

**Office of Enterprise Assessments Targeted Review of the  
Fire Protection Program at the Idaho Site  
Advanced Mixed Waste Treatment Project**



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**Office of Environment, Safety and Health Assessments  
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## Acronyms

AHJ	Authority Having Jurisdiction
AMWTP	Advanced Mixed Waste Treatment Project
BNA	Baseline Needs Assessment
BNFL	British Nuclear Fuels, Ltd.
CFR	Code of Federal Regulations
CRAD	Criteria, Review, and Approach Document
CWI	CH2M-WG Idaho, LLC
DOE	U.S. Department of Energy
DOE-ID	DOE Idaho Operations Office
DSA	Documented Safety Analysis
EA	Office of Enterprise Assessments
EM	Office of Environmental Management
ESH	Environment, Safety and Health
FHA	Fire Hazard Analysis
FPE	Fire Protection Engineer
FPP	Fire Protection Program
FSE	Fire System Engineer
gpm	Gallons Per Minute
HAZMAT	Hazardous Materials
HEPA	High Efficiency Particulate Air
ICP	Idaho Cleanup Project
INL	Idaho National Laboratory
ITG	Idaho Treatment Group, LLC
ITM	Inspection, Testing, and Maintenance
NE	Office of Nuclear Energy
NFPA	National Fire Protection Association
OFI	Opportunity for Improvement
P&ID	Piping and Instrumentation Diagram
psi	Pound per Square Inch
PVC	Polyvinyl Chloride
RCE	Retrieval Contamination Enclosure
RWMC	Radioactive Waste Management Complex
SDD	System Design Description
SSC	Structures, Systems, and Components
STD	Standard
TSA	Transuranic Storage Area
TSA-RE	Transuranic Storage Area – Retrieval Enclosure
TSR	Technical Safety Requirement

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**EXECUTIVE SUMMARY**

The U.S. Department of Energy independent Office of Enterprise Assessments (EA), Office of Environment, Safety and Health Assessments, conducted an independent review of the Advanced Mixed Waste Treatment Project (AMWTP) fire protection program (FPP) at the Idaho Site. The AMWTP is established to retrieve, characterize, treat, and package transuranic waste currently stored at the Idaho Site. The AMWTP includes the Transuranic Storage Area (TSA) and TSA Retrieval Enclosure, the Characterization Facility, and the Advanced Mixed Waste Treatment Facility, which is used to size-reduce, sort, and repackaged characterized waste.

Fire protection at nuclear facilities was identified as a targeted review area for the Department's independent oversight in 2013. Pursuant to the memorandum titled, *Independent Oversight of Nuclear Safety – Targeted Review Areas Starting in FY 2013*, dated November 6, 2012, this review was EA's assessment of the effectiveness of the AMWTP fire protection program. It included an evaluation of key program elements; including the baseline needs assessments, fire pre-plans, the exemption and equivalency process, combustible control, the fire hazard analysis, and the inspection, testing, and maintenance program. The assessment also evaluated the integration of the fire hazard analysis and the documented safety analysis, as well as technical safety requirement surveillance and testing for various AMWTP facilities.

The fire protection systems designed for AMWTP are generally adequate and capable of protecting the facilities assessed during this review. The responsible Federal and contractor staff members have a good understanding of how fire protection systems function to protect the AMWTP facilities, and appropriate documentation is in place to support the implementation of an effective program.

However, EA identified weaknesses in the FPP and its implementation in support of the AMWTP facilities. For example, the evaluation of fire pump test data is not performed in accordance with the applicable requirements; an equivalency has not been updated to reflect current system conditions; and a number of National Fire Protection Association codes are not fully followed. In addition, EA's observations indicate a lack of rigor in documenting the implementation, capability, and overall condition of AMWTP fire protection systems.

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**1.0 PURPOSE**

The U.S. Department of Energy (DOE) independent Office of Enterprise Assessments (EA), Office of Environment, Safety and Health Assessments, conducted an independent review of the fire protection program (FPP) at the Idaho Site's Advanced Mixed Waste Treatment Project (AMWTP). The review was one part of a targeted assessment of fire protection at nuclear facilities across the DOE complex.

This independent assessment of the AMWTP facility was performed at the Idaho Site from May 19 to May 23, 2014, and continued off site through additional document reviews and interviews with AMWTP and DOE Idaho Operations Office (DOE-ID) staff until July 31, 2014. This report discusses the scope, background, methodology, results, and conclusions of the review, as well as findings and opportunities for improvement (OFIs) identified during the review.

**2.0 SCOPE**

Fire protection was identified as an independent oversight targeted review area for 2013 in a memorandum from the DOE Chief Health, Safety and Security Officer to DOE senior line management, entitled *Independent Oversight of Nuclear Safety – Targeted Review Areas Starting in FY 2013*, dated November 6, 2012. The purpose of the EA targeted assessment was to evaluate implementation of program requirements that are intended to ensure that adequate controls have been implemented to reduce the risk resulting from a fire or explosion at nuclear facilities. Existing EA criteria, review, and approach documents (CRADs) were adapted to establish a focused set of inspection criteria, activities, and lines of inquiry for the targeted assessment. The independent review of AMWTP is designed to evaluate the core fire protection elements and provide the site and responsible DOE Office of Environmental Management (EM) line management organizations with information for benchmarking their programs' effectiveness.

As part of the targeted review, EA reviewed and assessed the effectiveness of the AMWTP FPP. The review included evaluation of key FPP elements, including the baseline needs assessments (BNAs), fire pre-plans, the exemption and equivalency process, combustible control, the fire hazard analysis (FHA), and the National Fire Protection Association (NFPA) inspection, testing, and maintenance (ITM) program. The assessment also evaluated fire protection-related structures, systems, and components (SSCs); FHA/documented safety analysis (DSA) integration; and technical safety requirement (TSR) surveillance and testing for AMWTP facilities.

**3.0 BACKGROUND**

EA is responsible for implementing the DOE Independent Oversight Program, which is one element of DOE's multi-faceted approach to oversight, as described in DOE Policy 226.1, *Department of Energy Oversight Policy*. Effective oversight of DOE Federal and contractor operations is an integral part of DOE's responsibility as a self-regulating agency to provide assurance of its safety and security posture to its leadership, its workers, and the public. 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 assessment 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 Idaho Site includes the Idaho National Laboratory (INL), the Idaho Cleanup Project (ICP), and the AMWTP. DOE-ID provides direction and oversight for the design and operation of the Idaho Site nuclear facilities for the DOE Office of Nuclear Energy (NE) and EM. NE is responsible for INL facilities and general site operations, and EM is responsible for ICP and AMWTP facilities. Within DOE-ID, two line management organizations are responsible for oversight of these nuclear facilities and their activities. The Deputy Manager for Operations Support is ultimately responsible for contractor oversight of the NE facilities, and under the Deputy Manager for ICP, oversight of the EM facilities is the responsibility of the Assistant Manager for Nuclear Safety and Performance. Currently, Battelle Energy Alliance, LLC (BEA); CH2M-WG Idaho, LLC (CWI); and Idaho Treatment Group, LLC (ITG) are the primary contractors responsible for the management and operation of INL, ICP, and AMWTP facilities, respectively.

The AMWTP is established to retrieve, characterize, treat, and package transuranic waste currently stored at the Idaho Site. The AMWTP consists of multiple facilities to support the execution of this mission. Included in these facilities are the Transuranic Storage Area (TSA) and TSA Retrieval Enclosure (TSA-RE); the Characterization Facility; and the Advanced Mixed Waste Treatment Facility, which is used to size-reduce, sort, and repackage characterized waste. Most facilities at the AMWTP are classified as nuclear Hazard Category 2 nuclear facilities, and multiple fire hazards are associated with their operation.

#### **4.0 METHODOLOGY**

The EA review of the AMWTP FPP included document reviews, facility walkdowns, and interviews with Federal and contractor personnel. The review considered the requirements of 10 CFR 851, *Worker Safety and Health Program*; DOE Order 420.1B, *Facility Safety*; and NFPA codes and standards.

The FPP was assessed using the objectives and criteria identified below. The criteria are based on program elements from DOE Orders 420.1B and 226.1B and are grouped under an overall objective.

The following sections of EA CRAD 45-34, Revision 1, were used for this targeted review:

- Section I, Programmatic Elements, FP-1, Program Documentation
- Section I, Programmatic Elements, FP-2, Program Implementation - Fire and Related Safety Hazards
- Section I, Programmatic Elements, FP-3, Program Implementation - Fire Prevention and Protection
- Section II, FHA/DSA Integration, FP-4
- Section IV, TSR Surveillance Testing.

#### **5.0 RESULTS**

The results of the EA review are presented in five subsections, which correspond to the five portions of CRAD 45-34 that were evaluated by EA.

##### **5.1 Program Documentation**

This portion of the review was to determine whether the following inspection criteria were satisfied:

- *A documented fire safety program exists as required by applicable safety criteria. (DOE Order 420.1B, DOE-STD-1066-99)*
- *A baseline needs assessment (BNA) of the fire protection emergency response organization has been documented and updated every 3 years. The plan should describe in sufficient detail fire-fighting operations for the respective facilities. (10 CFR 851, DOE Order 420.1B, DOE-STD-1066-99)*
- *Processes are developed and implemented that prioritize and monitor the status of fire protection assessment findings, recommendations, and corrective actions until final resolution. [DOE Order 420.1B, Contractor Requirements Document, Chapter II, 3.b(15)]*
- *Program issues identified during previous assessments or program reviews have been appropriately resolved, corrective actions have been completed, and are adequate, or a clear path to completion is indicated. (DOE Order 226.1B)*

### **AMWTP Fire Protection Program**

The AMWTP FPP ensures compliance with applicable fire protection requirements and establishes a level of fire protection sufficient to achieve the programmatic goals identified in DOE Order 420.1B, *Facility Safety*. AMWTP has a documented fire safety program, as described in procedure MP-ISIH-2.49, *Fire Protection Program*, which is based on nationally recognized codes and standards, including the International Building Code and, NFPA codes and standards, as well as DOE Orders relating to fire prevention. The FPP includes written safety procedures and implementing documents to reduce the risk and consequence of incidents involving fires. The requirements apply to fire protection at the facilities operated by ITG at the Idaho Site. The FPP also implements the fire protection and emergency services criteria necessary to comply with 10 CFR 851, *Worker Safety and Health Program*. Roles and responsibilities for the FPP are implemented by the AMWTP Environment, Safety and Health (ES&H) manager, who provides oversight to the Fire Marshal and approves the program.

The AMWTP Fire Marshal has the overall responsibility for administering and enforcing the FPP to support the DOE-ID, Authority Having Jurisdiction (AHJ). The Fire Marshal is responsible for ensuring that periodic programmatic fire protection assessments are conducted and that corrective actions are developed for identified deficiencies. Enforcement and compliance are achieved through the Fire Marshal's review and approval of new and significant changes to the facilities. The Fire Marshal also has responsibilities for coordinating facility investigations for cause, origin, or circumstance of any fire, explosion, or deflagration, and for fire-related accidents, incidents, and occurrences.

The Fire Protection Engineer (FPE) performs work assigned by the Fire Marshal and is responsible for implementing the FPP and monitoring implementation. Currently, the role of the FPE is being met through the use of a consultant who supports the site through monthly visits and various audits of the program. Although the functions performed by the consultant/FPE are value added, the FPP does not adequately define and document the responsibilities that have been delegated to the consultant by the Fire Marshal. The role of the FPE was not clear in the AMWTP FPP. (See **OFI-AMWTP-01**.)

The Fire System Engineer (FSE) performs inspection, testing, and maintenance activities on fire protection systems in accordance with the requirements of MP-CMNT-10.18, *Inspection, Testing, and Maintenance of Fire Protection Systems and Equipment*. The FSE is also responsible for fire system impairments in accordance with INST-CMNT-10.6.2, *Fire Protection System Impairments*, and monitors trends in the performance of fire systems and equipment to determine whether significant degradation is occurring over time. The Fire Department is an integral part of the Emergency Services Department and provides on-scene emergency response operations to the INL Emergency Management System. The emergency service functions are integrated into program development, implementation, and emergency response for a unified response to all emergencies. Emergency requirements involve emergency medical

services, structural fire suppression, hazardous materials (HAZMAT) mitigation, technical rescue, wildland firefighting, Integrated Planning System Support (IPSS) operation, fire and emergency medical dispatching, and associated support functions for the entire site. Guidance for establishing the Fire Department organizational structure is taken from NFPA-1201, *Standard for Providing Emergency Services to the Public*.

### **Fire System Impairment Program**

Procedure INST-CMMNT-10.6.2, *AMWTP Fire Protection System Impairment Procedure*, provides the program requirements for controlling fire systems. The FPE administers the program by evaluating and identifying compensatory measures to be put in place for impairments, categorizing the type of fire protection system impairment, and making necessary notifications. EA reviewed reports of several quarterly evaluations completed by the AMWTP FPE, which identified various deficiencies including three fire dampers located in the Advanced Mixed Waste Treatment Facility, Building WMF-676. Because of limited accessibility, these dampers had not been tested or maintained in accordance with NFPA-80, *Standard for Fire Doors and Other Opening Protectives*. The dampers are located at the floor level in the shredder room, two of them between the North Boxline and the Box Opening Gantry Robot (BOGR) Room. ITG self-identified this issue and entered it into the ITG issues management system, TrackWise, on March 19, 2014; however, the issue had not been resolved as of the completion of this EA assessment and ITG had not declared the system impaired to document this deficiency and system status. On June 19, 2014, after the onsite portion of the EA review, the AMWTP FPE issued a draft engineering evaluation, which appeared to address the issues, but had not yet been approved by the facility by the time the EA report was written. Following the completion of this evaluation and subsequent to this EA assessment, an impairment was also appropriately issued on these dampers. Therefore, with implementation of appropriate compensatory measures, this issue will be considered resolved.

The impairment logbook showed that the deluge system for the TSE-RE (Building WMF-636) Unit #1 exhaust fan and high efficiency particulate air (HEPA) filter is declared impaired because the deluge system isolation valve (IWR10-ISV-3603) is shut due to maintenance and the exhaust fan has been taken out of service. The impairment described in Fire Protection Impairment Plan #258-N states that the deluge system is capable of supporting only two of the HEPA filter plenums. Using a fire system impairment for a design condition/limitation does not meet the intent of the fire impairment procedure, nor does it address the issue of fan operability and a respective resolution. (See **OFI-AMWTP-02**.)

### **Exemption and Equivalency Process**

The exemption and equivalency procedure, MP-ISIH-2.48, *Fire Protection Exemption and Equivalency Procedure*, provides the instructions for obtaining an exemption or equivalency for fire protection systems or equipment that cannot meet applicable mandatory requirements and/or be brought into compliance. Exemptions and equivalencies document the reasons that strict compliance with mandatory fire protection requirements cannot be met and the measures taken to ensure life safety and prevent damage to property or to the environment. Overall, EA found that the equivalency and exemption process is managed effectively, with one exception. The equivalency request, DOE-ID-FPEQ-AMWTP-02-01, *AMWTP TSA-RE Fire Suppression Systems*, documents the NFPA non-compliant dry pipe systems located in the TSA-RE building; it was submitted on May 23, 2002, and subsequently approved by DOE on August 14, 2002. This equivalency was later revised and approved in 2011. However, the calculation attached to the equivalency, demonstrating equivalent functionality of a compliant system, does not account for certain system conditions that had changed since the original submittal, and the design inputs to the existing analysis are now non-conservative, based on the most recent dry pipe valve testing. (See **Finding AMWTP-F-01**.)



## **Baseline Needs Assessment**

DOE Order 420.1B requires that each site establish its capabilities to provide timely and effective firefighting response with sufficient staffing, apparatus, facilities, and equipment. These capabilities are to be documented in a BNA that reflects applicable NFPA codes and standards and is updated every three years. Consistent with the requirements of DOE Order 420.1B, the INL Fire Department has prepared and maintains a BNA that is customized to meet INL's unique needs and is based on requirements established in NFPA-1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Emergency Services Requirements*, and all applicable requirements, guidance, codes, and standards that address emergency response. The INL Fire Department provides Emergency Medical Services (EMS), structural fire suppression, HAZMAT mitigation, technical rescue, wildfire firefighting, and INL supervising station operation.

The BNA reflects the tri-annual review of the Fire Department and identifies credible fires involving radiological material, HAZMAT, spill of radiological material, structural fire, wildland urban interface fire, operational accident (including confined space and high angle rescue), construction or decontamination/decommissioning accident, and criticality accident. Fully deployed, the INL Fire Department can mobilize four engine companies with a total of at least 22 personnel from the three fire stations.

The INL Fire Department has developed an updated draft BNA that was scheduled to be approved and issued by June 2014. The draft document adequately addresses the minimum Fire Department staffing, apparatus, equipment, and procedures. However, the currently approved BNA was issued in March 2011 and, at the time of this assessment, had not been updated to meet the tri-annual frequency required by DOE Order 420.1B, nor was this out-of-date BNA identified as a deficiency by AMWTP. See the Finding IMCL-F-01 in EA Independent Review Report, *Independent Oversight Targeted Review of the Idaho National Laboratory Fire Protection Program as Implemented at the Irradiated Materials Characterization Laboratory at the Idaho Site*, dated September 2014.

## **Fire Response Plans and Training**

A 45,000-gallon propane tank, with its associated delivery system, supplies propane to Building WMF-676. Protection for this propane tank, meets the requirements of NFPA-58, *Liquefied Petroleum Gas Code*, has been provided. The engineering calculation, OPSCALC-ME-0005, *45,000 Gallon Propane Tank BLEVE* [boiling liquid expanding vapor explosion] *Consequence Analysis*, identifies the damage and vulnerability for various building types and the probability of fatalities or serious injury to occupants. The analysis concluded that although unlikely, numerous buildings at AMWTP are at some risk of damage in the event of a significant propane leak, as summarized in RPT-ESH-01, *Advanced Mixed Waste Treatment Project Non-Facility Operations Fire Hazards Analysis and Fire Safety Assessment*. This information has not been integrated into the AMWTP planning to determine safe refuge areas for AMWTP facility personnel during an event that could lead to a BLEVE. Adequate planning including specific administrative controls, such as a response procedure on which personnel can be trained, is required in accordance with NFPA-58, Section 6.25.2, for such incidents that could lead to an unconfined vapor cloud. (See **OFI-AMWTP-03**.)

Several incidents involving fires have occurred at Building WMF-676 within the boxline and shredder cell. However, training for operations in response to a fire condition does not use a comprehensive approach that includes "hands-on" application or manually discharging the CO<sub>2</sub> system on an established schedule to improve the operators' competence in using the equipment and robotic controls. Independent of this EA observation, a recommendation was recently documented in a report by Hughes Associates

associated with their review of the lessons learned from the fire that occurred at WIPP; *AMWTP Fire Protection Program Review for WIPP Incident Vulnerabilities*. The recommendation stated, “the RCE Control Room and AMWTF remote operation control room emergency protocols and operator training be evaluated for adequacy and corrective actions implemented as required to ensure proper response by operators in an actual fire event.” Currently, operator training FQPOT10B, *Qualifications Package for Remote Equipment Operations*, is limited to discussing or simulating the actions/steps to be taken in the event of a fire. (See **OFI-AMWTP-04**.)

### **Control of Combustibles**

DOE Order 420.1B requires that an FPP include comprehensive, written fire protection criteria or procedures that address controls on the use and storage of combustible, flammable, radioactive, and hazardous materials to minimize risk from fire. DOE STD 1066-99, *Fire Protection Design Criteria*, reinforces this requirement, stating that a combustible control program is a required element of all FPPs and requiring a documented description of general housekeeping practices, control of transient combustibles, and control of flammable and combustible liquids and gases. DOE Guide 420.1-3 further states that the quantity and associated hazards of flammable and combustible materials that are often found within the fire area should be factored into FHAs.

The AMWTP FPP was observed to have a generally effective combustible control program due to the quarterly housekeeping inspections that were being performed.

### **Issues Management – Corrective Actions**

DOE Order 420.1B, Attachment 2, *Contractor Requirements Document*, Chapter II, 3.b(15) requires “Processes to prioritize and monitor the status of fire protection assessment findings, recommendations, and corrective actions until final resolution.” Facility issues relating to fire protection are currently evaluated by the AMWTP Fire Marshal and entered into the contractor’s issues management system, TrackWise. This process, even though it authorizes immediate actions to be taken for serious conditions, does not evaluate risk in terms of fire protection and consider such critical factors as life safety, unacceptable program interruption, fire loss potential in excess of limits defined by DOE STD 1066-99, and potential damage to process control and safety systems. These and other risk factors can have a significant impact on the frequency and consequence of fire events. Other DOE sites use methods to rank risks, which help identify the more serious deficiencies and promote prompt corrective actions and appropriate compensatory measures. (See **OFI-AMWTP-05**.)

## **5.2 Fire and Related Safety Hazards Analyses**

This portion of the review was intended to determine whether the following inspection criteria were satisfied:

- *Fire Hazard Analyses (FHA) have been prepared for each nuclear facility and the results coordinated and integrated into the Documented Safety Analysis as required. (DOE Order 420.1B, DOE STD-1066-99, DOE-HDBK-1163, NFPA-801)*
- *Fire and related safety hazards on site (or within the facility) have been identified and evaluated in conjunction with a current and comprehensive FHA. (DOE Order 420.1B)*
- *The FHA and self-assessments address all essential elements for a complete analysis as delineated in DOE Order 420.1 and its implementation guide. (DOE Order 420.1B and DOE Guide 420.1-3)*
- *The information contained in the FHA and assessment is accurate, as required by applicable fire safety criteria. (DOE Order 420.1B)*

Because certain facilities at AMWTP have been evaluated to be nuclear Hazard Category 2 facilities, the AMWTP FPP document recognizes the FHA covering these facilities as the source document that establishes the design basis for the fire protection features of the facility. The AMWTP consists of multiple buildings and structures, each of which is described in their respective FHAs in terms of construction type, occupancy, function and activities, and potential hazards. The Non Facility Operations FHA (RPT-ESH-01, Rev 18, dated May 13, 2014) is comprehensive and generally meets the required criteria, however, EA made the observations noted below. Some of these items may be considered as enhancements to the current FHAs and good operating practices. (See **OFI-AMWTP-06.**)

- FHA RPT-ESH-01 does not in all cases document known fire protection deficiencies or adequately describe the existing fire protection related deficiencies noted in approved equivalencies. DOE Guide 420.1-3 suggests that the FHA should contain an assessment of the fire protection features; an evaluation of the effect of significant fire safety deficiencies on fire risk; and, where deficiencies have been identified and subsequently approved by a documented equivalency, identification and discussion of the fire protection feature equivalency. The fire protection objectives referred to in DOE Guide 420.1-3 are established in DOE Order 420.1B. It is considered a good practice to include in the FHA the exemption or equivalency compensatory measures that can be used to justify the noncompliance. Once the exemption or equivalency is approved, the next revision of the facility FHA would cite the approved exemption or equivalency documentation.
- FHA RPT-ESH-01 does not adequately describe the water supply system and the operational interface between the Radioactive Waste Management Complex (RWMC) fire pumps and tanks or evaluate the adequacy of the fire water capacity with respect to system demands.
  - Diesel FP-3901, located in Building WMF-639 and drawing water from storage tank WMF-727, is discussed in the FHA; however, the diesel driven fire pump, located in the new Subsurface Disposal Area firewater pump-house WMF-743 and drawing water from firewater tank FW-TK-4301, is not discussed, and neither the operational sequence of this pump nor its operational relationship to the AMWTP water distribution system is mentioned.
  - Firewater tank TK-4301 was added to provide a redundant firewater supply and complies with the Accelerated Retrieval Project (ARP) II fire protection exemption. Both fire pumps and firewater storage tanks are described in the AMWTP DSA and RWMC Firewater System Design Description (SDD) but not in the AMWTP FHA.
- The AMWTP TSA-RE FHA hydraulic sprinkler flow and pressure demands are not consistent with those documented in SDD-150, Rev. 6 (January 27, 2014) for the ICP RWMC Fire Water System SDD. The analytical basis for the hydraulic sprinkler demands is not always available, so the accuracy of these flow demands is questionable.
- FHA RPT-ESH-01, Section 5.1, states that the minimum water level in the firewater storage tank provides more than 90 minutes' supply for the largest building demand. The FHA does not address the capability of the system to meet the two-hour fire flow demand mentioned in the DSA.
- FHA RPT-ESH-01, Section 5.2.1.1, describes automatic fire suppression systems in the TSA-RE but does not reflect the current status of these dry pipe systems. The FHA states, "Recent tests indicate that it takes up to 169 seconds for water to reach the test port from the time the inspection test connection is fully opened." The previous AMWTP contractor, British Nuclear Fuels, Ltd. (BNFL), submitted an equivalency for this discrepancy that was accepted by DOE-ID on August 14, 2002.

Later, on July 25, 2011, DOE-ID approved an amendment to this equivalency that changed certain controls related to fueling of vehicles and operational equipment outside the TSA-RE. The FHA does not discuss the amended equivalency or the current, more degraded conditions of the dry pipe systems in the facility, and therefore requires revision. (See **Finding AMWTP-F-01.**)

- The calculations in the FHA for determining the Maximum Possible Fire Loss do not consider the costs associated with mission continuity (mission interruption costs).
- The FHA for Building WMF-636, Section 4.2.3.6, page 19, incorrectly indicates that the diesel fuel oil day tank has a volume of 40 gallons. In fact, the day tank and associated piping only have an administrative volume *limitation* of 40 gallons, since the pool fire analysis identifies the worst-case fuel spill as 40 gallons.
- Several of the fire alarm system panels and equipment are antiquated and need to be replaced, as identified by ITG. As of the completion of this assessment, there was no plan in place to address this issue, and it is not discussed in the recently approved FHA.

### **5.3 Fire Prevention and Protection SSCs and Controls**

This portion of the review was intended to determine whether the following inspection criteria were satisfied:

- *A complete spectrum of fire prevention controls and procedures are in existence and have been implemented as required by applicable fire safety criteria. (DOE Order 420.1B, Site & Facility DSA)*
- *All fixed fire protection features (appropriate construction types, fire barriers, fire alarm and signaling systems, manual and automatic fire suppression systems, etc.), that are required by authorization basis documents and fire hazards analyses, have been installed and are tested and maintained, as required by applicable fire safety criteria. (DOE Order 420.1B, Site & Facility DSA)*

#### **Fire Protection Controls Implementation**

EA reviewed fire protection systems at selected AMWTP facilities to confirm, in part, that they are appropriate for the facility fire scenarios identified in the FHA and the safety basis; that they are designed and installed compliant with the required codes and standards; and that an appropriate ITM program for fire protection features is in place and is being conducted. The primary focus was the Building WMF-636 facility (TSA-RE). The AMWTP fire protection controls are not credited as safety-significant features but are classified as administrative controls. Regardless of this classification, the requirements of NFPA-25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*; NFPA-72, *National Fire Alarm Code*; and other applicable NFPA standards and code inspection, testing, and maintenance (ITM) requirements apply and have been enveloped by the INL FPP. EA identified the following observations:

- The Building WMF-636 deluge system isolation valve (IWR10-ISV-3603) was shut due to maintenance, and the Unit #1 exhaust fan was taken out of service. Therefore, the fire protection deluge system to the Unit #1 exhaust fan and HEPA filter has been declared impaired. The impairment described in Fire Protection Impairment Plan #258-N states that the deluge system is capable of supporting only two of the HEPA filter plenums, and the hydraulic calculations that were provided to EA demonstrate that two HEPA filter plenums are simultaneously provided with adequate flow. However, the deluge water flow and pressure determined in the analysis differ from the water flow indicated on the HEPA filter deluge system drawing F-4 (Contract #1760-211). Following this

review, ITG staff stated that the deluge system vendor performed calculations of flow at two different pressures, as the system pressure can vary during normal operation, and therefore indicated that was a second calculation that was performed, which agrees with drawing F-4. (See **OFI-AMWTP-07.**)

- The Building WMF-636 mobile crane has a depth of 2 feet 6 inches and is located at the ceiling level of the building, where it represents a potential obstruction to the existing overhead sprinkler system. This installation has not been formally evaluated for sprinkler obstructions that could result in a delay of operations. (See **OFI-AMWTP-08.**)
- FHA RPT-ESH-01, Section 5.2.1.1, describes the automatic fire suppression systems in the TSA-RE but does not reflect the current status of these systems. The FHA states, “Recent tests indicate that it takes up to 169 seconds for water to reach the test port from the time the inspection test connection is fully opened.” The NFPA requirement is 60 seconds. BNFL submitted an equivalency for this discrepancy that was accepted by DOE-ID (August 14, 2002). An analysis provided as part of the equivalency request determined that the capability of the suppression system was adequate to control the postulated fire even with the 169 seconds delay time. However, since then, three of the dry pipe risers have significantly degraded further and now demonstrate a flow delivery time in excess of 300 seconds (323, 319, and 306) and two risers in excess of 180 seconds (202 and 184). The calculation that supports the approved equivalency used the 169-second water delivery time. The FHA and the analysis supporting the equivalency approval have not been revised and do not support the current performance of the suppression system. (Refer to **Finding AMWTP-F-01.**)
- Documentation states that some facilities can contain potentially contaminated fire suppression system water runoff for only 20 minutes, contrary to requirements cited in NFPA-801 that mandate containment or drainage of the credible volume of discharge (as determined by the FHA) for the suppression system operating for 30 minutes where automatic suppression is provided throughout. Furthermore, in some cases, the DSA safety basis accident analysis assumes a fire duration of two hours. (Refer to Section 5.4 for further discussion.)

### **Three-Way Valve and Diesel Storage Tank**

The Retrieval Contamination Enclosure (RCE) diesel fuel system is designed to meet AMWTP Retrieval Operations’ need for fuel delivery to the TSA-RE RCE equipment airlock refueling area (Room 206) for refueling heavy equipment and to protect the assumptions in the DSA (RPT-DSA-02) design basis accident, TSA-RE fire. By design, the maximum amount of diesel fuel that can be pumped, siphoned, or spilled from the RCE diesel fueling system is less than or equal to 40 gallons. To meet this requirement, a bulk storage fuel tank was located outside the TSA-RE structure, with a smaller day tank (25-gallon nominal size) adjacent to it. The maximum volume of fuel for each pumping campaign is not to exceed 40 gallons, including the sum of the day tank and delivery (discharge) fuel line volumes.

Filling and discharge of the day tank go through the same line, with a three-way switching valve at the junction of the lines from the bulk storage tank and the fuel delivery line to the fueling area's dispenser nozzle. The position of the three-way valve controls whether the day tank is in a filling or dispensing configuration. Both services cannot occur simultaneously, because the valve has an "L" flow configuration. The three-way valve is an engineered design feature that ensures that no more than 40 gallons can be delivered to the TSA-RE without specific operator intent.

A valve position switch is mounted on the handle of the three-way valve as another defense-in-depth feature to prevent simultaneous operation of both pumps. This switch has two sets of contacts that are set to be open or closed in opposition. When the day tank fill pump contacts are closed, the day tank delivery pump contacts are open, and vice versa. This feature prevents the two pumps from operating

simultaneously.

NFPA-30, *Flammable and Combustible Liquids Code*, requires posted labeling and placards restricting ignition sources and indicating the hazard rating of the stored material, in accordance with NFPA-704, *Standard System for Identification of the Hazard of Materials for Emergency Response*. This required labeling and/or placard was not observed for the diesel fuel day tank. (See **Finding AMWTP-F-02**.)

The EA team also noted the following concerns: (See **OFI-AMWTP-09**.)

- The safety-significant three-way valve and diesel storage tank has not been evaluated for protection from vehicle traffic in accordance with manufacturer (Convault) recommendations.
- AMWTP engineering design documents (Drawing 772644, *WMF-636 Retrieval Contamination Enclosure Diesel Fuel System RCE P&ID* [piping and instrumentation diagram], Rev. 07) and SDD (EDF-0761, *RCE Diesel System Description*) do not identify the safety-significant components.
- MP-ISIH-2.32, *AMWTP Combustibility Loading Checklist*, for Building WMF-636 does not include specific limits for restricting combustible materials for the RCE as required by the approved equivalency, DOE-ID-FPEQ-AMWTP-11-04, *Equivalency for Refueling within the WMF-636 Retrieval Contamination Enclosure (RCE)*.
- Placards for limiting combustible loading are limited to one sign on an exterior wall and do not address the diesel fuel storage tank.

### **Infrastructure Water Supply**

Firewater for the AMWTP TSA non-facility operations buildings is supplied through the RWMC, which is operated by another Idaho Site contractor, CWI. There are two separate systems: a firewater system and a domestic water system. This fire supply system consists of WMF-639, Firewater Pump House, and WMF-727, a dedicated 250,000-gallon water storage suction tank with manual fill. Two fire pumps, each rated at 2,000 gallons per minute (gpm) and 125 pounds per square inch (psi), one electrically powered and the other driven by a diesel engine, provide the primary and backup required fire flows for the facility. Normal static firewater system pressure is maintained at 125-142 psi by a jockey pump, FW-P-3904, located in WMF-639. The jockey pump start setpoint is 130 psi and it shuts off at 140 psi. If the system pressure drops to 120 psi, the main electric fire pump starts. Firewater is supplied to the RWMC by a 10-inch diameter main line in the TSA and the Administration and Operation areas. A looped system distributes water within the TSA with a primary 10-inch loop. Two dead-end mains supply the Administrative Area. The firewater system interfaces with building system risers within the TSA at the post indicator valves. Additionally, the firewater supply system has been modified to include a redundant firewater supply from firewater tank FW-TK-4301, which has a capacity of 500,000 gallons.

CWI maintains the firewater system within the TSA. The firewater pumps have no TSR-required surveillances but are required to be tested and maintained in accordance with NFPA-25. EA reviewed the annual pump test data for both the electric and diesel driven fire pumps and found no indication that this data is being evaluated to meet the requirements of NFPA-25 in order to ensure that there is no excessive pump performance degradation and that the capacity (flow and pressure) for the supplied firewater systems is adequate. CWI's fire pump annual test procedure has no acceptance criteria. NFPA-25 requires each pump assembly to be tested annually at the minimum (0% or "churn"), rated (100%), and peak (150%) flowrates by controlling the quantity of water discharged. In the case of the diesel driven pumps, theoretical factors for correction to the rated speed are to be applied, and the resulting developed pressure is to be no less than 95 percent of the pressure at rated flow and rated speed of the initial

unadjusted field acceptance test curve (if the original acceptance test curve matches the original certified pump curve established by using theoretical factors). The test procedure does not prescribe this test methodology, and pump field acceptance test curves are not part of the procedure. Additionally, there is no evidence that the test data is reviewed by an FPE, and the pump acceptance baseline curves that were reviewed were not always consistent with the recorded pump data. (See **Finding AMWTP-F-03.**)

The firewater supply system to AMWTP is provided by a looped underground piping infrastructure generally consisting of 10-inch PVC and ductile iron piping. Lead-ins to the facilities from the firewater loop are 8-inch ductile iron piping provided with a post indicator valve control valve. Sectional control valves are installed throughout the 10-inch looped system to facilitate isolation during maintenance and other activities. These valves are generally in a locked open position and are required to be annually verified to be operational and in their appropriate open position. As documented in the 2013 annual Fire Protection Self-Assessment Report (Report MAR-68196, dated March 12, 2013), there are issues (e.g., aging components) in the underground fire water distribution system; correcting the issues would necessitate replacing certain valves and portions of the underground piping network. The report concluded that the replacement project would be very costly and that there was insufficient justification to pursue this project. However, the system condition has not been sufficiently analyzed to determine whether the issues compromise the requirement for an adequate and reliable water supply system. (See **OFI-AMWTP-10.**)

EA also observed that communication between ITG and CWI, regarding the normal and off-normal status of the fire water supply system, is conducted informally. Though communication appears to be functional, the protocol is not formal and not documented in the interface agreement. Therefore, the ability to maintain the functionality and effectiveness of these communications can be subject to personnel changes, budget perturbations, or other events. (See **OFI-AMWTP-11.**)

#### **5.4 FHA/DSA Integration**

This portion of the review was intended to determine whether the following inspection criteria were satisfied:

- *Within the scope of the review, the FHA conclusions shall be incorporated into the safety authorization (preliminary safety design review, preliminary DSA, or DSA, as appropriate) and demonstrate the adequacy of controls provided by the system to eliminate, limit, or mitigate identified hazards, and define the process for maintaining the controls and controlling their use.*
- *The safety authorization basis is consistent with the fire hazards analysis; demonstrates the adequacy of controls provided by the system to eliminate, limit, or mitigate identified hazards; and defines the processes for maintaining the controls current at all times and controlling their use.*

In accordance with DOE Order 420.1B, the conclusions of the FHA are to be incorporated in the DSA for nuclear Hazard Category 1, 2, or 3 nuclear facilities to provide consistency between fire accidents analyzed in the DSA and the actual fire hazards analyzed in the facility. The FHAs for the AMWTP facilities, specifically FHA RPT-ESH-01, were reviewed for consistency with the facility's DSA to determine the adequacy of the selected fire protection control set, the identified hazards, and the combustible loading controls. The facility FHA comprehensively and qualitatively identifies the fire hazards, assesses the risk from fire within individual fire areas in the facility, concisely describes building construction as required, and identifies fire rated area separations. However, EA noted some omissions, inconsistencies, or deficiencies:

- Discussions with the system engineer responsible for the diesel fuel system revealed that only the three-way valve is credited as safety-significant, even though the DSA states that the three-way valve, day tank, and the delivery piping are credited. EDF-0761, *RCE Diesel System Description*, indicates that the 40-gallon restriction (discussed in Section 5.3) is achieved mechanically, electrically, and volumetrically, indicating that the piping and tank, in addition to the valve, are credited. This statement is misleading, because the DSA credits only passive system components and does not include the low level alarms, switches for the fuel pumps, or the respective interlocks. (Refer to **OFI-AMWTP-09**.)
- The FHA and preliminary DSA (PDSA) do not thoroughly discuss and analyze drainage and containment of potentially contaminated water from the Building WMF-636 retrieval contamination control HEPA filter deluge system. The Fire Department pre-incident plan states that three HEPA filter plenums, each containing 12 HEPA filters, are protected with deluge systems for all plenums and that “water usage should be minimized to facilitate controlling the quantity of contaminated water...the building is provided with a water containment system that will collect approximately twenty minutes of fire flow.” The PDSA evaluates a TSA-RE fire and assumes that the fire burns for two hours, and NFPA-801 requires containment of potentially contaminated discharge water for 30 minutes. Though, the FHA states that Building WMF-636 and other AMWTP facilities can contain only 20 minutes of suppression system discharge. According to the AMWTP Fire Marshal, the Building WMF-636 firewater collection system includes four 20,000 gallon tanks providing a total capacity of 80,000 gallons; and at the expected HEPA filter deluge system flowrate (169.7 gpm), the quantity of contaminated water will be well within the system’s capacity after two hours. However, the FHA does not reflect the correct system capacity, and the DSA does not agree with the FHA as to the worst-case firewater runoff scenario. The lack of accuracy, agreement, and coordination between these two documents can easily lead to confusion about facility design. (See **Finding AMWTP-F-04**.)

## 5.5 TSR Surveillance Testing and ITM

This portion of the review was intended to determine whether the following inspection criteria were satisfied:

- *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*

EA reviewed fire protection systems at selected AMWTP facilities to confirm, in part, that an appropriate ITM program for fire protection features is in place and is being conducted; the primary focus of the review was on the TSA-RE. The AMWTP fire protection systems and controls are not credited safety-significant features but are classified as administrative controls. The AMWTP fire protection systems and controls are not credited as safety-significant features but are classified as administrative controls. Nevertheless, regardless of this classification, the requirements of NFPA-25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*; NFPA-72, *National Fire Alarm Code*; and other applicable NFPA standards and code inspection, testing, and maintenance (ITM)



requirements apply and have been enveloped by the INL FPP. The hazard and accident analysis in the AMWTP DSA identifies preventive and mitigative SSCs and the safety management programs that are important to safety and provide defense-in-depth. The FPP identifies, as a defense-in-depth control, that before non-facility operations start in a given area, the fire suppression system in that area must be verified to be operable and maintained in accordance with the applicable NFPA code and fire equivalency determination. Except as noted under Infrastructure Water Supply in Section 5.3 of this report, the ITM performed on the fire protection systems generally complies with NFPA standards and requirements.

## 6.0 CONCLUSIONS

The fire protection systems designed for AMWTP are generally adequate and capable of protecting the facilities assessed by EA during this review. In addition, the responsible ITG and DOE-ID staff members have a good understanding of how fire protection systems function to protect the AMWTP facilities and appropriate documentation is in place to support the implementation of an effective program.

However, EA identified weaknesses in the FPP and its implementation in support of the AMWTP facilities. For example, the evaluation of fire pump test data is not performed in accordance with the applicable requirements; an equivalency has not been updated to reflect current system conditions; and a number of NFPA codes are not followed with strict adherence. In addition, EA's observations indicate a lack of rigor in documenting the implementation, capability, and overall condition of AMWTP fire protection systems.

Overall, the AMWTP FPP is functional but could be improved by resolving the findings and considering the OFIs in this EA report. Increased management attention is needed to ensure that the findings and OFIs in Sections 7 and 8 of this report are addressed in a timely manner.

## 7.0 FINDINGS

As defined in DOE Order 227.1, *Independent Oversight Program*, findings are significant deficiencies or safety issues that warrant a high level of attention from management. If left uncorrected, findings could adversely affect the DOE mission, the environment, the safety or health of workers and the public, or national security. Findings may identify aspects of a program that do not meet the intent of DOE policy or Federal regulations. Corrective action plans must be developed and implemented for EA appraisal findings. Cognizant DOE managers must use site- and program-specific issues management processes and systems developed in accordance with DOE Order 227.1 to manage these corrective action plans and track them to completion.

**AMWTP-F-01: The calculation that supported the approval of equivalency request DOE-ID-FPEQ-AMWTP-02-01 is not consistent with the current field performance conditions of the AMWTP TSA-RE fire suppression systems. Inputs to the supporting calculation are now non-conservative, based on the most recent dry pipe valve testing and therefore supporting documentation has not been kept current, as required by Title 10 CFR 830.**

**AMWTP-F-02: Labeling and placards in accordance with NFPA-704, indicating the hazard rating of the stored material, have not been installed on the RCE Diesel Fuel Day Tank, as required by NFPA-30.**

**AMWTP-F-03: The annual fire pump test and the evaluation of the resulting data are not being performed to meet the requirements of NFPA-25. The fire pump annual test procedure has no**

acceptance criteria, does not prescribe the test and data evaluation methodology, and does not include pump field acceptance test curves. Additionally, there is no evidence that test data is reviewed by an FPE.

**AMWTP-F-04:** The Building WMF-636 FHA and DSA do not accurately reflect the facility's capability to contain contaminated firewater runoff from the HEPA filter deluge system. The FHA and DSA documentation also does not show agreement as to the worst-case firewater runoff scenario. The FHA and DSA are to be current, complete, and accurate, as required by Title 10 CFR 830.

## 8.0 OPPORTUNITIES FOR IMPROVEMENT

EA identified the following OFIs. These potential enhancements are not intended to be prescriptive or mandatory. Rather, they are offered to the site to be reviewed and evaluated by the responsible line management organizations and accepted, rejected, or modified as appropriate, in accordance with site-specific program objectives and priorities.

**OFI-AMWTP-01:** Consider further clarifying the role of the FPE in the AMWTP FPP, including such functions as coordination, auditing, and oversight responsibilities performed by the FPE, and ensure roles and responsibilities of the FPE are adequately documented in the FPP.

**OFI-AMWTP-02:** Reconsider the use of a fire system impairment to compensate for an inadequate design condition. The current impairment of the deluge system does not meet the intent of the fire impairment procedure and does not address the issue and respective resolution.

**OFI-AMWTP-03:** Engineering calculation OPSCALC-ME-0005, *45,000 Gallon Propane Tank BLEVE Consequence Analysis*, identifies the damage and vulnerability for various occupied buildings, including WMF-634, WMF-684, and WMF-677, as well as safe refuge areas for AMWTP facility personnel during an event that could lead to a BLEVE. The Emergency Response Guide and 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*, both have guidance for initial buffer zones associated with bulk propane storage tanks. AMWTP should consider integrating the information documented in OPSCALC-ME-0005 into their existing emergency response plans that would help to establish buffer zones and safe refuge areas based on the anticipated radius of damage for a propane tank BLEVE.

**OFI-AMWTP-04:** Given the frequency of fires within the boxline and shredder cell, consider a comprehensive approach to training for operations in response to a fire condition including "hands-on" application.

**OFI-AMWTP-05:** Consider revising the AMWTP process for evaluating fire protection related issues to evaluate such critical risk factors as life safety, unacceptable program interruption, fire loss potential in excess of limits defined by DOE-STD-1066-99, and potential damage to process control and safety systems, all of which have a significant impact on event frequency and consequence. The revised process would also benefit the facility by identifying the more serious deficiencies and assigning prompt corrective action and appropriate compensatory measures.

**OFI-AMWTP-06:** Consider revising FHA RPT-ESH-01 to rectify the omissions and deficiencies identified in Section 5.2 of this report.

**OFI-AMWTP-07:** Consider clarifying documentation to show that two calculations were performed for

the hydraulic analysis to determine the deluge water flow and pressure, and ensure that this is clearly denoted on HEPA filter deluge system drawing F-4 (Contract #1760-211).

**OFI-AMWTP-08:** Consider evaluating the potential for the Building WMF-636 mobile crane to obstruct the existing overhead dry pipe sprinkler system.

**OFI-AMWTP-09:** Consider the following improvements to the description and implementation of the RCE systems:

- Evaluate the RCE Diesel Fuel System safety-significant three-way valve and diesel storage tank to verify adequate protection from vehicle traffic in accordance with manufacturer (Convault) recommendations.
- Revise AMWTP engineering design documents Drawing 772644, *WMF-636 Retrieval Contamination Enclosure Diesel Fuel System RCE P&ID*, Rev. 07, and EDF-0761, *RCE Diesel System Description*, to identify the safety-significant components.
- Provide specific limits for restricting combustible materials in the *AMWTP Combustibility Loading Checklist* (MP-ISIH-2.32, Building WMF-636).
- Verify that appropriate placards for limiting combustible loading have been addressed for the diesel fuel storage tank.
- Clarify the requirement for a maximum of 40 gallons of free fossil fuel in EDF-0761, *RCE Diesel System Description*.

**OFI-AMWTP-10:** Consider reevaluating the replacement of piping and valves in the firewater underground supply system for identified known issues that could compromise the requirement for an adequate and reliable water supply system.

**OFI-AMWTP-11:** Consider formalizing the communication process, possibly in the Interface Agreement, between ITG and CWI regarding the normal and off-normal status of the firewater supply system.

## 9.0 ITEMS FOR FOLLOW-UP

- Verify that corrective actions have been initiated or completed to resolve the issue of testing and maintenance of Building WMF-676 dampers.
- Verify that updated BNA has been approved, and that updates have returned to the required triennial schedule.
- Verify the effectiveness of the compensatory measures and the completion of corrective actions associated with the damper testing and maintenance issues that were identified and entered into the TrackWise system.

## **Appendix A Supplemental Information**

### **Dates of Review**

Onsite Review: May 19 – 23, 2014  
Offsite Review: May 23 – July 31, 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  
Thomas R. Staker  
William E. Miller  
Michael A. Kilpatrick

### **Office of Enterprise Assessments Site Lead for the Idaho Site**

Aleem E. Boatright

### **Office of Enterprise Assessments Reviewers**

Aleem E. Boatright – Lead  
Jeffrey Robinson  
Joseph Panchison

## **Appendix B**

### **Documents Reviewed and Interviews**

#### **Documents Reviewed:**

- French, R. R., BBWI, 2005, Letter entitled Contract No. DE-AC07-99ID13727 – Designation of Authority Having Jurisdiction for Fire Protection for the Advanced Mixed Waste Treatment Project, RFF-003-2005, 09/21/2005
- MP-ISIH-2.49, AMWTP Fire Protection Program, Rev. 6
- INST-CD&M-11.1.2, Facility Modification Proposal Preparation
- INST-CMNT-10.6.2, Fire Protection System Impairments
- INST-CMNT-10.7.1, Seasonal Facility Maintenance
- MP-CD&M-11.1, Change Control
- MP-CMNT-10.18, Inspection, Testing, and Maintenance of Fire Protection Systems and Equipment
- MP-COPS-9.6, Occurrence Reporting
- MP-DOCS-18.2, Records Management
- MP-ISIH-2.32, Housekeeping
- MP-ISIH-2.36, Welding, Cutting, and Other Hot Work
- MP-ISIH-2.43, Operating Experience/Lessons Learned
- MP-ISIH-2.47, Developing Fire Hazards Analyses, Fire Safety Assessments, and Abbreviated Fire Assessments
- MP-ISIH-2.48, Fire Protection Exemptions and Equivalencies
- MP-ISIH-2.62, Fire Prevention
- MP-ISIH-2.63, Flammable and Combustible Liquids
- MP-M&IA-17.1, Management Assessment
- RPT-ESH-01 Advanced Mixed Waste Treatment Project Non-Facility Operations Fire Hazards Analysis and Fire Safety Assessment, Rev. 18, May 2014
- FQPOT10B Qualifications Package for Remote Equipment Operations, Rev. 7
- EDF- 0761, RCE Diesel System Description, Rev. 4, 01/20/2011
- WMF-636, Retrieval Contamination Enclosure Diesel Fuel System RCE P&ID, Drawing 772644, Rev. 07
- OPSCALC-ME-0005, 45,000 Gallon Propane Tank BLEVE Consequence Analysis, 08/12/2004, Rev. 00
- MAR-68196, Joint Assessment of the AMWTP Fire Protection Program, March 2013
- Drawing 177648 Sheet S-5, Firewater Tank WMF-727
- Fire Protection Impairment Plan Number 258-N, WMF-636 HEPA Deluge Sprinkler System
- RPT-DSA-02, AMWTP Documented Safety Analysis, Rev. 10, 11/10/2013
- SDD-150, RWMC Firewater System, Rev. 6, 01/27/2014
- Drawing 53-10706, WMF-676 & AMWTP Site Fire System Plan, Rev. 7, 11/17/2009
- DOE-ID-FPEQ-AMWTP-10-03, WMF-636 Dry Pipe Suppression Systems Air Leakage, 09/07/2010
- DOE-ID-FPEQ-AMWTP-02-01 (Amended), TSA-RE Fire Suppression Systems, 07/25/2011
- Contract No. 1760-211, Drawing F-4, HEPA Filters Deluge System, 04/01/2011
- WMF-639 Annual Electric and Diesel Fire Pump Test Procedure and Data, 10/16/2013
- AHJ-AMWTP-03-2013, RCE Exhaust Plenum Fire Protection System Impairments, 01/22/2013
- AHJ-AMWTP-03-2009, WMF-636 Sprinkler Systems Hydro Test Interpretation, 05/26/2009

- IAG-473, Interface Agreement Between Radioactive Waste Management Complex and AMWTP, Rev. 3, 01/18/2012
- AMWTP Fire Protection Program Review for WIPP Incident Vulnerabilities, Hughes Associates, May 2014, Rev. 0

**Interviews:**

AMWTP Fire Marshal  
AMWTP Fire Protection Engineer  
AMWTP Fire Systems Engineer  
AMWTP ES&H Manager  
AMWTP Engineering Manager  
INL DOE Fire Protection Engineer  
DOE-ID Fire Protection Engineer  
ICP Fire Protection Engineer