement in accordance with the national consensus standard definition of "fuel package". The corrective action provided no objective evidence that the procedure had been corrected and no action to re-perform the surveillance correctly.

DOE Order 226.1B requires that contractor assurance systems must include the following: "A method for validating the effectiveness of assurance system processes," and "an issues management process that is capable of categorizing the significance of findings based on risk and priority and other appropriate factors that enables contractor management to ensure that problems are evaluated and corrected on a timely basis." Issue management using PFITS is one process of the contractor's assurance system at LANL. NA-LA appropriately issued FINDING SSO-WETF-FSS-F-14-07 in the NA-LA assessment report to document this deficiency. (See **OFI-NALA-2**.)

6.0 CONCLUSIONS

With a number of important exceptions, LANL processes and procedures for operating, testing, and maintaining the WETF FSS are adequate and meet most aspects of DOE requirements. Further, LANL's CSE program is effectively implemented; CSEs were well qualified, had clear responsibilities, and are producing system health reports, which provide useful information about the status of the systems.

However, the reliability of the FSS to perform its safety function is questionable because of a number of factors. In addition to questions about seismic qualifications, there are important legacy design shortcomings that reduce confidence in the capability of the system. These include: (1) the fire water supply to the FSS also serves a utility supply function and does not meet NFPA code requirements, (2) the design of the system internal to the facility is not redundant and therefore is not compliant with DOE Order 420.1B, and (3) the facility does not have adequate capacity to contain expended fire water for the design basis fire event, so contaminated water could be released into the environment in such an event. In addition to the legacy design issues, EA identified several important deficiencies in design and calculation processes, configuration management, corrective action management, and testing and surveillance procedures.

Overall, the results of this EA assessment indicate a need for increased management attention in two areas. First, more attention is needed to resolve issues with the WETF FSS, including the legacy design issues and the current deficiencies in LANL processes and procedures in such areas as design, surveillance testing, and configuration management. Second, LANL needs to improve its contractor assurance and oversight process to provide for better and more timely identification of deficient conditions and more confidence that corrective action plans are: (1) adequate to correct the identified problem, (2) determine and address the entire extent of condition of the problem, and (3) are effectively implemented before identified deficiencies are closed. To this end, EA has provided a few specific opportunities for improvement (OFIs) for LANL and NA-LA consideration.

7.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified three OFIs in addition to the findings and observations documented in the NA-LA report. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are suggestions offered by the EA team that may assist site management in implementing best practices, or

provide potential solutions to minor issues identified during the assessment. In some cases, OFIs address areas where program or process improvements can be achieved through minimal effort. EA anticipates that these OFIs will be evaluated by the responsible line management organizations and either accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities. As stated earlier, findings and observations identified in the NA-LA report are not repeated here.

National Nuclear Security Administration - Los Alamos Field Office

OFI-NALA-1 Based on the significant issues found in the fire protection calculations in this review, future NA-LA reviews should consider including enhanced scrutiny of contractor design basis calculations.

OFI-NALA-2 Based on the significant issues found examining the effectiveness of the contractor assurance process, consider performing a site-wide focused assessment of the LANL contractor assurance system.

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OFI-LANL-1 Develop a rigorous process for identification of predecessor/successor documents when revisions to documents occur to decrease the likelihood of CM issues. Consider using existing document management systems (e.g., Documentum) to establish interrelationships between documents to facilitate identifying those impacted by changes.

8.0 ITEMS FOR FOLLOW-UP

EA will follow-up on the correction of sprinkler installation and coverage deficiencies. Although recommendations for NA-LA have been provided in these areas, future planned EA assessments at LANL will also provide additional focus on design basis documentation, calculation correctness and accuracy, and weaknesses identified in the contractor assurance process.

Appendix A Supplemental Information

Dates of Review

March 17-21, 2014

Office of Enterprise Assessments Management

Glenn S. Podonsky, Director, Office of Enterprise Assessments
William A. Eckroade, Deputy Director, Office of Enterprise Assessments
Thomas R. Staker, Director, Office of Environment, Safety and Health Assessments
William E. Miller, Director, Office of Nuclear Safety and Environmental Assessments

Quality Review Board

William A. Eckroade
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William E. Miller
Michael A. Kilpatrick

Enterprise Assessments Site Lead

Robert Freeman

Enterprise Assessments Team Members

Charles R. Allen – Team Lead
Joseph Panchison
Joseph Frey

Appendix B Documents Reviewed, Interviews, and Activities

Documents Reviewed:

1. 10 CFR 830, *Nuclear Safety*.
2. 10 CFR 851, *Worker Safety And Health Program*.
3. DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*.
4. NA-1 SD 226.1A, *NNSA Line Oversight and Contractor Assurance System (LOCAS)*.
5. DOE O 414.1D, *Quality Assurance*.
6. DOE O 420.1B, *Facility Safety*.
7. DOE O 422.1, *Conduct of Operations*.
8. DOE O 433.1B, *Maintenance Management Program for Nuclear Facilities*.
9. DOE-STD-1066, *Fire Protection Design Criteria*.
10. DOE-STD-1073, *Guide for Operational Configuration Management Program*.
11. DOE-STD-1186, *Specific Administrative Controls*.
12. DOE-STD-1189, *Integration of Safety into the Design Process*.
13. DOE-STD-3009, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analyses*.
14. DOE-STD-3024, *Content of System Design Descriptions*.
15. DOE G 420.1-3, *Implementation Guide For DOE Fire Protection And Emergency Services Programs*.
16. NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2010 Edition.
17. NFPA 22, *Standard for Water Tanks for Private Fire Protection*, 2008 Edition.
18. NFPA 24, *Standard for the Installation of Private Fire Service Mains and Their Appurtenances*, 2010 Edition.
19. NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Base Fire Protection Systems*, 2011 Edition.
20. NFPA 801, *Standard for Fire Protection for Facilities Handling Radioactive Materials*, 2008 Edition.
21. NA-LA Letter FO:40JLF-562-317, *Transmittal of the Fiscal Year 14 Assessment Plan for the WETF Fire Protection System Vital Safety System Assessment*, 3/3/14.
22. NA-LA MP 06.02, R5, *Safety System Oversight*.
23. NA-LA MP 00.12, R1, *LASO Independent Assessment Process*.
24. NA-LA Assessment, FO:40JF-540118, R1, *Assessment Report for LANL Nuclear Facility Drainage Maintenance*, 10/13.
25. NA-LA Assessment, FO/SET:19JL-239457, *Safety System Oversight Assessment - Weapons Engineering Tritium Facility Wet Pipe Sprinkler System*, 9/12/10.
26. LANL Memorandum, FP-DO-13-020, *Plan of Action for LANL Assessment of Nuclear Facility Drainage Features and Maintenance*, 9/24/13.
27. LANL PD1220, R3, *Fire Protection Program*, effective 9/12/11.
28. LANL Engineering Standards Manual STD-342-100.
29. LANL PD340, *Conduct of Engineering*.
30. LANL P341, *Facility Engineering Processes Manual*.
31. LANL P342, *Engineering Standards*.
32. LANL P343, *Engineering Training and Qualification Manual*.
33. LANL P950, R3, *Conduct of Maintenance*, 1/26/12.
34. LANL P315, R3, *Conduct of Operations Manual*, 2/20/13.
35. LANL Operations and Maintenance (O&M) Manual.
36. AP-MNT-006, R4, *Preventive and Predictive Maintenance*, 11/28/11.

37. AP-MNT-006, *Preventive and Predictive Maintenance*, Attachment A's PM/PdM Justification forms for the fire protection system.
38. AP-341-511, R2, *Design Information Reconstitution*, 10/9/13.
39. AP-341-517, R1, *Design Change Form*, 4/18/12.
40. AP-341-519, R2, *Design Revision Control*, 3/21/13.
41. AP-341-605, R2, *Calculations*, 10/29/12.
42. AP-341-608, R1, *Engineering Drawings and Sketches*, 7/24/13.
43. AP-341-611, R1, *System Design Descriptions*, 4/4/12.
44. AP-341-802, R3.1, *System Health Reporting*, 9/4/10.
45. AP-341-901, R3, *Performing Vital Safety System Assessments*, 9/5/10.
46. WETF-DSA-R2.1, *Weapons Engineering Tritium Facility (WETF) Documented Safety Analysis*, 7/25/12.
47. WETF-TSR-R3.4, *Weapons Engineering Tritium Facility (WETF) Technical Safety Requirements (TSRs)*, 1/30/13.
48. NA-LA Memorandum SO:26CMK-459346, *Weapons Engineering Tritium Facility (WETF) – Approval of Revised Limiting Condition for Operation (LCO) for the WETF Oxygen Monitoring System (OMS)*, dated 8/24/12.
49. NA-LA Memorandum SO:26CMK-493375, *Weapons Engineering Tritium Facility (WETF) – Approval of Revised Limiting Condition for Operation (LCO) for the Weapons Engineering Tritium Facility (WETF) Tritium Gas Handling System (TGHS) Valve Interlock*, 2/7/13.
50. Safety Evaluation Report, SER WETF.01, R2, *The Documented Safety Analysis, Revision 2 And Technical Safety Requirements, Revision 3 For The Los Alamos National Laboratory Weapons Engineering Tritium Facility*, 06/11/12.
51. FP-DO-12-034-R5.1, *TA-16 205/450 WETF Fire Hazards Analysis*, 8/16/13.
52. WETF-FPS-SDD-01, Rev C, *Fire Protection System Description*, 7/1/13.
53. WETF-AP-21, Rev. A, *WETF Configuration Management Plan*, 5/10/10.
54. WFO-DI-168, Rev. A, *WFO Engineering Document Control and Records Management*, 8/8/13.
55. WFO-AP-143, Rev. A, *FOD Acceptance Checklist for Facility Changes*, 2/7/13.
56. WETF-SAR-FPS-13-001, *LANL Vital Safety System Assessment Report for the Wet Pipe Fire Suppression System at TA-16, Buildings 205 & 450, Weapons Engineering Tritium Facility (WETF)*, 4/23/13.
57. WETF-FPS-SR-01, Rev. F, *Surveillance of Wet-Pipe Fire Sprinkler System*, 3/19/12.
58. WETF-FPS-ISI-01, Rev C, *In-Service Inspection of Wet-Pipe Fire Sprinkler Design Feature 6.3.4*, 3/13/13.
59. CALC-10-TA55-0004-019-FP, R1, *Fire Suppression System Hydraulic Analysis*, 8/5/10.
60. CALC-16-205-CALC-F001, R2, *TA-16-205/450 WETF Sprinkler System Hydraulic Calculations*, 6/8/10.
61. CALC WETF-CALC-FPS-12-020, RA, *Fire Protection Water Demand at WETF*, 8/8/12.
62. CALC TSE-CAL-08-09, R0, *TA-16-205 WETF Waste Water Tank Vault Volume Calculation*, 6/17/08.
63. WETF-CALC-FPS-14-005, Rev. A, *WETF Wet Pipe Fire Suppression System Hydraulic Performance (Demand) Calculation*, 5/6/14.
64. WETF-CALC-FPS-14-006, Rev. A, *WETF Wet Pipe Fire Suppression System TSR Set Point Calculation*, 5/6/14.
65. TSE-CAL-08-01, FP-EE-07-005, R1, *WETF Riser Pressure Surveillance Limit for Concern*, 12/13/07.
66. Drawings, Support Drawings and P&IDs:
 - a. WETF-DR-FPS-001, G-0001, Title Sheet & Drawing Index
 - b. WETF-DR-FPS-002, F-0001, Fire Protection Legend
 - c. WETF-DR-FPS-003, F-1000, Fire Protection Site Plan
 - d. WETF-DR-FPS-004, F-1001, Fire Protection Sprinkler System Layout

- e. WETF-DR-FPS-005, F-1002, WETF Pull Station & Alarm Locations
- f. WETF-DR-FPS-006, F-5000, Building 205 Fire Protection System Layout Detail
- g. WETF-DR-FPS-007, F-5001, Building 205A Fire Protection System Layout Detail
- h. WETF-DR-FPS-008, F-5002, Building 450 Basement Fire Protection System Layout Detail
- i. WETF-DR-FPS-009, F-5003, Building 450 Change Room Fire Protection System Layout Detail
- j. WETF-DR-FPS-010, F-5004, Building 450 Equipment Room Fire Protection System Layout Detail
- k. WETF-DR-FPS-011, F-5005, Building 205 Mezzanine 116M Fire Protection System Layout Detail
- l. WETF-DR-FPS-012, F-5006, Building 450 Clean Room Fire Protection System Layout Detail
- m. WETF-DR-FPS-013, F-5007, Building 205 UPS Room 130 Fire Protection System Layout Detail
- n. WETF-DR-FPS-014, F-5008, Building 450 Partial First Floor Fire Protection System Layout Detail
- o. WETF-DR-FPS-015, F-5009, Building 205 Fire Protection Sprinkler System Riser Detail
- p. WETF-DR-FPS-016, F-5010, Building 450 Fire Protection Sprinkler System Riser Detail
- 67. Performed Surveillance WETF-FPS-SR-01 3/18/14
- 68. Master Equipment List (MEL) Printout Fire Protection, 3/13/14.
- 69. Preventive Maintenance Instruction (PMI) 40-35-099, R1, Wet Automatic Fire Sprinkler Systems 5-Year Inspection, Testing, and Maintenance, 3/31/11.
- 70. SHRB-WETF-FPS-WP-11-01, R1, FPS Wet Pipe Sprinkler System Health Basis, 7/16/12.
- 71. WETF Fire Protection System Health Reports:
- 72. WETF-SHR-FPS-13-019, 1/28/14.
- 73. WETF-SHR-FPS-13-010, 8/27/13.
- 74. WETF-SHR-FPS-13-002, 3/4/13.
- 75. Fire Protection CSE Qualification Package and Training Records, 6/6/12.
- 76. Fire Protection CSE Qualification Package and Training Records, 9/6/13.
- 77. WFO Schedule 8-Week-Lookahead, 3/10/14.
- 78. PFITS List, Closed FP Issues for WETF, 3/17/14.
- 79. PFITS List, WETF FP Open Actions, 3/17/14.
- 80. Design Change Form, WETF-DCF-FPS-12-017, Rev. B, Correction of Wet Pipe Sprinkler System Deficiencies.
- 81. Work Order 473046-01, 16-0205/0450 Replace Riser Gauges.
- 82. Work Order 464368-01, SPW's (M) Sprinkler System ITM 16-205/0450.
- 83. Work Order 460093-01, SPW's (M) Sprinkler System ITM 16-205/0450.
- 84. Work Order 456155-01, SPW's (M) Sprinkler System ITM 16-205/0450.
- 85. Work Order 454851-01, SPW's (M) Sprinkler System ITM 16-205/0450.
- 86. Work Order 464365-01, SPW's (M) Sprinkler System ITM 16-205/0450.
- 87. Work Order 433985-01, Quarterly PM Sprinkler System ITM 16-205/0450.
- 88. Work Order 374339-01, Quarterly PM Sprinkler System ITM 16-205/0450.
- 89. Validation Appendices for Independent Oversight Inspection Of Environment, Safety, and Health Programs at the Los Alamos National Laboratory, January 2008.

Interviews:

- WETF Fire Protection Primary CSE
- WETF Fire Protection Secondary CSE
- Operations Center Supervisor

- Operations Center Technicians
- Safety Basis Engineer
- Maintenance Support Specialist
- Manager of Engineering
- Safety Basis Manager

Activities:

- Walkdown of the WETF exterior
- Walkdown of the WETF interior
- CMMS performance demonstration