

2. AMENDMENT/MODIFICATION NO. M016	3. EFFECTIVE DATE See Block 16C	4. REQUISITION/PURCHASE REQ. NO. NOPR	5. PROJECT NO. (If applicable)
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6. ISSUED BY U.S. Department of Energy Idaho Operations Office Procurement Services Division 850 Energy Drive, MS 1221 Idaho Falls, ID 83401-1563	CODE	7. ADMINISTERED BY (If other than Item 6)	CODE
		Janet K. Surrusco Tel: (208) 526-5477 Fax: (208) 526-5548 E-mail: surrusjk@id.doe.gov	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, state, ZIP Code) BNFL Inc. 10306 Eaton Place, Suite 450 Fairfax, VA 22030		9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
	X	10A. MODIFICATION OF CONTRACT/ORDER NO. DE-AC07-97ID13481
		10B. DATED (SEE ITEM 13) December 20, 1996
CODE	FACILITY CODE	

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers is extended, is not extended.

Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation as amended, by one of the following methods:

(a) By completing Items 8 and 15, and returning ____ copies of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required)

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS; IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

A.	THIS CHANGE ORDER IS ISSUED PURSUANT TO (Specify authority): THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
B.	THE ABOVE-NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (Such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
C.	THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF:
X	D. OTHER (Specify type of modification and authority): Contract Clause H.47 and Section J, Appendix D
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>3</u> copies to the issuing office.	

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible)

The purpose of this Modification M016 is to incorporate document number BNFL-5232-ESH-01 Rev. 4, dated June 2002, and entitled "Idaho National Engineering and Environmental Laboratory Advanced Mixed Waste Treatment Project Environmental Safety and Health Program Operation Plan" into the contract as "Section J, Appendix Q - Environmental Safety and Health (ES&H) Authorization."

It is agreed that this modification does not cause a material change to the terms and conditions, Scope of Work, price, or schedule. It is further agreed that incorporation of BNFL-5232-ESH-01 Rev. 4 as "Section J, Appendix Q - Environmental Safety and Health (ES&H) Authorization" does not automatically incorporate into the contract or provide DOE approval of any other documents referenced therein.

Except as provided herein, all terms and conditions of the document referenced in Items 9A or 10A, as heretofore changed, remains unchanged and in full force and effect.

15A. NAME AND TITLE OF SIGNER (Type or print) FREDERICK P. HUGHES GM	16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Michael L. Adams Contracting Officer
15B. CONTRACTOR/OFFEROR	16B. UNITED STATES OF AMERICA
BY <u><i>Frederick P. Hughes</i></u> (Signature of person authorized to sign)	BY <u><i>Michael L. Adams</i></u> (Signature of Contracting Officer)
15C. DATE SIGNED 11/20/02	16C. DATE SIGNED 11/21/02

The signing of this modification, in effect, establishes BNFL Inc. as the "AMWTP Owner" and the U.S. Department of Energy, Idaho Operations Office as the "Regulator" of the document contained in Section J, Appendix Q. This modification makes the following changes to the contract:

1. On Page J-ii, at the bottom of Section J, List of Attachments, Table of Contents, add the following:

"APPENDIX Q - ENVIRONMENTAL SAFETY AND HEALTH (ES&H) AUTHORIZATION.....J-Q-1"

2. Incorporate the attached "Section J, Appendix Q - Environmental Safety and Health (ES&H) Authorization" into the contract.

SECTION J
APPENDIX Q – Environmental Safety and Health (ES&H) Authorization

ENVIRONMENTAL SAFETY AND HEALTH (ES&H)
AUTHORIZATION

AMWTP Owner: BNFL Inc.

Regulator: DOE-ID



**IDAHO NATIONAL ENGINEERING AND
ENVIRONMENTAL LABORATORY**

ADVANCED MIXED WASTE TREATMENT PROJECT

**ENVIRONMENT, SAFETY, AND HEALTH PROGRAM
OPERATING PLAN**

BNFL INC.

June 2002

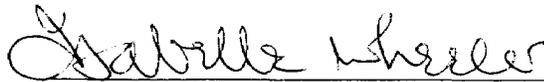
**IDAHO NATIONAL ENGINEERING AND
ENVIRONMENTAL LABORATORY**

**ADVANCED MIXED WASTE TREATMENT
PROJECT**

**ENVIRONMENT, SAFETY, AND HEALTH
PROGRAM OPERATING PLAN, Rev. 4**

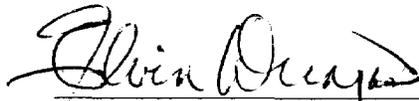
BNFL INC.

Approved by:



BNFL Inc. ES&H Manager

05/08/02
Date



BNFL Inc. Quality Assurance

8/8/02
Date



BNFL Inc. General Manager

8/8/02
Date



*ADVANCED MIXED WASTE TREATMENT PROJECT
ENVIRONMENT, SAFETY, AND HEALTH PROGRAM OPERATING PLAN*

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ACRONYMS

AA	authorization agreement
AB	authorization basis
ACGIH	American Conference of Government Industrial Hygienists
AES	Architectural Engineering Standards
AIHA	American Industrial Hygiene Association
ALARA	as low as reasonably achievable
AMWTF	Advanced Mixed Waste Treatment Facility
AMWTP	Advanced Mixed Waste Treatment Project
ANS	American Nuclear Society
ANSI	American National Standards Institute
BIO	Basis for Interim Operations
BMP	best management practice
CAT	construction acceptance testing
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
CRD	contractor requirements document
CSM	Construction Services Manual
DAC	derived air concentration
D&D	decontamination and decommissioning
DEQ	Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
DOELAP	DOE Laboratory Accreditation Program
DOT	U.S. Department of Transportation
DMS	data management system
DSA	documented safety analysis
EBR	Experimental Breeder Reactor
EIS	environmental impact statement



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EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ERPG	emergency response planning guideline
ES&H	environment, safety, and health
ESH&Q	environment, safety, health, and quality
ESHPOP	Environment, Safety, and Health Program Operating Plan
FAT	factory acceptance testing
FGE	fissile gram equivalent
FHA	fire hazards analysis
FM	Factory Mutual
FSAR	final safety analysis report
G	guide
HAZOP	hazard and operability
HAZWOPER	Hazardous Waste Operation and Emergency Response
HEPA	high-efficiency air particulate (filter)
HNBK	handbook
HWMA	Hazardous Waste Management Act
IDAPA	Idaho Administrative Procedures Act
IDHW	Idaho Department of Health and Welfare
IDLH	immediate danger to life or health
INEEL	Idaho National Engineering and Environmental Laboratory
INEL	Idaho National Engineering Laboratory
LANL	Los Alamos National Laboratory
LLMW	low-level mixed waste
LLW	low-level waste
LMITCO	Lockheed Martin Idaho Technologies Company
M&O	management and operating
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPs	National Emissions Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association



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NIOSH	National Institute of Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System
NPDWS	National Primary Drinking Water Standards
NSDWS	National Secondary Drinking Water Standards
NTS	noncompliance tracking system
ORR	operational readiness review
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PE	Professional Engineer (Registered)
PPE	personal protective equipment
PSAR	preliminary safety analysis report
QA	quality assurance
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation and Recovery Act
RWMC	Radioactive Waste Management Complex
SAR	safety analysis report
SARA	Superfund Amendments and Reauthorization Act
S/C	Supercompact
SER	safety evaluation report
SO	system operability
SSCs	structures, systems, and components
STD	standard
SWEPP	Stored Waste Examination Pilot Plant
TEDE	total effective dose equivalent
TLV	threshold limit value
TRU	transuranic
TRUPACT	transuranic package transporter
TSA	Transuranic Storage Area
TSA-RE	Transuranic Storage Area - Retrieval Enclosure
TSCA	Toxic Substance Control Act



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TSD	treatment, storage, and disposal
TSRs	technical safety requirements
TWA	time weighted average
UL	Underwriter Laboratories
UPS	uninterruptible power supply
USQ	unreviewed safety question
UV	ultraviolet
VOCs	volatile organic compounds
WIPP	Waste Isolation Pilot Plant
WMF	Waste Management Facility



PART A GENERAL

A.1 Purpose

The purpose of this Environment, Safety, and Health Program Operating Plan (ESHPOP) is to present the environment, safety, and health program that BNFL Inc. will implement throughout the three phases of the Advanced Mixed Waste Treatment Project (AMWTP) to achieve a high level of environment, safety, and health (ES&H) performance in compliance with the mandatory ES&H requirements identified herein. The phases of the AMWTP are

- Phase I: Permits, plans, and authorizations (completed)
- Phase II: Construction and preoperational testing
- Phase III: Operations and Hazardous Waste Management Act (HWMA) closure

The ESHPOP forms the basis for the project's Environment, Safety and Health Authorization, which is a document co-signed by the U. S. Department of Energy, Idaho Operations Office (DOE-ID) and BNFL Inc. The basic requirements in the ESHPOP are incorporated into the AMWTP Contract (DOE-ID, 1996a) to ensure the responsibility and accountability of BNFL Inc. for protecting human health and the environment. The program described in this ESHPOP has also been specifically designed to achieve excellence in environmental, safety, and health performance throughout all phases of the project. Notwithstanding contract obligations, the ESHPOP will be reviewed annually by BNFL Inc. and any necessary changes to the document will be discussed and mutually agreed by BNFL Inc. and DOE-ID as necessary. The results of that review will be provided to the Contracting Officer and the COR annually, but not later than November 1st of each year. If this review results in proposed changes, each change shall be identified, a reason for each change shall be stated, and any impacts of each change addressed.

Part A (General) of the ESHPOP establishes the fundamental commitments applicable to integrated safety management and implementation of the ES&H program for the AMWTP. Section A.5 also discusses the process by which the requirements determined to be applicable and mandatory sources of requirements for the AMWTP are identified and derived.

Part B (Facility and Process Description) briefly describes the facilities and processes that constitute the AMWTP. The facilities are located within the Radioactive Waste Management Complex at the Idaho National Engineering and Environmental Laboratory (INEEL).

Part C (Interface with other Permits, Authorizations, and Agreements) describes BNFL Inc. actions to interface and be consistent with applicable permits, authorizations, and environmental regulations. The documents described in Part C define the environmental envelope for the Project.

Applicable environmental compliance requirements are incorporated into facility design and into the programs and implementing documents of Part D (Specific ES&H Authorization Conditions). Part D shows how the mandatory ES&H requirements identified in Appendix A (Requirements Tables) are incorporated in the AMWTP safety programs.



Part E (References) lists the references used in the ESHPOP. References actually cited in the document are given in the first section of Part E, while the following sections present references organized by type of document.

As initially approved by DOE-ID in July 1998, the ESHPOP is the governing document for environment, safety, and health requirements that apply to the AMWTP. Pursuant to Section C.9 of the contract (DOE-ID (1996a), BNFL Inc. will comply with applicable federal, state, and local ES&H laws, codes, orders, and regulations in effect as of 8/1/96 and will plan compliance in a streamlined manner that eliminates redundant, unduly burdensome and unnecessary compliance activities. Changes to laws and regulations in effect after August 1, 1996, that apply to the AMWTP shall be incorporated into the ESHPOP through a formal contract change negotiated between DOE-ID and BNFL Inc. according to contract clause H.47 of DOE-ID (1996a).

The BNFL Inc. documents cited throughout this ESHPOP that support and implement the AMWTP environmental, safety, health and quality assurance programs are living documents, and many are periodically reviewed and updated. These documents are therefore cited as the "current revision" in Part E. Citations to specific document revisions are referenced by date and revision number.

A.2 Integrated Safety Management

To protect the public, the environment, the worker, and property during all phases of the AMWTP, BNFL Inc. will implement an integrated safety management program through this ESHPOP as outlined in DOE P 450.4, Safety Management System Policy. The ESHPOP is a part of the basis for the authorization agreement between BNFL and DOE. Section A.6 delineates the review and approval process necessary for performing the work.

The objective of integrated safety management is to systematically integrate safety into management and work practices at all levels so that missions are accomplished while protecting the public, the worker, and the environment. At the highest level, integrated safety management is implemented through the AMWTP contract (DOE-ID, 1996a), the *Project Management Plan*, the ESHPOP, the *Project Design Criteria*, and the project's documented safety analysis. At the operational level, procedures and instructions demonstrate how these principles and functions are implemented by line management and workers. Part D identifies the implementing documents and procedures for each functional area addressed.

A.2.1 Guiding Principles for Integrated Safety Management.

The seven guiding principles of integrated safety management defined in DOE P 450.4 provide fundamental guidance to BNFL Inc. in meeting the primary objective of integrated safety management to perform work safely (see Section A.3). These seven principles are as follows:

Line Management Responsibility for Safety. AMWTP line managers are directly responsible for the protection of the public, the workers, and the environment. Specific management responsibilities are described in Part D of the ESHPOP and the *Project Management Plan*.

Clear Roles and Responsibilities. Clear lines of authority and responsibility for ensuring safety are established and maintained at all organizational levels within the AMWTP. Specific responsibilities for individual environment, safety, and health programs are described in Section A.6 and Part D of the ESHPOP and in the *Project Management Plan*.



Competence Commensurate with Responsibilities. BNFL Inc. AMWTP personnel shall possess the experience, knowledge, skills, and abilities necessary to discharge their responsibilities, especially with regard to safety. Training and qualification for specific safety responsibilities are essential to meeting this principle. AMWTP training programs are described in ESHPOP Section D.7 (Training and Qualification Program).

Balanced Priorities. BNFL Inc. is committed to effective allocation of resources to address safety, programmatic, and operational issues and concerns. Protecting the public, the workers, and the environment is a priority whenever activities are planned and performed. BNFL Inc.'s commitment to this principle is described in Section A.3

Identification of Safety Standards and Requirements. Before work is performed, an agreed-on set of safety standards and requirements is established that will provide assurance that the public, the workers, and the environment are protected from adverse consequences. Appendix A (Requirements Tables) and the *Project Design Criteria* address these requirements.

Hazard Controls Tailored to Work Being Performed. Administrative and engineering controls to prevent and mitigate hazards are tailored to the work being performed and associated hazards. This tailoring is reflected in the *Project Design Criteria*, the project design activities, the safety analysis process, and the ESHPOP.

Operations Authorization. The ESHPOP provides the basis for establishing the conditions and requirements to be satisfied to initiate and conduct operations. Section A.6 describes the phased review and approval processes necessary for performance of work under the AMWTP contract (DOE-ID, 1996a). ESHPOP Section D.5 (Permission to Commence Operations and Stop Work Authority) addresses authority to commence operations.

A.2.2 Core Functions for Integrated Safety Management

The five core safety management functions provide the process for implementing integrated safety management. The process includes the following steps:

Define the Scope of Work. The scope of work for the AMWTP is defined in Section C of the contract (DOE-ID, 1996a). The ESHPOP discusses the scope of work in Section B.1 (Description of Work Processes Covered by this Contract). ESHPOP Section D.14 (Conduct of Operations) discusses the processes that establish the scope for specific operations and periods of time.

Analyze the Hazards. Hazards associated with the AMWTP are identified, analyzed, and categorized in the safety analysis process beginning with the preliminary hazard assessment. These hazards are under review and analysis throughout the safety analysis process and are described in the documented safety analysis. The safety analysis process is addressed in Section D.3 of the ESHPOP. The Work Control Program establishes the process for identifying and analyzing hazards associated with day-to-day work. The hazard analysis and control processes are addressed in D.16. The AMWTP Safety Committee provides guidance and endorsement on safety issues (see Section A.3).

Develop and Implement Hazard Controls. Controls to prevent or mitigate hazards are established in the *Project Design Criteria* document and in the documented safety analysis. Hazard controls include



engineered safety features and administrative controls. Applicable standards and requirements are identified in the ESHPOP.

Perform Work within Controls. Readiness is verified through readiness assessments or operational readiness reviews described in Section D.5 (Permission to Commence Operations and Stop Work Authority) of the ESHPOP. BNFL Inc. will operate the AMWTP facilities using a standard set of operating procedures to ensure work is performed safely.

Provide Feedback and Continuous Improvement. Feedback information on the adequacy of controls is gathered, opportunities for improving the definition and planning of work are identified and implemented, and line and independent oversight is conducted through the continuous improvement process described in Section D.10 of the ESHPOP (Continuous Improvement Process and Response to Internal and External Audits). The continuous improvement process is governed by the *AMWTP Quality Assurance Program Plan* and its implementing procedures.

Figure A-1 illustrates how the integrated safety management core functions are implemented with existing AMWTP documents. The figure also indicates which sections of the ESHPOP address each integrated safety management function. Some of these documents incorporate more detailed, second level documents such as, the Preliminary Fire Hazards Analysis and the Preliminary Criticality Safety Assessment. The as low as reasonably achievable (ALARA) and shielding analyses are developed as part of the safety analysis process to support the preliminary and final safety analysis reports. Integrated safety management is fully implemented at the working level through construction, operating, and maintenance procedures.

A.3 Statement of Management Commitment to Environment, Safety, and Health

The BNFL Inc. ES&H vision is implemented through constant vigilance, commitment, and continual improvement to achieve and maintain world class environmental, safety, health, and operational performance.

BNFL Inc.'s principles are

- Nothing is more important than the safety and health of employees, contractors, the public, and protection of the environment
- Ensuring that no harm comes to employees, employees of business partners, the general public, and the environment, and to be respected and trusted by stakeholders in managing environmental responsibilities
- Excellence in ES&H performance is an integral part of business and is essential to the commercial success of BNFL Inc. Integrated safety management serves as the cornerstone for achieving excellence
- Working diligently and cooperatively at all levels within the company to achieve continual improvement in performance, in particular to
 - Eliminate accidents and incidents
 - Minimize waste and use of natural resources



Figure A-1. Integrated safety management: documents and programs implementing the five core functions.

Define work scope	Analyze hazards	Develop and implement hazard controls	Perform work within controls	Provide feedback and continuous improvement
<i>High-Level Implementing Documents</i>				
Environmental Safety and Health Operating Plan (ESHPOP) B.1, B.2, B.3	ESHPOP D.1, D.2, D.3, D.11, D.16	ESHPOP B.4, D.1, D.2, D.4, D.6, D.7, D.8	ESHPOP D.1, D.2, D.4, D.5, D.6, D.7, D.8, D.9, D.11, D.14, D.15, D.13	ESHPOP D.7, D.10
Contract DE-AC07-97ID13481	Documented Safety Analysis	Project Design Criteria, Documented Safety Analysis	Not applicable	Quality Assurance Project Plan
Memorandum of Agreement	Documented Safety Analysis	Documented Safety Analysis	Documented Safety Analysis	Documented Safety Analysis
<i>Worker-Level Implementing Documents</i>				
Operations and Maintenance Procedures; Work Control Process	Radiological Protection Program; Industrial Hygiene Program; Work Control Process	Radiological Protection Program; Safety and Health Manuals; Radiological Protection Program	Training Program; Conduct of Operations Program; Radiological Protection Program	Worker Involvement; Lessons Learned; Self-Assessment Program



- Ensure that all wastes are managed safely and with care for the environment
- Share and use best practices
- Ensure products and services meet applicable standards of ES&H performance
- Communication is a key element of ES&H improvement. BNFL Inc. will
 - Report BNFL Inc. ES&H performance on an annual basis
 - Listen and respond appropriately to our employees, customers, shareholders, suppliers, and neighbors
- Strive to raise ES&H standards and performance by working with regulators, clients, and industry partners.

To implement its policy, BNFL Inc. has designated an independent safety committee reporting directly to the General Manager, chaired by a direct report to the General Manager. As described in its charter, the Safety Committee is an integrated group of individuals representing a cross-section of project functions, safety professionals, and operations personnel who have the appropriate knowledge and expertise to review safety documents and raise and resolve safety issues. This committee provides overall project review, guidance, recommendations, and endorsement, as appropriate, on matters having safety impact. The Safety Committee reviews AMWTP plans and documents for nuclear, radiological, and process safety.

BNFL Inc. provides safe working conditions through incorporating safety features into all life-cycle activities supporting the AMWTP. The ESHPOP defines the programs that incorporate all applicable and mandatory ES&H requirements.

BNFL Inc. continually monitors its ES&H performance through a self-assessment program that provides for both management and worker input. BNFL Inc.'s goal is to involve all employees in achieving excellence in ES&H performance.

A.4 Worker Involvement in Environment, Safety, and Health Performance and Improvement

BNFL Inc. workers are ultimately responsible for their own safety. They must perform work in the safest possible manner using work practices advocated within their specific skill or craft. In addition, BNFL Inc. encourages employees to provide input to improve ES&H performance. One method BNFL Inc. utilizes to involve workers in the integrated safety management process is the Work Control Program. The Work Control Program is a process that evaluates and improves how work is identified, planned, approved, scheduled, coordinated, controlled, and executed. This planning process is an improvement to the traditional work control process, primarily through extensive communication and feedback from the appropriate mix of personnel responsible for the work.

The Work Control Program which includes the 'Approved Method of Work', 'Request for Permit to Work' and 'Permit to Work' processes is designed to provide a safer, more efficient work environment by:

- Encouraging worker participation in the initial work planning process to enhance the effectiveness of safety and work efficiency

- Providing hazard analysis and controls that are appropriate for the job
- Improving worker knowledge of safety requirements
- Fostering teamwork between hourly and salary personnel
- Improving the technical accuracy and workability of work packages
- Balancing the degree of work instruction, skill-of-craft, and worksite supervision
- Reducing the overall time to plan, review, and approve work packages
- Promoting realistic, resource loaded schedules
- Enhancing job coordination and improving the efficient execution of the work
- Continually improving the work process through real-time feedback.

Employees are encouraged to report their concerns not only about safety, health, environmental protection, and compliance issues, but also about quality, fraud, waste, reprisals, or working conditions to their supervisor or the appropriate support organization. All employees have the responsibility to stop work if unsafe conditions are encountered. The BNFL Inc. AMWTP Employee Concerns Program provides more detail regarding how this program is implemented (BNFL, 2000). Employees are encouraged to seek to resolve concerns by working with their supervisor or their appropriate support organization. At any stage of the concern resolution process, an employee may elevate the concern to more senior levels of management or to DOE. Employees can also report concerns and issues to outside organizations, including the Occupational Safety and Health Administration (OSHA), the Idaho Department of Environmental Quality, the BNFL Inc. Human Resource Organization, and the DOE Inspector General Hotline.

Company processes for providing suggested improvements and for identifying and dealing with concerns include, but are not limited to, staff meetings, plan-of-the-day meetings, company announcements, safety meetings, safety committees, and training sessions. The self-assessment program also provides opportunities for workers to provide suggestions to improve ES&H performance.

A.5 Environmental, Safety, and Health Requirements Applicable to the Advanced Mixed Waste Treatment Project

As discussed in Section A.2.1, a fundamental element of the AMWTP integrated safety management program is the identification of ES&H requirements applicable to the AMWTP. BNFL Inc. applied a systematic process to identify both the mandatory and the applicable laws, regulations, court or consent orders, and DOE directives used to define the ES&H envelope for the AMWTP. The process and its results are described in the *ES&H Requirements Document for the Advanced Mixed Waste Treatment Project* (BNFL, 1997b).

The first step of the identification process was to determine a broad universe of potentially applicable rules, regulations, etc., using the following three criteria:



- Potentially applicable statutes and court orders
- Potentially applicable nonstatutory sources that may be necessary for the safe operation of the AMWTP
- Additional sources of potentially applicable ES&H “best practices” or guidance documents.

Section J of the AMWTP Contract (DOE-ID, 1996a) between DOE and BNFL Inc. lists the following 16 functional areas that must be addressed in this ESHPOP:

1. Radiological Controls (D.1 for Phase II and D.1A for Phase III)
2. Nuclear Criticality Controls
3. Safety Analysis Process
4. Worker Safety and Health
5. Permission to Commence Operations and Stop Work Authority
6. Facility, Construction, and Fire Safety
7. Training and Qualification
8. Environmental Protection and Monitoring
9. Contingency/Emergency Planning and Response
10. Continuous Improvement Process and Response to Internal and External Audits
11. Records and Reports
12. Supporting ES&H Documents, Manuals and Agreements
13. Security
14. Conduct of Operations
15. Waste Management
16. Hazards Analysis and Control.

Requirements falling into these functional areas were identified by electronic and hand searches of databases of the Code of Federal Regulations, DOE directives, State of Idaho statutes, and other databases. Additional screening resulted in two subsets of documents:

1. Documents that are applicable and mandatory (either by statute, court order, or contract)
2. Documents that are applicable but not mandatory. These documents were used for guidance during the development of the *Project Design Criteria*, the ESHPOP, and the *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999). Included are the INEEL site standards where consistency with certain INEEL practices, warning, and notifications was warranted (e.g., emergency signals).

Appendix A (Requirements Tables) lists those applicable documents that are mandatory sources of requirements for the AMWTP for each of the ES&H functional areas in Part D.

Changes to laws and regulations in effect after August 1, 1996, that apply to the project will be incorporated in the ESHPOP through formal contract change negotiated between DOE-ID and BNFL Inc. according to contract clause H.47 (DOE-ID, 1996a).



A.6 Roles and Responsibilities

BNFL Inc. is responsible for conducting all AMWTP activities within the conditions and requirements of the ESHPOP. DOE-ID conducts oversight activities of the environment, safety, and health program presented in the authorization. This oversight includes review and approval of the *AMWTP Emergency Plan/RCRA Contingency Plan*, the AMWTP security program, the *AMWTP Quality Assurance Program Plan*, and the occurrence reporting procedure. Also included are reviews of BNFL Inc.'s self-assessment activities designed to evaluate compliance with all environment, safety, and health requirements and to identify areas for improvement, as well as audits of ES&H program implementation.

BNFL Inc. management is committed to the safe and efficient operation of the AMWTP. Continuous improvement is directed and monitored by management through implementation of the *AMWTP Quality Assurance Program Plan* and its implementing procedures. The self-assessment and response to audits programs described in ESHPOP Section D.10 (Continuous Improvement Process and Response to Internal and External Audits) supplement this plan.

BNFL Inc. is committed to working together with DOE-ID in the most effective manner. Therefore, BNFL Inc. keeps DOE informed throughout design, engineering, safety analysis, and operations to ensure a common understanding of the level of safety to be achieved. This interaction minimizes the need for lengthy and costly reviews and ensures timely corrective action.

BNFL Inc. is responsible for developing the safety basis, environmental basis, and design basis for the AMWTP. The safety basis includes the documented safety analysis (including the hazard classification, technical safety requirements, and process hazard analysis), and the unreviewed safety question process.

Before procurement and construction were authorized, DOE-ID reviewed and approved the *Preliminary Safety Analysis Report*, which covered both retrieval operations and the AMWTF (BNFL, 1999). BNFL Inc. is preparing final documented safety analysis for retrieval operations and the AMWTF. These documents define and control the safety basis and commitments for design, procurement, construction, and operations to ensure safety. Before retrieval operations may begin, DOE-ID will review and approve the documented safety analysis. Before AMWTF operations, the documented safety analysis will be updated and reviewed and approved by DOE-ID.

Environmental activities associated with the project are controlled and monitored by the State of Idaho and/or the U. S. Environmental Protection Agency via normal permitting mechanisms. Conditions and provisions of these permits and licenses are listed and discussed in Part C (Interface with Other Permits, Authorizations, and Agreements) of the ESHPOP.

The *Project Design Criteria* establish the engineering baseline, which is updated and refined as necessary (see Section D.6, Facility, Construction, and Fire Safety). The *Project Design Criteria* serve as a basis for initiating detailed design activities, and also serve as a construction and testing/commissioning baseline.

BNFL Inc. is responsible for implementing the requirements of this ESHPOP. DOE-ID approves the ESHPOP. BNFL Inc. will develop implementing procedures or other appropriate documentation for use during construction, operation, closure, and D&D as applicable to the phase of the project.

BNFL Inc. is responsible to maintain and revise the ESHPOP as necessary to ensure protection of the public, the worker, and the environment, and to maintain compliance with changes in the law. BNFL Inc.



revises the ESHPOP as necessary to be consistent with current laws, safety analysis, design activities, and the memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL M&O contractor (DOE-ID, 2000a). Changes to the ESHPOP will be handled in accordance with Contract Clause H.47, "Changes to the Approved ES&H Authorization;" and Section J, Appendix D, Clause A.5, "Changes to the Authorization," and will at a minimum coincide with annual review and update of the documented safety analysis.

BNFL Inc. is also responsible for ensuring that interface activities involving the M&O contractor that support ESHPOP programs are identified in the memorandum of agreement. BNFL Inc. is then responsible to fulfill its obligations under the memorandum of agreement. DOE approval of the memorandum of agreement constitutes approval of the interface activities.

BNFL Inc. has completed all requirements under Phase I (permitting) of the AMWTP contract (DOE-ID 1996a). DOE-ID authorized Phase II (construction and preoperational testing) of the AMWTP on May 5, 1999.

In Phase II, BNFL Inc. is responsible for bringing the project to a state of readiness to safely conduct operations. This includes completion of detailed designs, construction, and operability tests. (See ESHPOP Section D.5, Permission to Commence Operations and Stop Work Authority.) During Phase II, BNFL Inc. is responsible for the safety of its employees and for the safety oversight of the construction subcontractor workers, although BNFL Inc. holds WGI fully accountable for construction safety. Per the organization chart presented in the *AMWTP Project Management Plan*, the ES&H Manager is responsible for ensuring that the design meets the safety design criteria (radiological, nuclear, and industrial safety) and for safety oversight of the construction contractor that includes health protection and industrial safety.

In Phase III (operations and HWMA closure), BNFL Inc. is responsible for operating the AMWTP facilities. This is accomplished through written procedures and instructions, periodic monitoring, and personnel performance accountability. Audits of performance relative to operating goals are provided to facility management and DOE-ID. Various elements in the DOE-approved *AMWTP Quality Assurance Program Plan* implement this commitment, specifically, BNFL Inc.'s self-assessment program. BNFL Inc. conducts self-assessment activities on all major functional work elements of the project. As described in ESHPOP Section D.10 (Continuous Improvement Process and Response to Internal and External Audits), DOE-ID reviews the self-assessment program and audits ES&H activities.

During operations, BNFL Inc. provides the necessary resources for retrieval, storage, characterization, treatment, processing, and preparation for shipment. DOE is responsible for transporting DOE waste to the Waste Isolation Pilot Plant (WIPP). BNFL Inc. is responsible for transporting mixed low-level waste and low-level waste to on- or off-the-INEEL disposal locations. BNFL Inc. characterizes and packages waste generated from HWMA closure activities to meet appropriate waste acceptance criteria.



PART B FACILITY AND PROCESS DESCRIPTION

The purpose of the Advanced Mixed Waste Treatment Project (AMWTP) is to process alpha low-level mixed waste and transuranic (TRU) mixed waste, currently stored in containers, for final disposal. The Advanced Mixed Waste Treatment Facility (AMWTF) has the capability to process Idaho National Engineering and Environmental Laboratory (INEEL) waste streams, and the flexibility to process other potential INEEL and U.S. Department of Energy (DOE) regional and national waste streams of like characteristics. The transuranic waste product is to be compliant with the *Waste Acceptance Criteria for the Waste Isolation Pilot Plant (WIPP)* (DOE, 1999c).

The AMWTP facility and process descriptions contained in Part B of this *Environment, Safety, and Health Program Operation Plan* (ESHPOP) reflect the status of project design as of August 2001. Changes to these descriptions will continue to occur as the design evolves, and changes will be captured in Part B through future ESHPOP revisions.

B.1 Description of Work Processes Covered by this Contract

The work processes covered by the AMWTP Contract, Section C (DOE-ID, 1996a) are performed in three phases:

Phase I (permits, plans, and authorizations), which is complete, consisted of the completion of the following primary deliverables:

- *AMWTP Community Relations Plan* (BNFL, 1997a)
- *AMWTP Project Management Plan*
- Siting Plan and Study (for a siting license)
- Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA) Treatment Permit and Storage Permit for the AMWTP
- *Air Permits to Construct for TSA-RE and AMWTF*
- *NESHAP Approvals for TSA-RE and AMWTF*
- *Notice of Intent for the NPDES Storm Water Multi-Sector General Permit for Industrial Activities*
- *Part A Permit Application for TSA interim status units* (pads TSA-1/TSA-R and TSA-2 and TSA-RMF)
- *Interim Status Documents for the TSA interim status units*
- *AMWTP Environment, Safety, and Health Program Operating Plan* (this ESHPOP) and *ES&H Requirements Document for the AMWTP* (BNFL, 1997b)
- Results Report (summary of technology verification studies and proposed changes)

- *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999)
- Data to support National Environmental Policy Act (NEPA) analyses
- Draft closure plan/other documents related to transfer of the HWMA/RCRA permits for government-furnished equipment
- *AMWTP Decommissioning Plan* (BNFL, 1997c).

The completion of Phase I resulted in fulfillment of all DOE contract requirements to proceed with construction. Some activities such as facility design began in Phase I but continue into Phase II (construction and preoperational testing).

Phase II consists of the completion of the design and construction of the AMWTP facilities and component and system operational testing. Phase II also includes receipt of all permits and completion of startup requirements and readiness assessments.

Phase III (operations and HWMA closure) consists of operations to retrieve and process alpha low-level mixed waste and TRU mixed waste for transportation and disposal at WIPP. The following are the principal processes in AMWTP operation:

- Retrieval of the waste
- Onsite transportation of waste
- Characterization of wastes
- Aggregation of waste and assembly of waste packages for direct shipment to WIPP
- Treatment and processing waste
- Post-treatment characterization and certification of the final TRU waste form to meet the *Waste Acceptance Criteria for WIPP* (DOE, 1999c)
- Loading of transuranic package transporter (TRUPACT II) containers or other approved transport containers.

Phase III also includes ultimate HWMA closure of facilities.

B.1.1 Retrieval

Approximately 11,700 m³ of waste are stored at the existing Type II storage modules at the Transuranic Storage Area (TSA). A structure has been constructed over the remaining 53,300 m³ of waste currently stored in cells on asphalt pads. Most of the cells are covered by a soil berm. Cells 2 and 3 on Pad R are not soil covered. The structure covering the waste, the TSA-RE (WMF-636), may be used to provide weather protection for retrieval operations.



At the conclusion of the waste retrieval operations, the TSA-RE and any government-furnished equipment are decontaminated in accordance with the *AMWTP Decommissioning Plan* (BNFL, 1997c), including any decontamination and HWMA closure of the asphalt pads on which the waste is currently stored, in accordance with the contract (DOE-ID, 1996a).

B.1.2 Characterization

As part of the AMWTP process, BNFL Inc. performs characterization activities at the Characterization Facility (WMF-634) and the Stored Waste Examination Pilot Plant (WMF-610). For any waste accepted from other INEEL or offsite generators, characterization is verified.

Headspace gas testing and certification of the waste is performed at the Type I and Type II storage modules. INEEL waste that cannot be processed, as defined by the *AMWTP Waste Acceptance Criteria* [Appendix O of Section J of DOE-ID (1996a)], is returned to DOE for storage. Any offsite waste that cannot be processed, as defined by the waste acceptance criteria, is returned to the generator. Waste determined suitable for direct shipment to WIPP can be aggregated in the Waste Aggregation Facility (WMF-618) or the Type I storage module (WMF-634).

B.1.3 Processing

Waste determined by characterization to be suitable for shipment to WIPP without further treatment is aggregated and packed for shipment. Drummed waste determined by characterization to be suitable for compaction is directly fed to the supercompaction stage of the AMWTF. The processing of boxed waste consists of emptying the waste, removing any prohibited items, and size reducing the material as necessary. This waste is placed into drums for re-assay and supercompaction. Supercompacted drums, referred to as pucks, are placed into new product drums that form the final waste package for transportation. Control of operations ensures that this final product complies with the WIPP acceptance and transportation criteria.

For a minor percentage of waste (4% by volume), drums are repackaged within the drummed waste handling enclosure and the drummed waste processing glovebox; drum contents are removed and repackaged. Noncompliant items are removed for treatment as special-case waste or exported.

A small percentage of waste (2% by volume) may require thermal treatment, and an approved flowsheet is not currently available for this waste. Potential treatment of this waste stream is not covered by this ESHPOP documentation.

Throughout the AMWTF the following are applied:

- Comprehensive data management
- Integrated control systems
- Remote handling
- Confinement structures



- Engineered systems
- Nuclear (alpha) plant proven ventilation principles and engineering.

B.1.4 Packaging and Transportation

The AMWTP program includes onsite transfer of retrieved waste containers and the waste product containers at the RWMC, and also includes the packaging and loading of waste for transport off the INEEL. Packaging and transportation for shipments off the INEEL must meet all applicable federal, state, and local regulatory requirements and conform to the waste acceptance criteria for the disposal facility.

The final TRU waste form is packaged in containers that can be shipped in the TRUPACT II shipping container (U.S. Nuclear Regulatory Commission certificate of compliance #USA/9218/B(U)F) or other transport containers approved by the U.S. Department of Transportation, as identified in the respective disposal facility waste acceptance criteria.

Packaging and transportation of low-level, mixed, and hazardous waste is described in ESHPOP Section D.15 (Waste Management Program)

B.2 General Facility Description

The transuranic storage area (TSA), within which the AMWTF is constructed, is illustrated in Figure B.2-1. Waste flow through the AMWTF is illustrated in Figure B.2-2.

The major AMWTP processes are described in the AMWTF documented safety analysis and in the AMWTF environmental permits.

B.3 Schedule for Facility Construction, Testing, and Operation

BNFL Inc.'s overall schedule supports the shipment of 65,000 m³ of the transuranic waste out of the State of Idaho by a target date of December 2015 and a deadline of December 2018. Detailed schedules and target dates are provided in the *AMWTP Project Management Plan*.

DOE has authorized BNFL Inc. to commence Phase II (construction and preoperational testing). The decision to commence Phase III (operations and HWMA closure) will be based on (a) approved final documented safety analysis and the authorization agreement, (b) successfully completing system operability testing, and (c) operational readiness reviews. BNFL Inc. anticipates a two-phase startup for AMWTF: first, a startup for retrieval activities and second, a startup for the AMWTF (see ESHPOP Section D.5, Permission to Commence Operations and Stop Work Authority).

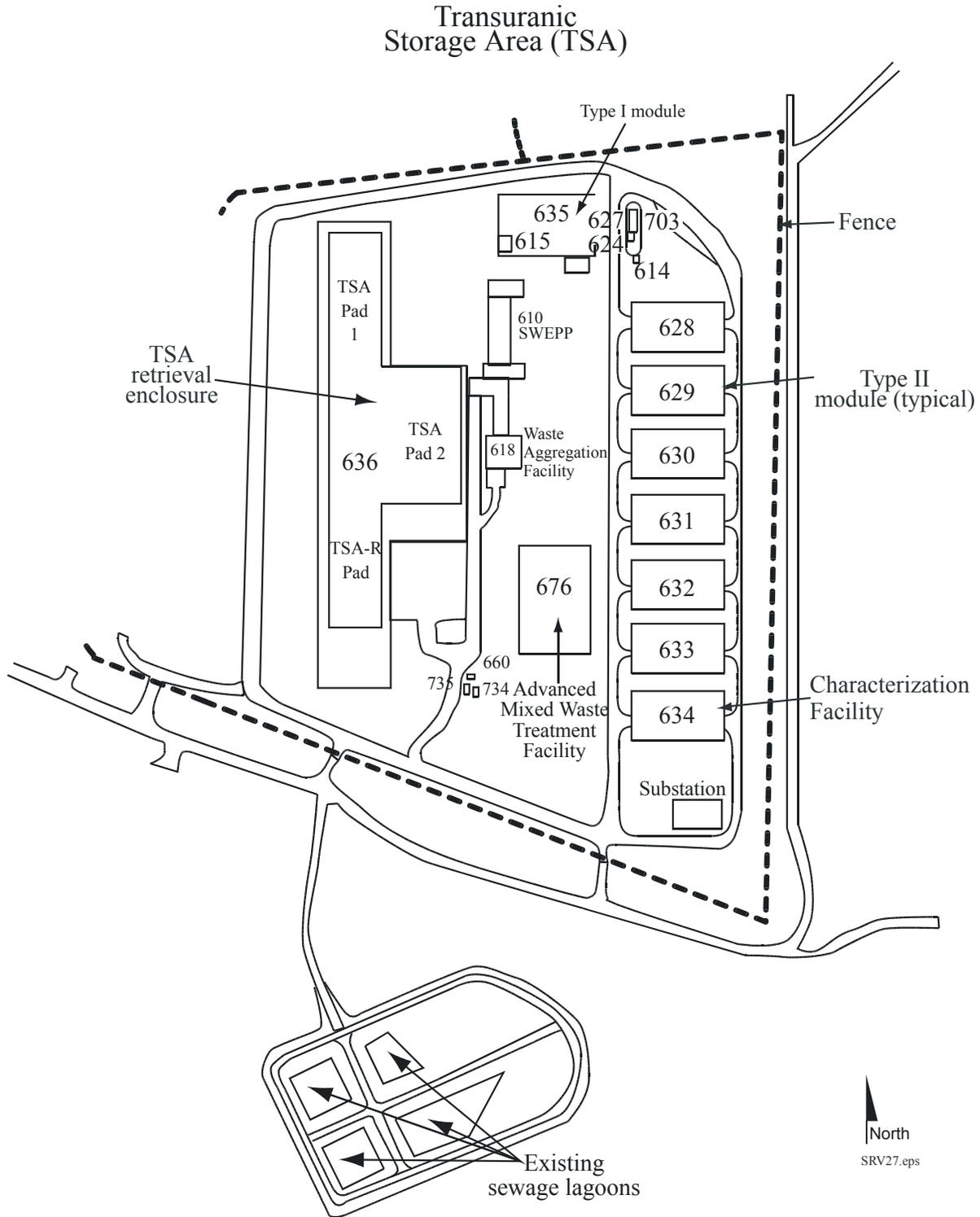


Figure B.2-1. General layout of the Advanced Mixed Waste Treatment Project facilities within the Transuranic Storage Area of the Radioactive Waste Management Complex.

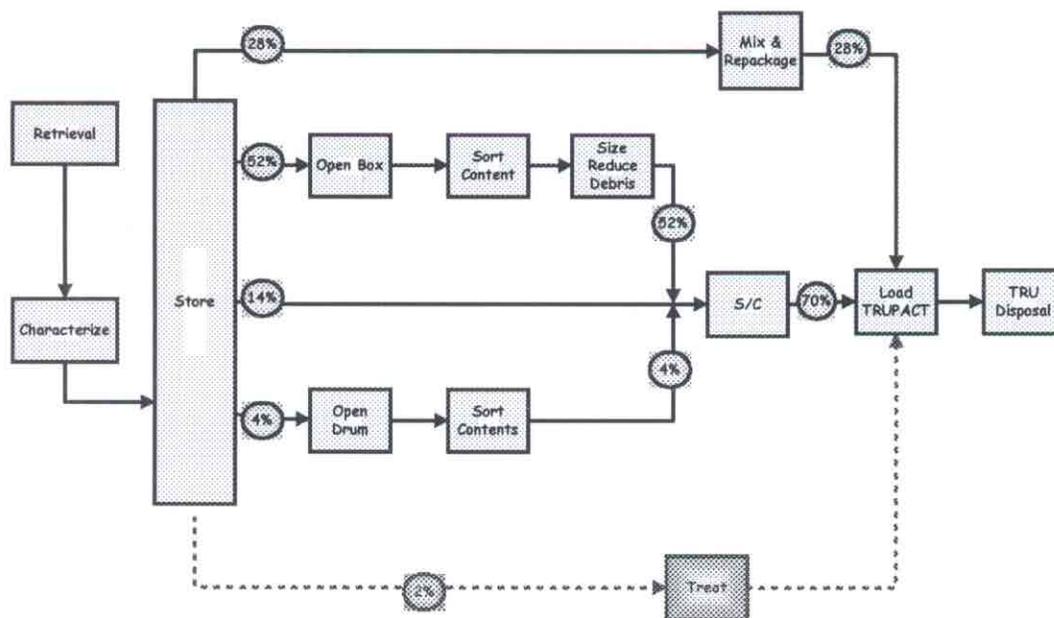


Figure B.2-2. Generalized flow of waste through the Advanced Mixed Waste Treatment Project (AMWTP) facilities (Legend: S/C - Supercompact).

B.4 Description of Engineered Safety Systems

The AMWTP documented safety analysis identifies engineered safety systems relied on to prevent or mitigate the consequences of accidents or provide defense in depth. In general, AMWTP systems are designed to be passively safe, so that a failure results in a safe condition for the facility with certain systems designated to function during various accident scenarios. Machines and systems are typically provided with emergency stops independent of software or electronic logic. Protection is provided (a) to preserve radiological and hazardous waste safety, (b) to prevent criticality incidents, and (c) to prevent personnel injury or equipment damage.



PART C. INTERFACE WITH OTHER PERMITS, AUTHORIZATIONS AND AGREEMENTS

C.1 Introduction

During all phases of the Advanced Mixed Waste Treatment Project (AMWTP), BNFL Inc. actions must interface and be consistent with all applicable regulations, permits, and authorizations. The purpose of this section is to explain these interfaces; the requirements that BNFL Inc. shall comply with are specified in the applicable permit, authorization, or agreement.

In addition to this Environment, Safety, and Health Program Operating Plan (ESHPOP), operations and activities of BNFL Inc. are governed by applicable federal, state, and local regulations, contract, authorizations and permits, and a memorandum of agreement. During Phase I (permits, plans, and authorizations) and Phase II (construction and preoperational testing) of the project, the required environmental permits and authorizations, plus a memorandum of agreement between U.S. Department of Energy, Idaho Operations Office (DOE-ID), BNFL Inc., and the Management and Operating (M&O) Contractor were completed.

In addition, important interface with DOE-ID and with the U.S. Environmental Protection Agency (EPA) and the State of Idaho Department of Environmental Quality occurs during all phases of the project. During Phase I, BNFL Inc. interacted with agencies to the extent needed to successfully complete the needed preliminary permits and approvals that allowed construction to proceed.

In Phase II, detailed design, construction and preoperational testing are completed, and permits and licenses are revised and finalized as needed. During Phase III (operations and Hazardous Waste Management Act [HWMA] closure) interactions continue on the permits, safety authorization, and environmental compliance/monitoring. At the end of waste management operations, as necessary, BNFL Inc. shall close each HWMA-regulated hazardous waste management unit in accordance with IDAPA 58.01.05.008 (40 CFR Part 264) or IDAPA 58.01.05.009 (40 CFR Part 265).

The AMWTP is important to DOE's mission and also plays an important part in helping DOE comply with the Settlement Agreement between Idaho's Governor, the Secretary of Energy, and the Department of the Navy signed on October 16, 1995. Specifically, DOE shall ship the transuranic waste now located at Idaho National Engineering and Environmental Laboratory (INEEL), currently estimated at 65,000 m³, to the Waste Isolation Pilot Plant (WIPP) or other such facility designated by DOE, by a target date of December 31, 2015, and in no event later than December 31, 2018.

Other plans, agreements, and documents that interface with AMWTP operation include the *Waste Isolation Pilot Plant Waste Acceptance Criteria* (DOE, 1999c), the *Federal Facility Agreement and Consent Order for the INEL* (IDHW, 1991), the Title V Clean Air Act site permit, National Emission Standards for Hazardous Air Pollutants (NESHAPs) regulations, the *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement* (DOE, 1995b), the *Advanced Mixed Waste Treatment Project Final Environmental Impact Statement* (DOE, 1999a), and other applicable federal, state, and local environmental and health and safety regulations. In addition, BNFL Inc. will adhere to the requirements of the *Idaho National Engineering Laboratory Management Plan for Cultural Resources* (Miller, 1995) during all phases of the project.



The following sections describe the AMWTP HWMA/Resource Conservation and Recovery Act (RCRA) permits and interim status documents, the Air Permits to Construct and their interface with the INEEL air permit, the NESHAPs authorization and standards, the storm water pollution prevention plans, relevant operating agreements between INEEL contractors, and federal, state, and local regulations applicable to AMWTP operations.

C.2 Hazardous Waste Management Act /Resource Conservation and Recovery Act Permit

BNFL Inc. developed an application for a HWMA/RCRA permit (Parts A and B) for the Advanced Mixed Waste Treatment Facility (AMWTF). A permit application was required under Idaho Administrative Procedures Act (IDAPA) 58.01.05.012, Hazardous Waste Management Act (State of Idaho), which outlines the permitting process, and various subparts [which address permitting to conduct hazardous waste treatment, storage and disposal (TSD) activities]. On July 19, 2000, a final HWMA/RCRA permit was issued for the AMWTF and became effective on August 18, 2000.

In addition to the *AMWTF HWMA/RCRA Treatment Permit*, an *AMWTF HWMA/RCRA storage permit* was issued by the Idaho Department of Environmental Quality on August 7, 2000. This permit covers storage units under control of BNFL Inc. Other storage units at the Radioactive Waste Management Complex (RWMC) are covered by the *Final HWMA Storage Permit for the RWMC* (DEQ, 2000), as revised. Additionally, three HWMA/RCRA interim status units were transferred to BNFL Inc. as the operator on June 1, 2001. These units are Transuranic Storage Area (TSA) Pads 1 and R, Pad 2, and the TSA-retrieval enclosure (TSA-RE).

Because the AMWTF is a mixed waste treatment facility, the following requirements relating to contingency plan and emergency procedures apply:

- HWMA/RCRA requirements of IDAPA 58.01.05.008 (implementing 40 CFR Part 264 Subpart D), *Contingency Plans and Emergency Procedures*
- 29 CFR 1910.120, *Hazardous Waste Operations and Emergency Response*

The requirements of 29 CFR 1910.120 are very similar to the HWMA/RCRA requirements but add specific training requirements for emergency response personnel. The Idaho Department of Environmental Quality has requested that the *HWMA/RCRA Contingency Plan for the AMWTF* be a stand-alone document but its elements may be subsequently incorporated into a single integrated *AMWTF Emergency Plan/RCRA Contingency Plan*. Reporting procedures are developed to ensure notifications are made to appropriate site personnel, DOE-ID, and federal, state, and local agencies to ensure that DOE and INEEL contractor management are kept informed of events that could affect worker or public health and safety or degraded the environment.

The first step in the AMWTF HWMA/RCRA permitting process (Part A Application) for the AMWTF focused on identifying the EPA hazardous waste numbers for the 65,000 m³ of mixed waste currently in storage at the TSA. Waste characteristics of the TSA waste streams identified for inclusion in the facility Part A Permit Application were compiled from existing data generated by INEEL permits, INEEL permit applications, contractor organizations, and other documented waste databases.

Components addressed in the permit that satisfy applicable IDAPA 58.01.05.008 (40 CFR Part 264) environment, safety, and health requirements include the following:

- Facility Security—measures to ensure only authorized personnel and authorized visitors are allowed entry to the AMWTF [IDAPA 58.01.05.012(40 CFR 264.14)].
- Inspections—routine inspections for malfunctions and deterioration, operator errors, and discharges that could cause or lead to release of hazardous waste constituents to the environment [IDAPA 58.01.05.012 (40 CFR 264.15)].
- Contingency Plan and Emergency Response Procedures—design features to minimize human health hazards as a result of fires, explosions, and timely notification of any unusual, off-normal and/or emergency occurrences or events during Phase III operations of the AMWTF. Timely notification to DOE-ID of unplanned releases of hazardous waste or hazardous waste constituents into the air, soil, or surface water [IDAPA 58.01.05.008 (40 CFR Part 264 Subpart D)].
- Training—as required by IDAPA 58.01.05.008 (40 CFR 264.16) via permit and other skills, education, and qualifications deemed necessary.
- Records and Reports—required pursuant to IDAPA 58.01.05.008 (40 CFR 264.73).
- Design—design of the HWMA/RCRA-regulated hazardous waste management units (HWMUs)
- Closure—the AMWTF shall be closed in accordance with IDAPA 58.01.05.008 (40 CFR Part 264 Subpart G).

C.3 Air Permit to Construct

The application for the Permit to Construct was submitted to the Idaho Department of Environmental Quality and was consistent with, and used information from, the AMWTF HWMA/RCRA application. A Department of Environmental Quality approval of the Permit to Construct was obtained for the Advanced Mixed Waste Treatment Facility.

The *AMWTF Air Permit to Construct* specifies the following requirements: emission limits for specific parameters/contaminants, visible emission limits, feed rate limits for bulk waste and contaminants, operating limits, monitoring, and record keeping requirements.

An application for a Permit to Construct for the TSA-RE was also submitted to the Department of Environmental Quality, and a Permit to Construct was issued.

AMWTF facilities will be incorporated, as appropriate, into the *INEEL Site-wide Air Operating Permit* under Title V of the *Clean Air Act of 1990*.

C.4 National Emission Standards for Hazardous Air Pollutants (NESHAPs)

Emissions of radionuclides from AMWTF facilities are regulated under NESHAPs, specifically at IDAPA 58.01.01.591 (40 CFR Part 61, Subpart H, *National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities*). A NESHAPs analysis and



application was submitted to the EPA for the AMWTF and TSA-RE. During operation, radioactive emissions will be reported to DOE in accordance with the memorandum of agreement (Section C.6) for inclusion with the other INEEL releases in the annual NESHAPs report, as required by IDAPA 58.01.01.591(40 CFR Part 61).

The NESHAPs applications demonstrate that adequate pollution control equipment and abatement measures exist to ensure that the total of all emissions from the entire INEEL will remain under the regulatory limit of 10 mrem per year. The application identified the radionuclide source term on the basis of expected radionuclide concentrations in the wastes process, annual quantities of waste processed, throughputs of the various processes, and radionuclide removal efficiencies of the air pollution control system for the facility. The source terms were then used to calculate maximum individual doses at selected locations and the doses used to confirm that expected controls and sampling and monitoring of stack flow rates and radionuclide emissions comply with IDAPA 58.01.01.591 (40 CFR Part 61, Subpart H requirements).

C.5 Storm Water Pollution Prevention Plan

The INEEL has two storm water pollution prevention plans; one for generic construction activities and one for industrial activities. Both plans cover the entire area within the INEEL boundary and were prepared under the National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges. Each INEEL contractor is required to prepare and implement a storm water pollution prevention plan for their facility areas. Accordingly, BNFL Inc. prepared a storm water pollution prevention plan to cover AMWTF construction activities through Phase II (construction and preoperational testing). The plan conforms to the NPDES requirements of the storm water general permit maintained by DOE-ID. In July of 1999, BNFL Inc. submitted a "Notice of Intent for Storm Water Discharges Associated with Construction Activity Under a NPDES General Permit." On September 22, 1999, EPA approval was obtained, and NPDES construction storm water general permit number IDR10A429 was assigned to the AMWTF.

BNFL Inc. prepared a *Storm Water Pollution Prevention Plan for Industrial Activities at the AMWTF*. In May 2001, BNFL Inc. submitted a "Notice of Intent for Storm Water Discharges Associated with Industrial Activity under the NPDES Multi-sector General Permit." On May 30, 2001, the EPA issued Industrial Storm Water General Permit No. IDR05A492 to the AMWTF for the discharges of storm water associated with industrial activities at the AMWTF. During Phase II (construction and preoperational testing) and Phase III (operations and HWMA closure), BNFL Inc. assigns an individual (a) to ensure compliance with the storm water pollution prevention plan in AMWTF operation and closure activities, and (b) to provide necessary reports to DOE-ID. These actions ensure all structures and practices required by the storm water pollution prevention plan compliance are adhered to through the end of Phase III closure so that undue erosion, runoff, and pollution discharge are avoided. The M&O contractor is responsible for monitoring of storm water discharges when the discharge point, or outfall, to the waters of United States.

C.6 Interface Agreements with INEEL Prime Contractor and Other Agencies

A memorandum of agreement between DOE-ID, BNFL Inc., and the M&O Contractor (DOE-ID, 2000a) has been developed that identifies areas of interface among personnel and facilities in a variety of areas to implement specific requirements contained in Part D (Specific ES&H Authorization Conditions) of the ESHPOP. During the development of the agreement, core team representatives and key points of contact



from each of the parties were identified to help determine the interfaces required. These individuals determined key areas where interfaces and information exchanges are required. Mechanisms were established to ensure that required interfaces identified throughout the project can be incorporated in the agreement. A new memorandum will be developed before the start of Phase III (operations and HWMA closure).

The memorandum of agreement describes and defines the responsibility for interfaces with DOE-ID and coordination with the M&O Contractor (DOE-ID, 2000a). The AMWTP also interfaces with the M&O Contractor in reporting data from environmental monitoring. In addition, BNFL Inc. supplies needed information and data for incorporation into various monthly or annual site reports required by DOE-ID, EPA, and the State of Idaho for recordkeeping and monitoring (as described further in ESHPOP Section D.8.4, Environmental Protection and Monitoring).

BNFL Inc. developed a memorandum of agreement with DOE-ID to gain access to existing operating agreements for various federal facilities and to M&O contracts with private entities for environment, safety, and health support such as fire and safety. These agreements are maintained at the DOE-ID office and include the following:

- Agreements for law enforcement with surrounding county entities that aid the security and transportation functions.
- An agreement between DOE-ID and the State of Idaho for Environmental Oversight and Monitoring that covers a broad range of environmental monitoring.
- Memorandums of understanding between DOE-ID and Bingham, Bonneville, Butte, Clark, Jefferson counties and the City of Idaho Falls police departments for law enforcement functions and for disaster services or emergency management services.
- Memorandums of understanding between DOE-ID and Clark and Jefferson counties for civil defense.
- A memorandum of understanding between the State of Idaho and DOE-ID radiological assistance response for DOE and/or non-DOE incidents in public access areas.
- A memorandum of understanding between DOE-ID and the Idaho Department of Transportation.
- A memorandum of understanding for mutual fire aid between DOE-ID and the Bureau of Land Management.
- Reciprocal fire fighting assistance agreements between all the surrounding communities and cities and DOE-ID.
- An Emergency Planning and Community Right to Know Act (EPCRA) Coordinator will be assigned to gather and provide certified data for inclusion in the INEEL EPCRA reports. BNFL Inc. will provide directly to DOE-ID an annual certified Superfund Amendments and Reauthorization Act (SARA) 313 report and will provide to the INEEL M&O contractor certified data for inclusion in the SARA 312 report.



C.7 Additional Requirements

Appendix A (Requirements Tables) lists all applicable environment, safety, and health requirements.



PART D SPECIFIC ES&H AUTHORIZATION CONDITIONS

D.1 Radiation Protection Program

The purpose of the Advanced Mixed Waste Treatment Project (AMWTP) radiation protection program is to identify the program elements that establish an effective radiation protection program for AMWTP individuals. The AMWTP radiation protection program shall at all times conform to 10 CFR Part 835, *Occupational Radiation Protection*, and its amendments, and if a requirement of Part 835 is inadvertently omitted, the AMWTP radiation protection program shall be deemed to include by reference all provisions of Part 835. This radiation protection program is written to be a working management tool, as well as a means of demonstrating compliance with the requirements of 10 CFR Part 835.

This radiation protection program, i.e., Section D.1 of this Environment, Safety, and Health Program Operating Plan (ESHPOP), is applicable to all areas of the AMWTP during the preoperational phase. The preoperational phase covers the process description given in the *Basis for Interim Operations*, BNFL-5232-BIO-01, and Phase II (construction) activities involving radiation producing devices and sources. The radiation protection program given in section D.1A of this ESHPOP is applicable during the operations phase. The operations phase covers all Phase III operations of AMWTP. In the current part of the preoperations phase, the AMWTP has custody of the Transuranic Storage Area-Retrieval Enclosure (TSA-RE) and its associated waste; therefore, all aspects of 10 CFR Part 835 apply.

No exemptions to the requirements of 10 CFR Part 835 have been requested in this radiation protection program. Subcontractors working at the AMWTP during the preoperations phase shall operate in accordance with this AMWTP radiation protection program, with the implementing document for this radiation protection program, the *AMWTP Radiological Control Manual*, and associated implementing procedures. Work in the operations phase is covered under the radiation protection program for operations and its associated radiological control program. No person, including DOE individuals, shall take or cause to be taken any action inconsistent with the requirements of this radiation protection program, or any program, plan, schedule, or other process established by this radiation protection program. Nothing in this radiation protection program shall be construed as limiting actions necessary to protect health and safety [10 CFR 835.3].

An update of this radiation protection program will be submitted to DOE (a) whenever a change or addition to the radiation protection program is made, (b) before the initiation of a task outside the scope of this radiation protection program, or (c) within 180 days following changes to 10 CFR Part 835. In instances where changes to 10 CFR Part 835 are incorporated by reference (no modifications are required to the radiation protection program), BNFL Inc. will, within 180 days following changes to 10 CFR Part 835, notify DOE in writing that the changes have been incorporated by reference. Changes, additions, or updates to this radiation protection program may become effective without prior DOE approval only if the changes do not decrease the effectiveness of the program and the changed program continues to meet the requirements of 10 CFR 835 [835.101].

The programmatic requirements contained in this radiation protection program represent BNFL Inc.'s commitment to achieving excellence in radiation protection and maintaining radiation exposures as low as reasonably achievable (ALARA). Terms and words used in the radiation protection program are as defined in 10 CFR Part 835, unless otherwise noted or defined in the *AMWTP Radiological Control Manual* and associated procedures.



This radiation protection program is a legally binding document between BNFL Inc. and DOE. Reference to AMWTP throughout this document refers to facilities where radioactive material or radiation generating devices are located within the Advanced Mixed Waste Treatment Facility, Transuranic Storage Area-Retrieval Enclosure, the Characterization Facility, and other buildings under BNFL Inc. control; the physical location of these facilities; and the individuals working at the facilities, all of which are the responsibility of BNFL Inc. The requirements in this radiation protection program are implemented by the *AMWTP Radiological Control Manual and* associated procedures.

The purpose of the AMWTP is to treat the alpha low-level mixed waste and transuranic (TRU) waste, currently stored in drums and boxes, for final disposal. The facility has the capability to treat the specified INEEL waste streams, and the flexibility to treat other potential INEEL and DOE regional and national waste streams. The TRU waste product is to be suitable for disposal at the Waste Isolation Pilot Plant (WIPP).

D.1.1 AMWTP Radiological Control Organization

- A. The AMWTP Radiological Control Organization provides relevant support to employees and is accountable to the AMWTP Radiological Control Manager. The Radiological Control Manager and the radiological control staff are independent of project staff. The Radiological Control Manager reports directly to the AMWTP Environment, Safety, and Health Manager.
- B. The AMWTP Radiological Control Organization is independent of project staff and reports directly to the AMWTP Radiological Control Manager.
- C. AMWTP radiological control individuals monitor adherence to the *AMWTP Radiological Control Manual and* associated procedures and provide for radiological support to the project organization.

D.1.1.1 AMWTP Management Commitment

The responsibility for compliance with radiological protection requirements, and for optimizing individual and collective doses, starts at the worker level and broadens as it progresses upward through the organization. AMWTP line managers are fully responsible for radiological performance among their personnel and shall take necessary actions to ensure requirements are implemented and performance is monitored and corrected, as necessary. As part of the commitment to the radiation protection program, AMWTP senior management ensures the following:

- A. Sound engineering techniques are used to reduce and to maintain occupational exposures in accordance with the ALARA methodology.
- B. Individuals are made aware of the commitment from management to maintain exposures ALARA. At a minimum, employees are informed as to what “as low as reasonably achievable” radiation exposure means, why it is a good policy, and how they can implement it while performing their jobs.



- C. Assessments are periodically conducted to determine how exposures might be reduced in accordance with the ALARA philosophy. This includes assessing design, operating, and maintenance procedures and past exposure records.
- D. A supervised and effective radiation protection capability with defined responsibilities exists at the AMWTP. All radiation protection individuals are trained and qualified commensurate with the responsibilities of their position and the potential problems expected in the performance of their duties.
- E. Employees receive adequate training. Instruction of individuals is in accordance with 10 CFR Part 835, Subpart J.

D.1.1.2 AMWTP Radiological Control Manager

- A. The AMWTP Radiological Control Manager has the designated responsibility for planning, administering, and maintaining the AMWTP radiation protection program. The AMWTP Radiological Control Manager ensures that the radiation protection program elements are appropriately implemented and maintained.

D.1.2 Requirements

Table 1 of Appendix A (Requirements Tables) lists environment, safety, and health requirements for the radiation protection program.

D.1.3 Occupational As Low As Reasonably Achievable Program

BNFL Inc.'s ALARA policy is to reasonably limit radiation exposures to the lowest levels commensurate with the benefit of the work to be accomplished. AMWTP line management and all levels of the work force are committed to this policy. In addition to other functions, the AMWTP Safety Committee and the ALARA Subcommittee have been established to help ensure that BNFL Inc.'s ALARA policy is implemented. The *AMWTP ALARA Plan* implements the AMWTP ALARA program.

D.1.3.1 Safety Committee and ALARA Subcommittee

The AMWTP Safety Committee includes individuals from management, operations, and the Environment, Safety, Health, and Quality (ESH&Q) organization. For preoperations, the AMWTP Environment, Safety, and Health (ES&H) Manager serves as the chairperson of the Safety Committee.

The AMWTP Safety Committee has established the ALARA Subcommittee. During preoperations, the ALARA Subcommittee is chaired by the Operations Manager or his designee and is composed of the Retrieval Project Manager and members from the Radiological Control Department, the Operations and Maintenance Department, the Project Engineering Section, and the Industrial Safety/Industrial Hygiene Department. Specific functions of the AMWTP ALARA Subcommittee include the following:

- Issuing through the AMWTP Safety Committee BNFL Inc. ALARA policy (835.101)
- Reviewing the training requirements to confirm that the ALARA process is appropriately included (835 Subpart J)



- Performing ALARA reviews of facility design and proposed modifications (835.1001 and 835.1002)
- Planning to achieve ALARA for specific operations, including first-time and high-risk jobs (835.1003)
- Participating in the establishment of ALARA budgets and goals and of facility administrative control levels
- Reviewing the programs for, and the results of, audits and assessments on ALARA compliance and lessons learned (835.102)
- Ensuring that records of compliance with ALARA policy and requirements are maintained (835.704).

The AMWTP ALARA Subcommittee reviews the following: administrative control levels, ALARA goals, and ALARA budget. Additionally, the ALARA Subcommittee routinely reviews lessons learned from the AMWTP, DOE complex, and industry. The committee also evaluates items such as construction and design of facilities and systems and planned major modifications or work activities.

The Safety Committee receives and reviews, as a minimum, the results of programmatic internal and external reviews and audits (835.102). The committee is responsible for advising the Radiological Control Manager on the overall conduct of the radiation protection program.

D.1.3.2 Assessments

Assessment is the process of providing independent feedback to line managers to indicate the adequacy of the radiation protection program. Inspections, audits, reviews, investigations, and self-assessments are part of the numerous checks and balances in the AMWTP radiation protection program. BNFL Inc. policy is to implement continuous improvement and appropriate response to internal and external audits through the *AMWTP Quality Assurance Program Plan*. Assessments of the radiation protection program are an integral part of the AMWTP quality assurance program and integrated safety management. Internal audits will be conducted such that the all the functional elements are reviewed no less than every 36 months.

D.1.3.3 Administrative Control Levels and Dose Limits

BNFL Inc.'s objective is to maintain individual radiation doses well below regulatory limits. The numerical value of the administrative control level will be set initially based upon the calculated dose uptake and then modified using historical dose information and the projected work load. To accomplish this objective, challenging numerical administrative control levels are established below the regulatory limits to administratively control and to help reduce individual and collective radiation dose. Unless otherwise indicated, administrative, lifetime, and special control levels and dose limits are stated in terms of the total effective dose equivalent, which is the sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure).



BNFL Inc. is committed to establishing facility administrative control levels below the 5 rem/yr regulatory limit. These administrative control levels are approved by management and are included in the *AMWTP Radiological Control Manual*. The AMWTP project organization sets job-specific ALARA goals on a job-by-job basis.

D.1.4 Radiological Standards

The following sections discuss occupational dose limits, contamination control, and posting.

D.1.4.1 Occupational Dose Limits

The following sections discuss planned special exposures, emergency conditions, accidental overexposure, special control limits, member of public dose limits, and embryo/fetus dose controls.

- A. Occupational dose limits are provided in Table D.1-1 [835.202(a)(1)-(4)]. All occupational doses received during the current year, except those resulting from planned special exposures and emergency exposures, are included when demonstrating compliance with Table D.1-1 limits [835.202(b) & 702(d)]. Reasonable efforts are made to obtain complete records of prior years' occupational internal and external doses [835.702 (e)]. If formal records cannot be obtained, a written estimate signed by the individual may be accepted [835.702(d)]. The process for conducting a written dose estimate is defined in the *AMWTP Radiological Control Manual*.

Table D.1-1. Summary of occupational dose limits.

Type of exposure	Annual limit(rem)
Employee: total effective dose equivalent, (TEDE) [835.202(a)(1)]	5
Employee: lens of the eye (external) [835.202(a)(3)]	15
Employee: skin and extremities (external shallow dose) [835.202(a)(4)]	50
Employee: any organ or tissue (other than lens of eye) (internal + external) [835.202(a)(2)]	50
Declared pregnant worker: embryo/fetus (internal + external) [835.206(a)]	0.5 per gestation period

- B. The occupational dose limits provided in Table D.1-1 apply to all employees. Employees must successfully complete radiation worker training and pass an examination before being granted unescorted access to any AMWTP radiological area.
- C. AMWTP policy is to not hire minors (835.207).
- D. Exposures from background radiation, from therapeutic and diagnostic medical procedures as a patient, or from medical research programs (while a subject) are not included in either individual radiation dose records or assessments of dose against the limits in Table D.1-1 [835.202(c)].

- E. The total effective dose equivalent during a year is determined by summing the effective dose equivalent from external exposures and the committed effective dose equivalent from intakes during the year [835.203].
- F. Determinations of the effective dose equivalent are made using the weighting factor values provided in 10 CFR 835.2.
- G. Nonuniform exposures of the skin from x-rays, beta radiation, and/or radioactive material on the skin are assessed as follows [835.205]:
- *If the area of skin irradiated is 100 cm² or more*—The nonuniform dose equivalent received during the year is averaged over the 100 cm² of the skin receiving the maximum dose, added to any uniform dose equivalent also received by the skin, and recorded as the shallow dose equivalent to any extremity or skin for the year.
 - *If the area of skin irradiated is 10 cm² or more but is less than 100 cm²*—The nonuniform dose equivalent (H) to the irradiated area received during the year is added to any uniform dose equivalent also received by the skin and recorded as the shallow dose equivalent to any extremity or skin for the year. H is the dose equivalent averaged over the 1 cm² of skin receiving the maximum absorbed dose D, reduced by the fraction f, which is the irradiated area in cm² divided by 100 cm² (i.e., $H = fD$). In no instance shall a value of f less than 0.1 be used.
 - *If the area of skin irradiated is less than 10 cm²*—The nonuniform dose equivalent is averaged over the 1 cm² of skin receiving the maximum dose. This dose equivalent is recorded as a special entry in the individual's occupational exposure history and is not added to any other dose equivalent or extremity or skin (shallow) dose equivalent recorded for the annual dose equivalent.
- H. Planned Special Exposures. A planned special exposure is a preplanned, infrequent exposure to radiation, separate from and in addition to the annual dose limits. Planned special exposures are not applicable in the preoperations phase of the AMWTP.
- I. Emergency Conditions. AMWTP emergency conditions are defined in ESHPOP Section D.9 (Contingency/Emergency Planning and Response). Under emergency conditions where actions are necessary to protect life or save major property, individuals may receive doses that exceed the limits established in Table D.1-1 [835.1301 & 1302]. In such emergency conditions, AMWTP adheres to the following requirements:
- Each individual authorized to perform emergency action must be trained in accordance with 10 CFR 835.901 and be briefed beforehand on the known or expected hazards to which the individual may be subjected [835.1302 (d)].
 - The risk of injury to those individuals involved in rescue and recovery operations is minimized through the use of preplanning and personal protective equipment (PPE) [835.1302 (a)].

- Operating management weigh actual and potential risks to rescue and recover individuals against the benefits to be gained [835.1302 (b)].
 - No individual shall be required to perform a rescue action that might involve substantial personal risk [835.1302 (c)].
 - Operations after a dose was received in excess of the limits specified in 10 CFR 835.202, except those received in accordance with 10 CFR 835.204 (Planned Special Exposures), require prior approval from the AMWTP General Manager and the DOE-ID Operations Manager.
- J. Special Control Levels. Certain situations may require lower individualized exposure control levels. For example, a special control level would be appropriate for an individual undergoing radiation therapy. Such situations are evaluated on a case-by-case basis. The AMWTP General Manager is responsible for establishing special control levels. The implementation of special control levels will not interfere with the individual's right to work.
- K. Member of the Public Dose Limit. Members of the public permitted access to the controlled area at the AMWTP site are limited to a total effective dose equivalent of 0.1 rem in a year [835.208].
- L. Embryo/Fetus Dose Controls. Dose controls that affect embryos and fetuses are as follows:
- After a female employee voluntarily notifies BNFL Inc. in writing that she is pregnant, for the purposes of fetal/embryo protection, she is considered a declared pregnant worker. A declared pregnant worker may revoke this declaration, in writing, at any time [835.2(a)].
 - For a declared pregnant worker, BNFL Inc. provides the option of a mutually agreeable assignment of work tasks, without loss of pay or promotional opportunity, such that further occupational radiation exposure is unlikely.
 - For a declared pregnant worker who chooses to continue work involving occupational exposure:
 - The dose limit for the embryo/fetus from conception to birth (entire gestation period) is 500 millirem from the sum of doses received from external sources, sources inside the mother, and sources inside the embryo/fetus [835.206(a)].
 - Measures are taken to avoid substantial variation above the uniform exposure rate necessary to meet the 500 millirem limit for the gestation period [835.206(b)]. In addition, efforts are made to avoid exceeding 50 millirem per month to the declared pregnant worker.
 - If the dose to the embryo/fetus is determined to have already exceeded 500 millirem when an employee notifies BNFL Inc. of her pregnancy, the employee is not assigned to tasks where additional occupational radiation exposure is likely during the remainder of the gestation period [835.206 (c)].



D.1.4.2 Contamination Control

Work area monitoring for airborne radioactivity is in accordance with 10 CFR 835.403.

Control of radioactive contamination is achieved by using engineering controls, administrative controls, and employee performance to contain contamination at the source, monitoring, and by promptly decontaminating areas that become contaminated.

Instruments and techniques used for radioactive contamination monitoring and control are adequate to ensure compliance with the requirements of 10 CFR 835.1102.

The primary emphasis at the AMWTP is physical design features to contain radioactive contamination and to prevent airborne and surface contamination [835.1001(a)]. In addition to the provisions of this radiation protection program, *Guide of Good Practices for Occupational Radiological Protection in Plutonium Facilities* (DOE-STD-1128-98) is considered for guidance in preparing the *AMWTP Radiological Control Manual*. This guide provides specific guidance related to dosimetry, radiological monitoring, instrumentation, contamination control, and applicable radiological control procedures that are considered for AMWTP plutonium operations.

- A. AMWTP controls are implemented as necessary to prevent the spread of removable contamination outside of radiological areas under normal operating conditions [835.1101 (b)]. The extent of these controls depends on the type and level of contamination present and the activities in and around the area. The following measures are used to prevent the spread of contamination across the boundaries of contamination, high contamination, and airborne radioactivity areas:
- Use solid barriers to enclose areas wherever practicable
 - Mark and secure items, such as hoses and cords that cross the boundary, to prevent safety hazards and the spread of contamination
 - Control and direct airflow from areas of lesser to greater contamination
 - Use engineering controls and confinement devices such as glovebags, gloveboxes, and tents.

Personal Protective Equipment and Clothing. Requirements affecting personal protective equipment and clothing, with respect to protection from exposure or contamination from radioactive material, are as follows:

- A. Individuals wear protective clothing during work in contamination and high contamination areas [835.1102 (e)] and during the following activities:
- Handling of contaminated materials with removable contamination in excess of Table D.1-2 levels
 - Work in airborne radioactivity areas



- Work in areas with posted requirements or with requirements specified by safe work permit.
- B. Protective clothing designated for radiological control are
- Uniquely identified by color, symbol, or appropriate marking
 - Used only for radiological control purposes.
- C. General guidelines for protective clothing selection and use are contained in the *AMWTP Radiological Control Manual*.
- D. Guidance concerning use of respirators is contained in the *AMWTP Radiological Control Manual*.

Monitoring for Individual Contamination. Individuals exiting radiological areas established to control removable contamination and/or airborne radioactivity will perform appropriate monitoring to detect and prevent the spread of contamination. Requirements for monitoring individuals are contained in the *AMWTP Radiological Control Manual* [835.1102 (d)].

Contamination Control Levels. A surface is considered contaminated if either the removable or total radioactivity is detected above the levels in Table D.1-2. Controls are implemented for these surfaces commensurate with the nature of the contaminant and level of contamination [835.1102 (b)]. Management and entry control of fixed contamination is in accordance with 10 CFR 835.1102 (c). The *AMWTP Radiological Control Manual and associated procedures implement the contamination control program*.

Airborne Radioactivity Control Levels. The derived air concentration (DAC) values in 10 CFR Part 835 Appendices A and C are used to control occupational exposures to airborne radioactive material [10 CFR 835.209]. The *AMWTP Radiological Control Manual* implements the airborne radioactivity control program.

D.1.4.3 Posting

The following sections discuss general posting provisions, radioactive material labeling in radiation areas, and posting in contamination and airborne radioactivity areas [835.601 and 835.605]. Controlled areas are posted in accordance with 10 CFR 835.602, as specified in the *AMWTP Radiological Control Manual* and associated procedures. Items or containers of radioactive material, except those meeting the 10 CFR 835.606 exceptions to labeling requirements, bear a durable, clearly visible label bearing the standard radiation warning trefoil in black or magenta on a yellow background and the words “Caution, Radioactive Material” or “Danger, Radioactive Material.” The label provides sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers, to take precautions to avoid or control exposures.



Table D.1-2. Surface contamination values in dpm/100 cm² (used for identifying, posting, monitoring, and controlling surface contamination) (10 CFR Part 835 Appendix D).

Radionuclide ^a	Removable ^b	Total ^{c,d} (Fixed + Removable)
U-natural, U-235, U-238, and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac- 227, I-125, I-129	20 alpha	500 alpha
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200 alpha	1,000 alpha
Beta-gamma emitters (nuclides with decay modes other than emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. ^e	1,000 beta-gamma	5,000 beta-gamma
Tritium and tritiated compounds ^f	10,000	NA

- a. The values in this table, with the exception noted in footnote e, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for the alpha- and beta-gamma-emitting nuclides apply independently [10 CFR Part 835 Appendix D, note 1].
- b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation [10 CFR Part 835 Appendix D, note 2].
- c. The amount of removable radioactive material per 100 cm² of surface area is determined by swiping the area with a dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. For objects with a surface area less than 100 cm², the entire surface is swiped, and the activity per unit area is based on the actual surface area. Swiping techniques are not required to measure removable contamination levels if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination [10 CFR Part 835 Appendix D, note 4].
- d. The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm² is less than three times the values in this table. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds three times the applicable value [10 CFR Part 835 Appendix D, note 3].
- e. This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched [10 CFR Part 835 Appendix D, note 5].
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply [10 CFR Part 835 Appendix D, note 6].



General Posting Provisions. General posting provisions are as follows:

- A. Radiological postings are intended to alert individuals to the presence of radiation and radioactive materials within confinement systems.
- B. Radiological areas are clearly and conspicuously posted [CFR 835.601(b)]. Postings of doors are such that the postings remain visible when doors are open or closed.
- C. Each access point to a controlled area is posted whenever radioactive materials or radiation fields that would require posting under radiation and contamination and airborne provisions may be present in the area.
- D. Posting requirements are contained in the *AMWTP Radiological Control Manual*.

Radioactive Material Labeling

Items or containers of radioactive material, except those meeting the 10 CFR 835.606 exceptions to labeling requirements, bear a durable, clearly visible label bearing the standard radiation warning trefoil and the words "Caution, Radioactive Material" or "Danger, Radioactive Material." The label provides sufficient information to permit individuals handling, using, or working in the vicinity of the items or containers, to take precautions to avoid or control exposures.

Radioactive material labeling is implemented by the *AMWTP Radiological Control Manual and associated procedures*.

Posting Radiation Areas. Areas are posted to alert individuals to the presence of external radiation in accordance with Table D.1-3 and general posting provisions [10 CFR 835.601, 603]. Posting requirements are implemented by the *AMWTP Radiological Control Manual and associated procedures*.

Posting Contamination and Airborne Areas. Areas are posted to alert individuals to the presence (or potential presence) of surface contamination and airborne radioactivity in accordance with Table D.1-4 and general posting provisions [835.1102 (c)(2) and 835.603]. Derived Air Concentration values found in 10 CFR Part 835 are used in posting airborne radioactivity areas, in accordance with Table D.1-4 [835.209(a)]. Posting requirements are implemented by the *AMWTP Radiological Control Manual and associated procedures*.



Table D.1-3. Criteria for posting radiation areas.

Area	Criteria	Required posting
Radiation area	> 0.005 rem in 1 h at 30 cm	"CAUTION, RADIATION AREA" [835.603(a)]
High radiation area	> 0.1 rem in 1 h at 30 cm	"CAUTION, HIGH RADIATION AREA" or "DANGER HIGH RADIATION AREA" [835.603(b)]
Very high radiation area	> 500 rad in 1 h at 1 m	"GRAVE DANGER, VERY HIGH RADIATION AREA" [835.603(c)]

Access requirements may be deleted or modified if personnel access is specifically prohibited.

Table D.1-4. Criteria for posting contamination, high contamination, and airborne radioactivity areas.

Area	Criteria	Required posting
Contamination area	Removable contamination levels (dpm/100 cm ²) > Table D.1-2 values but ≤ 100 x Table D.1-2 values	"CAUTION, CONTAMINATION AREA" [835.603(e)]
High contamination area	Removable contamination levels (dpm/100 cm ²) > 100 x Table D.1-2 values	"CAUTION HIGH CONTAMINATION AREA" or "DANGER, HIGH CONTAMINATION AREA" [835.603(f)]
Airborne radioactivity area	1. Airborne concentrations (μCi/mL) > the applicable derived air concentration (DAC) values; or 2. Individual without respiratory protection could receive > 12 DAC-hours in a week	"CAUTION, AIRBORNE RADIOACTIVITY AREA" [835.603(d)]

D.1.5 Controlling Radiological Work

The primary methods used to control workplace exposures are physical design features [835.1001(a)]. AMWTP augments these physical design features through area entry/exit requirements to control access to and from radiological areas and safe work permits to control radiological work [835.501(d) and 835.1003]. The *AMWTP Radiological Control Manual and associated procedures* implement the requirements of this program.



Proposed maintenance and modification plans are reviewed to identify and incorporate radiological protection requirements. AMWTP line management is responsible for performing this review, with support and concurrence from the AMWTP Radiological Control Manager.

In addition, all AMWTP personnel have the authority and responsibility to stop work activities if unsafe conditions are encountered, as specified in Section D.5 (Permission to Commence Operations, Stop Work Authority, and Restart).

D.1.5.1 Safe Work Permits

The AMWTP safe work permit is an administrative mechanism used to establish radiological and hazardous material controls for intended work activities. The safe work permit informs employees of area radiological conditions and entry requirements and provides a mechanism to relate employee exposure to specific work activities. Each safe work permit is written for the work being performed and includes required personnel protective equipment (PPE) and criteria for the suspension of work.

D.1.5.2 Entry and Exit Requirements

BNFL Inc. has established specific requirements for entering and exiting radiological control areas. These entry requirements are consistent with 10 CFR 835 Subpart F and are implemented by the *AMWTP Radiological Control Manual* and associated procedures. Radiation safety training commensurate with the hazards and required controls is required before unescorted access to radiological areas [835.901] is allowed. AMWTP minimum radiation control training guidelines are contained in Table D.1-5. Specific training requirements are contained in the AMWTP radiological worker training discussed in ESHPOP Section D.7 (Training and Qualification Program).

Table D.1-5. Minimum radiological control training guidelines.

Activities	Minimum training	Frequency
Member of the public escorted entry into controlled areas	Radiological Orientation For Visitors	monthly
Member of the public unescorted entry into controlled areas	General Employee Radiological Training	biennial
Unescorted entry into controlled areas	General Employee Radiological Training	biennial
Unescorted entry into posted radioactive material areas	Radiological Worker Training I	biennial
Unescorted entry into radiation areas	Radiological Worker Training I	biennial
Unescorted entry into contamination areas	Radiological Worker Training II	biennial
Unescorted entry into high radiation areas	Radiological Worker Training II	biennial

D.1.5.3 Monitoring and Surveys

AMWTP workplace and individual monitoring is performed to (a) demonstrate compliance with the requirements of this radiation protection program, (b) document radiological conditions in the workplace, (c) detect changes in radiological conditions, (d) detect the gradual buildup of radioactive material in the workplace, (e) verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure, and (f) identify and control potential sources of individual exposure to radiation and/or radioactive material [835.401(a)(f)].

Surveys for radiation, contamination, and airborne radioactive materials are performed as specified in the *AMWTP Radiological Control Manual* and associated procedures and safe work permits.

The Advanced Mixed Waste Treatment Facility (AMWTF) uses nuclear accident dosimeters [835.1304] capable of measuring the estimated neutron dose and approximate neutron spectrum from a criticality accident. These dosimeters are in addition to the criticality monitoring system (in accordance with ANSI/ANS 8.3), the requirements for which are detailed in Section D.2 of this ESHPOP.

D.1.6 Individual Monitoring

AMWTP provides the results of internal and external dose determinations to the organization responsible for maintaining INEEL historical dosimetry files (see ESHPOP Section D.11, Records and Reports). The following sections discuss AMWTP internal dosimetry and external dosimetry.

D.1.6.1 Internal Dosimetry

- A. AMWTP obtains support for internal dosimetry from one or more DOE Laboratory Accreditation Program (DOELAP)-accredited facilities. These support functions include bioassay services, dose determinations (internal and external), dose record maintenance, and dose reporting. The contracts with these labs require services and records maintenance in accordance with 10 CFR Part 835. The AMWTP internal dose evaluation program, specified in the *AMWTP Radiological Control Manual* and associated procedures, is adequate to demonstrate compliance with 10 CFR 835.202 [835.402(d)].
- B. The following individuals participate in the AMWTP internal dosimetry program:
 - Radiological workers identified by their occupation and work location as likely to receive a committed effective dose equivalent of 100 millirem or more from all radionuclide intakes in a year [835.402(c)(1)].
 - Declared pregnant workers likely to receive intakes resulting in a dose equivalent to the embryo/fetus of 50 millirem or more during the gestation period [835.402(c)(2)].
 - Members of the public who enter a controlled area and are likely to receive an intake resulting in a committed effective dose equivalent exceeding 50 millirem in a year [835.402(c)(3)].
- C. The estimation of internal dose is based on bioassay data rather than air concentration values unless one of the following conditions exists [835.209(b)]:

- Bioassay data are unavailable
- Bioassay data are inadequate
- Internal dose estimates based on air concentration values are demonstrated to be as accurate or more accurate than bioassay data.

The *AMWTP Radiological Control Manual* and associated procedures implement the bioassay program.

D.1.6.2 External Dosimetry

AMWTP obtains support for external dosimetry from qualified contractors. These support functions include dosimeters and their processing, dose determinations, dose record maintenance, and dose reporting. The contracts require services and records maintenance in accordance with 10 CFR Part 835. These contractors are accredited by the DOE Laboratory Accreditation Program for personnel dosimetry.

External General Provisions. External dosimetry general provisions are as follows:

- A. AMWTP individual dosimetry is provided to and used by individuals on the basis of the following thresholds:
 - Individuals identified by their occupation and work location as likely to receive a deep dose equivalent to any portion of the whole body of 100 millirem or more in a year or a dose equivalent to the extremities, or organs and other tissues (including lens of the eye and skin) of 10 percent or more of the corresponding limits specified in Table D.1-1 [835.402(a)(1)]
 - Declared pregnant workers expected to receive from external sources a dose equivalent of 50 millirem or more to the embryo/fetus during the gestation period [835.402(a)(2)]
 - Members of the public likely to receive in 1 year, from external sources, a dose in excess of 50 millirem [835.402(a)(4)]
 - Individuals entering a high radiation area [835.402(a)(5)].
- B. Neutron dosimetry is provided when an individual is likely to exceed the applicable threshold just outlined and is exposed to neutron radiation.

The *AMWTP Radiological Control Manual* and associated procedures implement the external dosimetry program.

D.1.7 Radioactive Material

The following sections describe basic requirements for radioactive material, radioactive material labeling, packaging, and storage.

D.1.7.1 Radioactive Material Requirements

Materials in contamination or airborne radioactivity areas are considered contaminated until surveyed and released. Any equipment or system component removed from a process area that may have had contact



with radioactive material is considered contaminated until disassembled to the extent required to perform an adequate survey, surveyed, and shown to meet the criteria of Table D.1-2. [835.1101].

D.1.7.2 Radioactive Material Packaging

- A. Radioactive material that is outside contamination or airborne radioactivity areas and is confirmed or suspected of having removable radioactive contamination levels greater than Table D.1-2 values is securely wrapped in plastic or placed in a closed container.
- B. Radioactive material packaging requirements are implemented by the *AMWTP Radiological Control Manual* and associated procedures.

D.1.7.3 Radioactive Material Storage

Any accessible area in which radioactive material is used, handled, or stored shall be posted with the words "Caution Radioactive Material." The posting meets the requirements of 10 CFR 835 Subpart G. The following areas are exempt from the posting requirements:

- Areas, for periods of less than 8 continuous hours, when placed under continuous observation and control of an individual knowledgeable of, and empowered to implement, required access and exposure control measures.
- Areas when (1) posted in accordance with 10 CFR 835.603(a) through (f); or (2) each item or container of radioactive material is labeled in accordance with 10 CFR 835 Subpart G such that individuals entering the area are made aware of the hazard; or (3) the radioactive material of concern consists solely of structures or installed components that have been activated (i.e., such as by being exposed to neutron radiation or particles produced by an accelerator).
- Areas containing only packages received from radioactive material transportation labeled and that are not degraded need not be posted in accordance with 10 CFR 835.603 until the packages are monitored in accordance with 10 CFR 835.405.

D.1.7.4 Release of Radioactive Material to Controlled and Uncontrolled Areas

Once materials have entered radiological areas controlled for surface contamination or airborne radioactivity, evaluations of the potential for contamination of that material are required before releasing the material to controlled areas [835.1101]. Implementing requirements for releasing radioactive material to controlled areas are contained in the *AMWTP Radiological Control Manual* and associated procedures [835 Appendix D]. Equipment and Material releases to uncontrolled areas are conducted in accordance with DOE O 5400.5.

D.1.7.5 Sealed Radioactive Source Controls

The policy of BNFL Inc. radiological operations is to control sealed radioactive sources so that they are used, handled, and stored in a manner commensurate with their radiological hazard. The *AMWTP Radiological Control Manual* and associated procedures implement acquisition, receipt, labeling, storage, transfer, inventory, leak testing, and use of sealed radioactive sources [10 CFR 835 Subpart M].



D.1.8 Radioactive Waste Management

Waste management is discussed in ESHPOP Section D.15 (Waste Management Program). The policy of BNFL Inc. radiological operations is to minimize the generation of radioactive waste. In general, AMWTP radioactive waste generation is minimized by the following:

- Segregating known uncontaminated from potentially contaminated waste
- Restricting material entering radiological areas to only those needed for performance of work
- Restricting the quantities of hazardous materials, such as paints, solvents, chemicals, cleaners, and fuels, entering radiological areas
- Substituting recyclable items in place of disposable ones and reuse of equipment when possible
- Maintaining an assortment of tools primarily for use in controlled contamination or airborne radioactivity areas.

D.1.9 Design and Control

AMWTP design is controlled in accordance with 10 CFR 835 Subpart K. The following sections discuss radiological design criteria and control procedures.

D.1.9.1 Radiological Design Criteria

BNFL Inc.'s design criteria is to limit radiological doses to employees to 20 percent of the values in 10 CFR 835.202 [10 CFR 835.1002(b)]. To control airborne radioactive material, the design objective under normal conditions is to avoid releases to the work place atmosphere. In any situation, confinement and ventilation are normally used to control the inhalation of such material by workers to levels that are ALARA [835.1002(c)]. The design or modification of a facility and the selection of materials includes features that facilitate operations, maintenance, decontamination, and decommissioning [10 CFR 835.1002(d)]. Optimization methods are used to ensure that occupational exposure is maintained ALARA in developing and justifying design and physical controls [835.1002(a)].

Radiological design criteria are included in the *AMWTP Project Design Criteria* document.

D.1.9.2 Control Procedures

- A. Administrative control and procedural requirements are developed and implemented as necessary to supplement facility design features [835.1001(b)]. Administrative control procedures include such things as access control measures and safe work permits. These and other control procedures are written to implement the *AMWTP Radiological Control Manual*.
- B. Written authorizations, including specific radiation protection measures, are required to control entry into and work within radiological areas [835.501(d)].



- C. The AMWTP combination of design features and administrative control procedures ensures that during routine operation the Table D.1-1 dose limits for radiological employees are met and that doses are ALARA [835.1003(a)(b)].

D.1.10 Respiratory Protection

- A. AMWTP respiratory protection equipment includes respirators with particulate and/or gas-absorbing cartridges, supplied air respirators, self-contained breathing apparatus, and airline supplied-air suits and hoods.
- B. BNFL Inc. requires that respiratory protection equipment selection be in accordance with 29 CFR 1910.134. Additional respiratory protection requirements are contained in the *AMWTP Radiological Control Manual*. In general the following shall apply:
- Respirators are issued only to individuals who are trained, fitted, and medically qualified to wear the specific type of respirator.
 - Training and qualification testing is performed annually [29 CFR 1910.134].
 - Monitoring of airborne radioactivity shall be performed as necessary to characterize the airborne radioactivity hazard where respiratory protective devices for protection against airborne radionuclides have been prescribed [10 CFR 835.403(a)(2)].

D.1.11 Records and Reporting

BNFL Inc.'s policy is to generate and maintain complete and accurate radiation protection records for the AMWTP facilities. Records are recorded and maintained in accordance with the requirements of 10 CFR 835.701, 10 CFR 835.702, 10 CFR 835.703 and 10 CFR 835.704. ESHPOP Section D.11 (Records and Reports) establishes the AMWTP records management program. Radiological Records generated in accordance with this Radiological Records Program will be retained until final disposition is authorized by DOE in accordance with 10 CFR 835.701(b).

Reports to individuals are formatted in accordance with, and contain the data required by, 10 CFR 835 Subpart I. AMWTP uses these records (a) to help ensure that individuals are prevented from receiving unnecessary radiation exposure, (b) to make these records available as prescribed by the *Privacy Act of 1974*, and (c) to use these records to document compliance with 10 CFR 835 [835.701(a)]. These records are also used for (a) evaluation of the effectiveness of the radiation protection program, (b) demonstration of compliance with regulations and requirements, and (c) defense of the radiation protection program against unwarranted litigation.

BNFL Inc. maintains dose records sufficient to evaluate compliance with all applicable dose limits and monitoring and reporting requirements [835.702(c)(1) & (2)]. Requirements for maintaining employee radiological control records are contained in Section D.11 (Records and Reports). In addition, BNFL provides records of individual exposures to the appropriate INEEL Radiation and Dosimetry Records organization on an ongoing and timely basis.



BNFL Inc. is responsible for the production and distribution of reports to individuals as specified in 10 CFR 835 Subpart I. As a minimum, BNFL Inc. provides exposure reports to individuals under the following conditions:

- Upon the request from an individual terminating employment, records of exposure are provided to that individual as soon as the data are available, but not later than 90 days after termination [835.801(b)]
- If requested, a written estimate of radiation dose based on available information at the time of termination is provided [835.801 (b)]
- Annual radiation dose reports to individuals [835.801 (c)]
- If requested, detailed exposure information [835.801 (c)]
- Reports to individuals when BNFL Inc. is required to report to DOE pursuant to (a) occurrence reporting or (b) planned special exposures [835.801 (e) and 835.204 (e)].

D.1.11.1 General Provisions

- A. Where radiological services (for example, dosimetry and laboratory analyses) are purchased, there is a clear agreement regarding records responsibility during performance of the service.
- B. Detailed information concerning an individual's exposure is made available to that individual, upon request, consistent with the *Privacy Act of 1974*, which contains requirements to protect the privacy of individual records [835.702(f) and 801(d)].
- C. Unless otherwise specified, radiological control records shall use the special units of curie, roentgen, rad, and rem, including multiples of these units [835.4]. Use of the international system of units (becquerel, gray, and sievert) should be limited to calculational, scientific, or reference purposes.
- D. AMWTP forwards a copy of the assay or dosimetry results to the appropriate INEEL Radiation and Dosimetry Records Organization.

D.1.12 Radiation Safety Training

- A. AMWTP radiological control training is commensurate with the employee's duties. AMWTP radiation training is performed to meet the requirements of 10 CFR 835 Subpart J (Radiation Safety Training).
- B. AMWTP uses DOE standardized core courses to the extent practicable and supplements these with AMWTP site-specific information. These standardized core courses are referred to as General Employee Radiological Training, Radiological Worker Training (I and II), and Radiological Control Technician Training. Table D.1-5 (Section D.1.5) lists minimum training guidelines.

- C. The AMWTP facility-specific instruction is commensurate with the nature of the activities performed at the facility and includes special instructions in plutonium waste handling to ensure adequate radiation safety. The AMWTP training requirements are contained in ESHPOP Section D.7 (Training and Qualification Program).

D.1.13 Instrumentation Calibration

The AMWTP radiation protection program uses support functions from other contractors that meet *AMWTP Quality Assurance Program Plan* calibration requirements. These support functions include calibration and maintenance of health physics instrumentation. The contracts require services and records maintenance in accordance with 10 CFR Part 835. AMWTP uses commercially available radiological instrumentation where practical.

In general, instruments used for monitoring and contamination control are

- A. Maintained and calibrated on an established frequency [835.401(b)(1)]
- B. Appropriate for the type(s), levels, and energies of the radiation(s) encountered [835.401(c)(2)]
- C. Appropriate for existing environmental conditions [835.401(c)(3)]
- D. Routinely tested for operability [835.401 (c)(4)]

D.1.14 Implementing Documents

The following documents implement the radiation protection program:

- *AMWTP Radiological Control Manual* and associated procedures
- *AMWTP As Low as Reasonably Achievable Plan*.



D.1A Radiation Protection Program (Operations Phase)

The purpose of the Advanced Mixed Waste Treatment Project (AMWTP) radiation protection program is to identify the program elements that establish an effective radiation protection program for AMWTP individuals. The AMWTP radiation protection program shall at all times conform to 10 CFR Part 835, *Occupational Radiation Protection*, and its amendments, and if a requirement of Part 835 is inadvertently omitted, the AMWTP radiation protection program shall be deemed to include by reference all provisions of Part 835. This radiation protection program is written to be a working management tool, as well as a means of demonstrating compliance with the requirements of 10 CFR Part 835.

This Radiation Protection Program is applicable to all areas of the AMWTP during the operations phase. The operations phase covers all aspects of phase III operations of AMWTP. The Radiation Protection Program for the project's preoperations phase is given as Section D.1 of this *AMWTP Environment, Safety, and Health Program Operating Plan* (ESHPOP).

No exemptions to the requirements of 10 CFR Part 835 have been requested in this radiation protection program. Subcontractors working at the AMWTP during the operations phase shall operate in accordance with this AMWTP radiation protection program, the *AMWTP Radiological Control Implementation Matrix*, and the associated implementing procedures. No person, including DOE individuals, shall take or cause to be taken any action inconsistent with the requirements of this radiation protection program, or any program, plan, schedule, or other process established by this radiation protection program. Nothing in this radiation protection program shall be construed as limiting actions necessary to protect health and safety [10 CFR 835.3].

An update of this radiation protection program will be submitted to DOE (a) whenever a change or addition to the radiation protection program is made, (b) before the initiation of a task outside the scope of this radiation protection program, or (c) within 180 days following changes to 10 CFR Part 835. In instances where changes to 10 CFR Part 835 are incorporated by reference (no modifications are required to the radiation protection program), BNFL Inc. will, within 180 days following changes to 10 CFR Part 835, notify DOE in writing that the changes have been incorporated by reference. Changes, additions, or updates to this radiation protection program may become effective without prior DOE approval only if the changes do not decrease the effectiveness of the program and the changed program continues to meet the requirements of 10 CFR 835 [835.101].

The programmatic requirements contained in this radiation protection program represent BNFL Inc.'s commitment to achieving excellence in radiation protection and maintaining radiation exposures as low as reasonably achievable (ALARA). Terms and words used in the radiation protection program are as defined in 10 CFR Part 835, unless otherwise noted or defined in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

This radiation protection program is a legally binding document between BNFL Inc. and DOE. Reference to AMWTP throughout this document refers to facilities where radioactive material or radiation generating devices are located within the Advanced Mixed Waste Treatment Facility, Transuranic Storage Area-Retrieval Enclosure, the Characterization Facility, and other buildings under BNFL Inc. control; the physical location of these facilities, and the individuals working at the facilities, all of which are the responsibility of BNFL Inc. The requirements in this radiation protection program are

implemented by the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

The purpose of the AMWTP is to treat the alpha low-level mixed waste and transuranic (TRU) waste currently stored in drums and boxes for final disposal. The facility has the capability to treat the specified INEEL waste streams, and the flexibility to treat other potential INEEL and DOE regional and national waste streams. The TRU waste product is to be suitable for disposal at the Waste Isolation Pilot Plant (WIPP).

D.1A.1 AMWTP Radiological Control Organization

- A. The AMWTP Radiological Control Organization provides relevant support to all areas of the AMWTP and is accountable to the AMWTP Radiological Control Manager. The Radiological Control Manager and the radiological control staff have a day-to-day reporting relationship with the Operations Manager to ensure that the Radiological Control Organization is fully integrated with Operations and Maintenance activities. However, to preserve an independent technical and oversight role, the Radiological Control Manager also has a direct reporting relationship to the AMWTP Environment, Safety, and Health Manager.
- B. AMWTP radiological control individuals monitor adherence to the Radiation Protection Program and *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures and provide for radiological support to the operations organization.

D.1A.1.1 AMWTP Management Commitment

The responsibility for compliance with radiological protection requirements, and for optimizing individual and collective doses, starts at the worker level and broadens as it progresses upward through the organization. AMWTP line managers are fully responsible for radiological performance among their personnel, and shall take necessary actions to ensure requirements are implemented and performance is monitored and corrected as necessary. As part of the commitment to the radiation protection program, AMWTP senior management ensures the following:

- A. Sound engineering techniques are used to reduce and to maintain occupational exposures in accordance with the ALARA methodology.
- B. Individuals are made aware of the commitment from management to maintain exposures ALARA. At a minimum, employees are informed as to what “as low as reasonably achievable” radiation exposure means, why it is a good policy, and how they can implement it while performing their jobs.
- C. Assessments are periodically conducted to determine how exposures might be reduced in accordance with the ALARA philosophy. This includes assessing design, operating, and maintenance procedures and past exposure records.
- D. A supervised and effective radiation protection capability with defined responsibilities exists at the AMWTP. All radiation protection individuals are trained and qualified commensurate with



the responsibilities of their position and the potential problems expected in the performance of their duties.

- E. Employees receive adequate training. Instruction of individuals is in accordance with 10 CFR Part 835, Subpart J.

D.1A.1.2 AMWTP Radiological Control Manager

- A. The AMWTP Radiological Control Manager has the designated responsibility for planning, administering, and maintaining the AMWTP radiation protection program. The AMWTP Radiological Control Manager ensures that the radiation protection program elements are appropriately implemented and maintained.

D.1A.2 Requirements

Table 1A in Appendix A (Requirements Tables) lists environment, safety, and health requirements for the radiation protection program (operations phase).

D.1A.3 Occupational As Low As Reasonably Achievable Program

BNFL Inc.'s ALARA policy is to reasonably limit radiation exposures to the lowest levels commensurate with the benefit of the work to be accomplished. AMWTP line management and all levels of the work force are committed to this policy. In addition to other functions, the AMWTP Safety Committee and the ALARA Subcommittee have been established to help ensure that BNFL Inc.'s ALARA policy is implemented. The *AMWTP ALARA Plan* implements the AMWTP ALARA program.

D.1A.3.1 Safety Committee and ALARA Subcommittee

The AMWTP Safety Committee includes individuals from management, operations, and the environment, safety, and health organization. For the operations phase, the AMWTP Operations Manager serves as the Chair of the Safety Committee.

The AMWTP Safety Committee has established the ALARA Subcommittee. During the operations phase, the ALARA Subcommittee is chaired by the Operations Manager or his designee and has members from the Radiological Control Department, the Operations and Maintenance Department, and the Industrial Safety/Industrial Hygiene Department. Specific functions of the AMWTP ALARA Subcommittee include the following:

- Issuing through the AMWTP Safety Committee of BNFL Inc. ALARA policy (835.101)
- Reviewing the training requirements to confirm that the ALARA process is appropriately included (835 subpart J)
- Performing ALARA reviews of facility design and proposed modifications (835.1001 and 835.1002)

- Planning to achieve ALARA for specific operations, including first-time and high-risk jobs (835.1003)
- Participating in the establishment of ALARA budgets and goals and of facility administrative control levels
- Reviewing the programs for, and the results of, audits and assessments on ALARA compliance and lessons learned (835.102)
- Ensuring records of compliance with ALARA policy and requirements are maintained (835.704).

The AMWTP ALARA Subcommittee reviews the following: administrative control levels, ALARA goals, and ALARA budget. Additionally, the ALARA Subcommittee routinely reviews relevant lessons learned from the AMWTP, DOE complex, and industry. The subcommittee also evaluates items such as construction and design of facilities and systems and planned major modifications or work activities.

As a minimum, the Safety Committee receives and reviews the results of programmatic internal and external reviews and audits (835.102). The committee is responsible for advising the Radiological Control Manager on the overall conduct of the radiation protection program.

D.1A.3.2 Assessments

Assessment is the process of providing independent feedback to line managers to indicate the adequacy of the radiation protection program. Inspections, audits, reviews, investigations, and self-assessments are part of the numerous checks and balances in the AMWTP radiation protection program. BNFL Inc. policy is to implement continuous improvement and appropriate response to internal and external audits through the *AMWTP Quality Assurance Program Plan*. Assessments of the radiation protection program are an integral part of the AMWTP Quality Assurance Program and integrated safety management. Internal audits will be conducted such that all the functional elements are reviewed no less than every 36 months.

D.1A.3.3 Administrative Control Levels and Dose Limits

BNFL Inc.'s objective is to maintain individual radiation doses well below regulatory limits. The numerical value of the administrative control level will be set initially based upon the calculated dose and then modified using historical dose information and the projected work load. To accomplish this objective, challenging numerical administrative control levels are established below the regulatory limits to administratively control and to help reduce individual and collective radiation doses. Unless otherwise indicated, administrative, lifetime, and special control levels and dose limits are stated in terms of the total effective dose equivalent, which is the sum of the effective dose equivalent (for external exposure) and the committed effective dose equivalent (for internal exposure).

BNFL Inc. is committed to establishing facility administrative control levels below the 5 rem/yr regulatory limit. These administrative control levels are approved by management and are included in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures. The AMWTP operations organization sets job-specific ALARA goals on a job-by-job basis.

D.1A.4 Radiological Standards

The following sections discuss occupational dose limits, contamination control, and posting.

D.1A.4.1 Occupational Dose Limits

The following sections discuss planned special exposures, emergency conditions, accidental overexposure, special control limits, member of public dose limit, and embryo/fetus dose controls.

- A. Occupational dose limits are provided in Table D.1A-1 [835.202(a)(1)-(4)]. All occupational doses received during the current year, except those resulting from planned special exposures and emergency exposures, are included when demonstrating compliance with Table D.1A-1 limits [835.202(b) & 702(d)]. Reasonable efforts are made to obtain complete records of prior years' occupational internal and external doses [835.702 (e)]. If formal records cannot be obtained, a written estimate signed by the individual may be accepted [835.702(d)]. The process for conducting a written dose estimate is defined in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.
- B. The occupational dose limits provided in Table D.1A-1 apply to all employees. Employees must successfully complete radiation worker training and pass an examination before unescorted access to any AMWTP radiological area.
- C. AMWTP policy is to not hire minors (835.207).

Table D.1A-1. Summary of occupational dose limits.

Type of exposure	Annual limit (rem)
Employee: total effective dose equivalent, (TEDE) [835.202(a)(1)]	5
Employee: lens of the eye (external) [835.202(a)(3)]	15
Employee: skin and extremities (external shallow dose) [835.202(a)(4)]	50
Employee: any organ or tissue (other than lens of eye) (internal + External) [835.202(a)(2)]	50
Declared pregnant worker: embryo/fetus (internal + external) [835.206(a)]	0.5 per gestation period

- D. Exposures from background radiation, from therapeutic and diagnostic medical procedures as a patient, or from medical research programs (while a subject) are not included in either individual radiation dose records or assessment of dose against the limits in Table D.1A-1 [835.202(c)].

- E. The total effective dose equivalent during a year is determined by summing the effective dose equivalent from external exposures and the committed effective dose equivalent from intakes during the year [835.203].
- F. Determinations of the effective dose equivalent are made using the weighting factor values provided in 10 CFR 835.2.
- G. Nonuniform exposures of the skin from x-rays, beta radiation, and/or radioactive material on the skin are assessed as in accordance with 10 CFR 835.205.
- H. Planned Special Exposures. A planned special exposure is a preplanned, infrequent exposure to radiation, separate from and in addition to the annual dose limits. Planned Special Exposures are not expected in the operations phase of AMWTP. If they are required, however, procedures will be written in accordance with 10 CFR 835.204
- I. Emergency Conditions. AMWTP emergency conditions are defined in ESHPOP Section 9 (Contingency/Emergency Planning and Response). Under emergency conditions where actions are necessary to protect life or save major property, individuals may receive doses that exceed the limits established in Table D.1A-1 [835.1301 & 1302]. If such emergency conditions occur, AMWTP adheres to the following requirements:
- Each individual authorized to perform emergency action must be trained in accordance with 10 CFR 835.901 and be briefed beforehand on the known or expected hazards to which the individual may be subjected [835.1302 (d)].
 - The risk of injury to those individuals involved in rescue and recovery operations is minimized through the use of preplanning and personal protective equipment (PPE) [835.1302 (a)].
 - Operating management weigh actual and potential risks to rescue and recover individuals against the benefits to be gained [835.1302 (b)].
 - No individual shall be required to perform a rescue action that might involve substantial personal risk [835.1302 (c)]
 - Operations after a dose was received in excess of the limits specified in 10 CFR 835.202, except those received in accordance with 10 CFR 835.204 (Planned Special Exposures), require prior approval from the AMWTP General Manager and the DOE-ID Operations Manager.
- J. Special Control Levels. Certain situations may require lower individualized exposure control levels. For example, a special control level would be appropriate for an individual undergoing radiation therapy. Such situations are evaluated on a case-by-case basis. The AMWTP General Manager, with advice from the AMWTP Radiological Control Manager, is responsible for establishing special control levels. The implementation of special control levels will not interfere with the individual's right to work.



- K. Member of the Public Dose Limit. Members of the public permitted access to the controlled area at AMWTP site are limited to a total effective dose equivalent of 0.1 rem in a year [835.208].
- L. Embryo/Fetus Dose Controls. Dose controls that affect embryos and fetuses are as follows:
- After a female employee voluntarily notifies BNFL Inc. in writing that she is pregnant, for the purposes of fetal/embryo protection, she is considered a declared pregnant worker. A declared pregnant worker may revoke this declaration, in writing, at any time [835.2(a)].
 - For a declared pregnant worker BNFL Inc. provides the option of a mutually agreeable assignment of work tasks, without loss of pay or promotional opportunity, such that further occupational radiation exposure is unlikely.
 - For a declared pregnant worker who chooses to continue work involving occupational exposure:
 - The dose limit for the embryo/fetus from conception to birth (entire gestation period) is 500 millirem from the sum of doses received from external sources, sources inside the mother, and sources inside the embryo/fetus [835.206(a)].
 - Measures are taken to avoid substantial variation above the uniform exposure rate necessary to meet the 500 millirem limit for the gestation period [835.206(b)]. In addition, efforts are made to avoid exceeding 50 millirem per month to the declared pregnant worker.
 - If the dose to the embryo/fetus is determined to have already exceeded 500 millirem when an employee notifies BNFL Inc. of her pregnancy, the employee is not assigned to tasks where additional occupational radiation exposure is likely during the remainder of the gestation period [835.206 (c)].

D.1A.4.2 Contamination Control

Work area monitoring for airborne radioactivity is in accordance with 10 CFR 835.403.

Control of radioactive contamination is achieved by using engineering controls, administrative controls, employee performance to contain contamination at the source, monitoring, minimizing the size of contaminated radiological areas, and by promptly decontaminating other areas that become contaminated.

Instruments and techniques used for radioactive contamination monitoring and control are adequate to ensure compliance with the requirements of 10 CFR 835.1102.

The primary emphasis of the AMWTP is on physical design features to contain radioactive contamination and to prevent airborne and surface contamination [835.1001(a)]. In addition to the provisions of this radiation protection program, *Guide of Good Practices for Occupational Radiological Protection in Plutonium Facilities* (DOE-STD-1128-98) and the DOE Standard on Radiological Control (DOE-STD-1098-99) is considered for guidance in preparing the *AMWTP Radiological Control Implementation*

Matrix and associated implementing procedures. These procedures provide specific guidance related to dosimetry, radiological monitoring, instrumentation, contamination control, and applicable radiological control procedures that are considered for AMWTP plutonium operations.

- A. AMWTP controls are implemented as necessary to prevent the spread of removable contamination outside of radiological areas under normal operating conditions [835.1101 (b)]. The extent of these controls depends on the type and level of contamination present and the activities in and around the area. The following measures are used to prevent the spread of contamination across the boundaries of contamination, high contamination, and airborne radioactivity areas:
- Use solid barriers to enclose areas wherever practicable.
 - Mark and secure items such as hoses and cords that cross the boundary to prevent safety hazards and the spread of contamination.
 - Control and direct airflow from areas of lesser to greater contamination.
 - Use engineering controls and confinement devices such as glovebags, gloveboxes, and tents.

Personal Protective Equipment and Clothing. Requirements affecting personal protective equipment and clothing, with respect to protection from exposure or contamination from radioactive material, are as follows:

- A. Individuals wear protective clothing during work in contamination and high contamination areas [835.1102 (e)] and during the following activities:
- Handling of contaminated materials with removable contamination in excess of Table D.1A-2 levels
 - Work in airborne radioactivity areas
 - Work in areas with posted requirements or with requirements specified by a permit to work (PTW) or an approved method of work (AMOW).
- B. Protective clothing designated for radiological control are
- Uniquely identified by color, symbol, or appropriate marking
 - Used only for radiological control purposes.
- C. General guidelines for protective clothing selection and use are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.



Table D.1A-2. Surface Contamination Values in dpm/100 cm² (used for identifying, posting, monitoring, and controlling surface contamination) (10 CFR Part 835 Appendix D).

Radionuclide ^a	Removable ^{b,c}	Total ^{b,d} (Fixed + Removable)
U-natural, U-235, U-238, and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac- 227, I-125, I-129	20 alpha	500 alpha
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200 alpha	1,000 alpha
Beta-gamma emitters (nuclides with decay modes other than emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90. ^e	1,000 beta-gamma	5,000 beta-gamma
Tritium and tritiated compounds ^f	10,000	NA

- a. The values in this table, with the exception noted in footnote e, apply to radioactive contamination deposited on, but not incorporated into the interior or matrix of, the contaminated item. Where contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for the alpha- and beta-gamma-emitting nuclides apply independently [10 CFR Part 835 Appendix. D, note 1].
- b. As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation [10 CFR Part 835 Appendix D, note 2].
- c. The amount of removable radioactive material per 100 cm² of surface area is determined by swiping the area with dry filter or soft absorbent paper while applying moderate pressure and then assessing the amount of radioactive material on the swipe with an appropriate instrument of known efficiency. For objects with a surface area less than 100 cm², the entire surface is swiped, and the activity per unit area is based on the actual surface area. Swiping techniques to measure removable contamination levels are not necessary if direct scan surveys indicate that the total residual contamination levels are below the values for removable contamination [10 CFR Part 835 Appendix. D, note 4].
- d. The levels may be averaged over 1 square meter provided the maximum activity in any area of 100 cm² is less than three times the values in this table. For purposes of averaging, any square meter of surface shall be considered to be above the surface contamination value if: (1) From measurements of a representative number of sections it is determined that the average contamination level exceeds the applicable value; or (2) it is determined that the sum of the activity of all isolated spots or particles in any 100 cm² area exceeds three times the applicable value [10 CFR Part 835 Appendix. D, note 3].
- e. This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr- 90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched [10 CFR Part 835 Appendix D, note 5].
- f. Tritium contamination may diffuse into the volume or matrix of materials. Evaluation of surface contamination shall consider the extent to which such contamination may migrate to the surface in order to ensure the surface contamination value provided in this appendix is not exceeded. Once this contamination migrates to the surface, it may be removable, not fixed; therefore, a "Total" value does not apply [10 CFR Part 835 Appendix D, note 6].

D. Guidance concerning use of respirators is contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.



Monitoring for Individual Contamination. Individuals exiting radiological areas established to control removable contamination and/or airborne radioactivity will perform appropriate monitoring to detect and prevent the spread of contamination. Requirements for monitoring individuals are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures [835.1102 (d)].

Contamination Control Levels. A surface is considered contaminated if either the removable or total radioactivity detected is above the levels in Table D.1A-2. Controls are implemented for these surfaces commensurate with the nature of the contaminant and level of contamination [835.1102 (b)]. Management and entry control of fixed contamination is in accordance with 10 CFR 835.1102 (c). The *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures contain additional detail regarding contamination control.

Airborne Radioactivity Control Levels. The derived air concentration (DAC) values in 10 CFR Part 835 Appendices A and C are used to control occupational exposures to airborne radioactive material [10 CFR 835.209]. Additional details regarding airborne radioactivity control levels are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

D.1A.4.3 Posting

The following sections discuss general posting provisions, radioactive material labeling in radiation areas, and posting contamination and airborne radioactivity areas [835.601 and 835.605]. Controlled areas are posted in accordance with 10 CFR 835.602, as specified in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

General Posting Provisions. General posting provisions are as follows:

- A. Radiological postings are intended to alert individuals to the presence of radiation and radioactive materials within confinement systems.
- B. Radiological areas are clearly and conspicuously posted [CFR 835.601(b)]. Postings of doors are such that the postings remain visible when doors are open or closed.
- C. Each access point to a controlled area is posted whenever radioactive materials or radiation fields that would require posting under radiation, contamination and airborne provisions may be present in the area.
- D. Detailed posting requirements are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

Radioactive Material Labeling

Items or containers of radioactive material, except those meeting the 10 CFR 835.606 exceptions to labeling requirements, bear a durable, clearly visible label bearing the standard radiation warning trefoil and the words "Caution, Radioactive Material" or "Danger, Radioactive Material." The label provides sufficient information to permit individuals handling, using, or working in the vicinity of the items or



containers to take precautions to avoid or control exposures. Details regarding radioactive material labeling are provided in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

Posting Radiation Areas. Areas are posted to alert individuals to the presence of external radiation in accordance with Table D.1A-3 and general posting provisions [10 CFR 835.601, 603]. Supplemental posting guidance is contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

Table D.1A-3. Criteria for posting radiation areas.^a

Area	Criteria	Required posting
Radiation area	> 0.005 rem in 1 h at 30 cm	"CAUTION, RADIATION AREA" [835.603(a)]
High radiation area	> 0.1 rem in 1 h at 30 cm	"CAUTION, HIGH RADIATION AREA" or "DANGER HIGH RADIATION AREA"[835.603(b)]
Very high radiation area	> 500 rad in 1 h at 1 m	"GRAVE DANGER, VERY HIGH RADIATION AREA" [835.603(c)]

a. Access requirements may be deleted or modified if personnel access is specifically prohibited.

Posting Contamination and Airborne Areas. Areas are posted to alert individuals to the presence (or potential presence) of surface contamination and airborne radioactivity in accordance with Table D.1A-4 and general posting provisions [835.1102 (c)(2) and 835.603]. Derived Air Concentration values found in 10 CFR Part 835 are used in posting airborne radioactivity areas in accordance with Table D.1A-4 [835.209(a)]. Supplemental posting guidance is contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

D.1A.5 Controlling Radiological Work

The primary methods used to control workplace exposures are physical design features [835.1001(a)]. AMWTP augments these physical design features through area entry/exit requirements to control access to and from radiological areas and permits to work or approved methods of work to control radiological



work [835.501(d) and 835.1003]. The *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures contain details regarding the control of radiological work, including the use of permits to work or approved methods of work, area entry/exit requirements, and monitoring and survey requirements.

Table D.1A-4. Criteria for posting contamination, high contamination, and airborne radioactivity areas.

Area	Criteria	Required posting
Contamination area	Removable contamination levels (dpm/100 cm ²) > Table D.1A-2 values but ≤ 100 x Table D.1A-2 values	"CAUTION, CONTAMINATION AREA" [835.603(e)]
High contamination area	Removable contamination levels (dpm/100 cm ²) > 100 x Table D.1A-2 values	"CAUTION HIGH CONTAMINATION AREA" or "DANGER, HIGH CONTAMINATION AREA" [835.603(f)]
Airborne radioactivity area	1. Airborne concentrations > the applicable derived air concentration (DAC) values given in 10 CFR 835 Appendix A or C; or 2. Individual without respiratory protection could receive > 12 DAC-hours in a week	"CAUTION, AIRBORNE RADIOACTIVITY AREA" [835.603(d)]

Proposed maintenance and modification plans are reviewed to identify and incorporate radiological protection requirements. AMWTP line management, with support and concurrence from the AMWTP Radiological Control Manager, is responsible for performing this review.

In addition, all AMWTP personnel have the authority and responsibility to stop work if unsafe work conditions are encountered, as specified in Section D.5 (Permission to Commence Operations, Stop Work Authority, and Restart).

D.1A.5.1 Permits to Work or Approved Methods of Work

The AMWTP permit to work or an approved method of work is an administrative mechanism used to establish radiological, industrial safety, and hazardous material controls for intended work activities. The permit to work or approved method of work informs employees of area radiological conditions and entry requirements and provides a mechanism to relate employee exposure to specific work activities. Each permit to work or approved method of work is written for the work being performed and includes required personnel protective equipment (PPE) and criteria for suspension of work.

D.1A.5.2 Entry and Exit Requirements

BNFL Inc. has established specific requirements for entering and exiting radiological control areas. These entry requirements are consistent with 10 CFR 835 Subpart F and are specified in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures. Radiation safety training commensurate with the hazards and required controls is required before unescorted access to radiological areas [835.901] is allowed. AMWTP minimum radiation control training guidelines are contained in Table D.1A-5. Specific training requirements are contained in AMWTP radiological worker training discussed in ESHPOP Section D.7 (Training and Qualification Program).

Table D.1A-5. Minimum radiological control training guidelines.

Activities	Minimum training	Frequency
Member of the public escorted entry into controlled areas	Radiological Orientation for Visitors	Monthly
Member of the public unescorted entry into controlled areas	General Employee Radiological Training	Biennial
Unescorted entry into controlled areas	General Employee Radiological Training	Biennial
Unescorted entry into posted radioactive material areas	Radiological Worker Training I	Biennial
Unescorted entry into radiation areas	Radiological Worker Training I	Biennial
Unescorted entry into contamination areas	Radiological Worker Training II	Biennial
Unescorted entry into high radiation areas	Radiological Worker Training II	Biennial



D.1A.5.3 Monitoring and Surveys

AMWTP workplace and individual monitoring is performed to (a) demonstrate compliance with the requirements of this radiation protection program, (b) document radiological conditions in the workplace, (c) detect changes in radiological conditions, (d) detect the gradual buildup of radioactive material in the workplace, (e) verify the effectiveness of engineering and process controls in containing radioactive material and reducing radiation exposure, and (f) identify and control potential sources of individual exposure to radiation and/or radioactive material [835.401(a)(f)].

Surveys for radiation, contamination, and airborne radioactive materials are performed as specified in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures and permits to work or approved methods of work.

The Advanced Mixed Waste Treatment Facility uses nuclear accident dosimeters [835.1304] capable of measuring the estimated neutron dose and approximate neutron spectrum from a criticality accident.

These dosimeters are in addition to the criticality monitoring system (in accordance with ANS/ANSI 8.3), the requirements for which are detailed in Section D.2 of this ESHPOP.

D.1A.6 Individual Monitoring

AMWTP provides the results of internal and external dose determinations to the organization responsible for maintaining INEEL historical dosimetry files (see ESHPOP Section D.11, Records and Reports). The following sections discuss AMWTP internal dosimetry and external dosimetry.

D.1A.6.1 Internal Dosimetry

- A. AMWTP obtains support for internal dosimetry from one or more facilities accredited by the DOE Laboratory Accreditation Program. These support functions include bioassay services, dose determinations (internal and external), dose record maintenance, and dose reporting. The contracts with these laboratories require services and records maintenance in accordance with 10 CFR Part 835. The AMWTP internal dose evaluation program, described in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures, is adequate to demonstrate compliance with 10 CFR 835.202 [835.402(d)].
- B. The following individuals participate in the AMWTP internal dosimetry program:
 - Radiological workers, identified by their occupation and work location, as likely to receive a committed effective dose equivalent of 100 millirem or more from all radionuclide intakes in a year [835.402(c)(1)].
 - Declared pregnant workers likely to receive intakes resulting in a dose equivalent to the embryo/fetus of 50 millirem or more during the gestation period [835.402(c)(2)].

- Members of the public who enter a controlled area and are likely to receive an intake resulting in a committed effective dose equivalent exceeding 50 millirem in a year [835.402(c)(3)].
- C. The estimation of internal dose is based on bioassay data rather than air concentration values unless one of the following conditions exists [835.209(b)]:
- Bioassay data are unavailable
 - Bioassay data are inadequate
 - Internal dose estimates based on air concentration values are demonstrated to be as accurate or more accurate than bioassay data.
- D. The *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures contain details of the bioassay program.

D.1A.6.2 External Dosimetry

AMWTP obtains support for external dosimetry from qualified contractors. These support functions include dosimeters and their processing, dose determinations, dose record maintenance, and dose reporting. The contracts require services and records maintenance in accordance with 10 CFR Part 835. These contractors are accredited by the DOE Laboratory Accreditation Program for personnel dosimetry.

External General Provisions. External dosimetry general provisions are as follows:

- A. AMWTP individual dosimetry is provided to and used by individuals based on the following thresholds:
- Individuals identified by their occupation and work location, as likely to receive a deep dose equivalent to any portion of the whole body of 100 millirem or more in a year or a dose equivalent to the extremities, or organs and other tissues (including lens of the eye and skin) of 10 percent or more of the corresponding limits specified in Table D.1A-1 [835.402(a)(1)]
 - Declared pregnant workers expected to receive from external sources a dose equivalent of 50 millirem or more to the embryo/fetus during the gestation period [835.402(a)(2)]
 - Members of the public likely to receive in 1 year, from external sources, a dose in excess of 50 millirem [835.402(a)(4)]
 - Individuals entering a high radiation area [835.402(a)(5)].
- B. Neutron dosimetry is provided when an individual is likely to exceed the applicable threshold just provided and is exposed to neutron radiation.
- C. The *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures contain details of the external dosimetry program.

D.1A.7 Radioactive Material

The following sections describe basic requirements for radioactive material, radioactive material labeling, packaging, and storage. Additional detail is contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

D.1A.7.1 Radioactive Material Requirements

Materials in contamination or airborne radioactivity areas are considered contaminated until surveyed and released. Any equipment or system component removed from a process area that may have had contact with radioactive material is considered contaminated until disassembled to the extent required to perform an adequate survey, surveyed, and shown to meet the criteria of Table D.1A-2. Details regarding release of materials from radiological areas are provided in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures [835.1101].

D.1A.7.2 Radioactive Material Packaging

- A. Radioactive material that is outside contamination or airborne radioactivity areas and is confirmed or suspected of having removable radioactive contamination levels greater than Table D.1A-2 values is securely wrapped in plastic or placed in a closed container.
- B. Details regarding radioactive material packaging are provided in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

D.1A.7.3 Radioactive Material Storage

Any accessible area in which radioactive material is used, handled, or stored shall be posted with the words "Caution Radioactive Material." The posting meets the requirements of 10 CFR 835 Subpart G. The following areas are exempt from the posting requirements:

- Areas, for periods of less than 8 continuous hours, when placed under continuous observation and control of an individual knowledgeable of, and empowered to implement, required access and exposure control measures.
- Areas when (1) posted in accordance with 10 CFR 835.603(a) through (f); or (2) each item or container of radioactive material is labeled in accordance with 10 CFR 835 Subpart G such that individuals entering the area are made aware of the hazard; or (3) the radioactive material of concern consists solely of structures or installed components that have been activated (i.e., such as by being exposed to neutron radiation or particles produced by an accelerator).
- Areas containing only packages received from radioactive material transportation labeled not degraded need not be posted in accordance with 10 CFR 835.603 until the packages are monitored in accordance with 10 CFR 835.405.

D.1A.7.4 Release of Radioactive Material to Controlled and Uncontrolled Areas

Once materials have entered radiological areas controlled for surface contamination or airborne radioactivity, evaluations of the potential for contamination of that material are required before releasing the material to controlled areas [835.1101]. Implementing requirements for releasing radioactive material to controlled areas are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures [835 Appendix D]. Equipment and Material releases to uncontrolled areas are conducted in accordance with DOE O 5400.5.

D.1A.7.5 Sealed Radioactive Source Controls

The policy of BNFL Inc. radiological operations is to control sealed radioactive sources so that they are used, handled, and stored in a manner commensurate with their radiological hazard. The *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures implement acquisition, receipt, labeling, storage, transfer, inventory, leak testing, and use of sealed radioactive sources [10 CFR 835 Subpart M].

D.1A.8 Radioactive Waste Management

Waste management is discussed in ESHPOP Section D.1A5 (Waste Management Program). The policy of BNFL Inc. radiological operations is to minimize the generation of radioactive waste. In general, AMWTP radioactive waste generation is minimized by the following:

- Segregating known uncontaminated from potentially contaminated waste
- Restricting material entering radiological areas to only those needed for performance of work
- Restricting the quantities of hazardous materials, such as paints, solvents, chemicals, cleaners, and fuels, entering radiological areas
- Substituting recyclable items in place of disposable ones and reuse of equipment when possible
- Maintaining an assortment of tools primarily for use in controlled contamination or airborne radioactivity areas.

D.1A.9 Design and Control

AMWTP design is controlled in accordance with 10 CFR 835 Subpart K. The following sections discuss radiological design criteria and control procedures.

D.1A.9.1 Radiological Design Criteria

BNFL Inc.'s design criteria is to limit radiological doses to employees to 20 percent of the values in 10 CFR 835.202 [10 CFR 835.1002(b)]. To control airborne radioactive material, the design objective under normal conditions, is to avoid releases to the work place atmosphere. In any situation, confinement and ventilation are normally used to control the inhalation of such material by workers to levels that are

ALARA [835.1002(c)]. The design or modification of a facility and the selection of materials includes features that facilitate operations, maintenance, decontamination, and decommissioning [10 CFR 835.1002(d)]. Optimization methods are used to ensure that occupational exposure is maintained ALARA in developing and justifying design and physical controls [835.1002(a)].

Radiological design criteria are included in the *AMWTP Project Design Criteria* document.

D.1A.9.2 Control Procedures

- A. Administrative control and procedural requirements are developed and implemented as necessary to supplement facility design features [835.1001(b)]. Administrative control procedures include such things as access control measures and permits to work or approved methods of work. These and other control procedures are written to implement the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.
- B. Written authorizations, including specific radiation protection measures, are used to control entry into and work within AMWTP radiological areas [835.501(d)].
- C. The AMWTP combination of design features and administrative control procedures ensure that during routine operation the Table D.1A-1 dose limits for radiological employees are met and that doses are ALARA [835.1003(a)(b)].

D.1A.10 Respiratory Protection

- A. AMWTP respiratory protection equipment includes respirators with particulate and/or gas-absorbing cartridges, supplied air respirators, self-contained breathing apparatus, and airline supplied air suits and hoods.
- B. BNFL Inc. requires that respiratory protection equipment selection be in accordance with 29 CFR 1910.134. Additional respiratory protection requirements are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures. In general the following shall apply:
 - Respirators are issued only to individuals who are trained, fitted, and medically qualified to wear the specific type of respirator.
 - Training and qualification testing is performed annually [29 CFR 1910.134].
 - Monitoring of airborne radioactivity shall be performed as necessary to characterize the airborne radioactivity hazard where respiratory protective devices for protection against airborne radionuclides have been prescribed [10 CFR 835.403(a)(2)].

D.1A.11 Records and Reporting

BNFL Inc.'s policy is to generate and maintain complete and accurate radiation protection records for the AMWTP facilities. Records are recorded and maintained in accordance with the requirements of



10 CFR 835.701, 10 CFR 835.702, 10 CFR 835.703 and 10 CFR 835.704. ESHPOP Section D.11 (Records and Reports) establishes the AMWTP records management program. Radiological Records generated in accordance with this radiological records program will be retained until final disposition is authorized by DOE in accordance with 10 CFR 835.701(b).

Reports to individuals are formatted in accordance with and contain the data required by 10 CFR 835 Subpart I. AMWTP uses these records (a) to help ensure that individuals are prevented from receiving unnecessary radiation exposure, (b) to make these records available as prescribed by the *Privacy Act of 1974*, and (c) to use these records to document compliance with 10 CFR 835 [835.701(a)]. These records are also used for (a) evaluation of the effectiveness of the radiation protection program, (b) demonstration of compliance with regulations and requirements, and (c) defense of the radiation protection program against unwarranted litigation.

BNFL Inc. maintains dose records sufficient to evaluate compliance with all applicable dose limits and monitoring and reporting requirements [835.702(c)(1) & (2)]. Requirements for maintaining employee radiological control records are contained in ESHPOP Section D.11 (Records and Reports). In addition BNFL provides records of individual exposures to the appropriate INEEL Radiation and Dosimetry Records organization on an ongoing and timely basis.

BNFL Inc. is responsible for the production and distribution of reports to individuals as specified in 10 CFR 835 Subpart I. As a minimum, BNFL Inc. provides exposure reports to individuals under the following conditions:

- Upon the request from an individual terminating employment, records of exposure are provided to that individual as soon as the data are available, but not later than 90 days after termination [835.801(b)]
- If requested, a written estimate of radiation dose based on available information at the time of termination is provided [835.801 (b)]
- Annual radiation dose reports to individuals [835.801 (c)]
- If requested, detailed exposure information [835.801 (c)]
- Reports to individuals when BNFL Inc. is required to report to DOE pursuant to (a) occurrence reporting or (b) planned special exposures [835.801 (e) and 835.204 (e)].

D.1A.11.1 General Provisions

- A. Where radiological services (for example, dosimetry and laboratory analyses) are purchased, there is a clear agreement regarding records responsibility during performance of the service.
- B. Detailed information concerning an individual's exposure is made available to that individual, upon request, consistent with the *Privacy Act of 1974*, which contains requirements to protect the privacy of individual records [835.702(f) and 801(d)].

- C. Unless otherwise specified, radiological control records shall use the special units of curie, roentgen, rad, and rem, including multiples of these units [835.4]. Use of the international system of units (becquerel, gray, and sievert) should be limited to calculational, scientific, or reference purposes.
- D. AMWTP forwards a copy of the assay or dosimetry results to the appropriate INEEL Radiation and Dosimetry Records Organization.

D.1A.12 Radiation Safety Training

- A. AMWTP radiological control training is commensurate with the employee's duties. AMWTP radiation training is performed to meet the requirements of 10 CFR 835 Subpart J (Radiation Safety Training).
- B. AMWTP uses DOE standardized core courses to the extent practicable and supplements these with AMWTP site-specific information. These standardized core courses are referred to as General Employee Radiological Training, Radiological Worker Training I and II, and Radiological Control Technician Training. Table D.1A-5 (Section D.1A.5) lists minimum training guidelines.
- C. The AMWTP facility-specific instruction is commensurate with the nature of the activities performed at the facility and includes special instructions in plutonium waste handling to ensure adequate radiation safety. The AMWTP training requirements are contained in ESHPOP Section D.7 (Training and Qualification Program).

D.1A.13 Instrumentation Calibration

The AMWTP radiation protection program uses support functions from other contractors that meet *AMWTP Quality Assurance Program Plan* calibration requirements. These support functions include calibration and maintenance of health physics instrumentation. The contracts require services and records maintenance in accordance with 10 CFR Part 835. AMWTP uses commercially available radiological instrumentation where practical.

In general, instruments used for monitoring and contamination control are

- A. Maintained and calibrated on an established frequency [835.401(b)(1)]
- B. Appropriate for the type(s), levels, and energies of the radiation(s) encountered [835.401(c)(2)]
- C. Appropriate for existing environmental conditions [835.401(c)(3)]
- D. Routinely tested for operability [835.401 (c)(4)]

D.1A.14 Implementing Documents

The following documents implement the radiation protection program:



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- *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures
- *AMWTP As Low as Reasonably Achievable Plan*



D.2 Nuclear Criticality Controls

D.2.1 Introduction

This section details the Advanced Mixed Waste Treatment Project (AMWTP) nuclear criticality safety program. The purpose of the program is to ensure that sufficient controls are in place to adequately reduce the potential of an inadvertent criticality as a result of retrieving and characterizing waste, transporting waste to the Advanced Mixed Waste Treatment Facility (AMWTF), processing waste, and loading the product for transport from the INEEL.

D.2.2 Requirements^a

Table 2 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for nuclear criticality controls. The requirements to be met for the criticality safety program are contained in the following documents:

- ◆ **10 CFR 835.1304, "Nuclear Accident Dosimetry."**
- ◆ **DOE O 420.1, 'Facility Safety', October 1995, criticality safety sections only (This document requires that the following ANSI/ANS Standards be adhered to, however some of the standards as detailed below are not relevant to AMWTP, hence the requirements within those standards are not included in this program):-**
 - **ANSI/ANS-8.1-1998, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors"**
 - **ANSI/ANS-8.3-1997, "Criticality Accident Alarm System"**
 - *ANSI/ANS-8.5-1986, "Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material" (NOT APPLICABLE)*
 - *ANSI/ANS-8.6-1983,R88, "Safety in Conducting Sub-critical Neutron-Multiplication Measurements in Situ," (NOT APPLICABLE)*
 - **ANSI/ANS-8.7-1998, "Guide for Nuclear Criticality Safety in the Storage of Fissile Materials"**
 - *ANSI/ANS-8.9-1987, "Nuclear Criticality Safety Criteria for Steel-Pipe Intersections Containing Aqueous Solutions of Fissile Materials" (NOT APPLICABLE)*
 - *ANSI/ANS-8.10-1983,R88, "Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement" (NOT APPLICABLE)*
 - **ANSI/ANS-8.12-1987,R93, "Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors"**

^a Note that in Section J of the AMWTP contract, DOE O 5480.24 is listed as a mandatory requirement pending codification, to be included in ESHPOP. This Order has been superseded by DOE O 420.1, which is the basis of this section of the ESHPOP. DOE O 5480.24 will be removed from the contract at the next modification, hence it is not included as a requirement in this section.

- **ANSI/ANS-8.15-1981,R87, "Nuclear Criticality Control of Special Actinide Elements"**
- *ANSI/ANS-8.17-1984,R89, "Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors," (NOT APPLICABLE)*
- **ANSI/ANS-8.19-1996, "Administrative Practices for Nuclear Criticality Safety"**
- *ANSI/ANS-8.21-1995, "Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors." (NOT APPLICABLE)*

D.2.3 Fissile Material Considerations

Generally, containers and plant areas containing fissile bearing waste will only contain a few grams of fissile material in the form of contamination. This amount is significantly less than the minimum critical mass of not less than 620 fissile gram equivalent (FGE) Pu-239 (see Figure 10 of LANL, 1996). Additionally, any fissile material is usually present in a form that is far from optimum in terms of the following:

- Moderation
- Reflection
- Geometry
- Likely presence of neutron absorbing materials (e.g., polyvinyl chloride or steel).

Given that the material will likely be far from optimized, the minimum critical mass of 620 FGE Pu-239 is very conservative. In reality before the potential for a criticality exists, at least twice this minimum critical mass would need to accumulate, if not more (BNFL, 2001a). Even so, because of the large quantities of waste, the total quantity of fissile material being handled is significantly greater than a critical mass. Thus, criticality analyses have been performed and appropriate controls defined to ensure that, under normal conditions and potential contingency conditions, a criticality is extremely unlikely.

D.2.4 Nuclear Criticality Safety Program Philosophy

The AMWTP retrieves transuranic and alpha low-level mixed waste from the Transuranic Storage Area Retrieval Enclosure (TSA-RE) and the Type II storage modules. The waste is characterized, processed, and prepared for shipment in a transuranic package transporter-II (TRUPACT-II) (or other approved transport container) to the DOE Waste Isolation Pilot Plant (WIPP). During retrieval operations, containers are removed from the existing storage array and maintained in a planer array before assay.

To establish the basis of criticality safety for AMWTF operations, the *AMWTP Waste Acceptance Criteria* (DOE-ID, 1996a) limits the incoming fissile content to a maximum of 200 FGE Pu-239 per 55-gallon drum (or larger drum, e.g., 55-gallon drum in an 83-gallon overpack) or 325 FGE Pu-239 per waste box. Criticality safety of the AMWTP product is established by satisfying TRUPACT-II loading requirements and fissile mass limits from the *WIPP Waste Acceptance Criteria* (DOE, 1999c).



Loading requirements for the TRUPACT-II are specified in the documented safety analysis for the TRUPACT-II shipping package (Westinghouse, 1999). As specified in that documented safety analysis, a TRUPACT-II container may be transported only if the FGE Pu-239 plus two times the uncertainty in determining the fissile gram equivalent is below 200 grams per 55-gallon drum, 325 grams per standard waste box, and 325 grams per TRUPACT-II. (Note: Other limits, e.g., decay heat, also apply)

Key areas within the AMWTF are controlled on a fissile mass basis. These area mass limits are set to less than the minimum safely sub-critical mass and on consideration of the fissile properties of the material will remain safe in the event of double batching.

The purpose of this AMWTF nuclear criticality safety program is to ensure that criticality safety is addressed and reviewed with the goal of ensuring that adequate margins of criticality safety are demonstrable for normal and credible abnormal operations. At any given time, the quantities and concentrations of fissile materials (primarily Pu-239) in the AMWTF are typically low. Conservative criticality safety evaluations are performed to evaluate criticality hazards in the AMWTF. Similar evaluations are performed to evaluate criticality hazards during retrieval, characterization, storage, and transport within AMWTF areas.

The criticality safety evaluations include demonstrable margins of safety that conservatively account for uncertainties in the following:

- The process and storage conditions (e.g., quantity of fissile material, moderation)
- The data and methods used in the criticality safety evaluation.

D.2.5 Criticality Safety Evaluations

The AMWTF criticality safety program is based on the criticality safety evaluations performed for the AMWTF documented safety analysis. All criticality safety evaluations for AMWTF processes are performed and reviewed by competent analysts. The criticality safety evaluations, which conform to the requirements given in Appendix A (Requirements Tables), are prepared using the guidance presented in DOE Standard STD-3007-93, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities*. These evaluations demonstrate that operations involving fissionable materials are subcritical under both normal and credible abnormal conditions. The criticality safety evaluations are summarized in the AMWTF documented safety analysis.

The following specific items related to criticality control are included in the criticality safety evaluations or associated documentation:

- A description, using appropriate sketches or drawings, of equipment and facilities in which the hazard of criticality exists showing dimensions in sufficient detail to permit the evaluation of the limits and controls intended to prevent inadvertent criticality.
- A statement of the quantities of fissionable material allowed in each step of the process. Nuclear Material Safety Limits and Criticality Working Requirements are established for certain operations on the basis of the results of the criticality safety evaluations.



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- A description of the methods for collecting, handling, and transporting products from each process area or individual operation and evaluation of the nuclear safety of these methods.
- A description of the assay techniques used to determine the quantities of fissionable material contained in the incoming waste containers.
- A description of the controls used to prevent criticality resulting from the accumulation of fissionable materials in the process areas.
- A description of the systems used for controlling fissile mass quantities throughout the AMWTF.

The *Basis of Interim Operations, Transuranic Storage Area Retrieval Enclosure (TSA-RE) Stewardship and Construction Activities* has been approved to facilitate BNFL Inc. ownership of waste within TSA-RE in order to allow modifications to the building to take place in preparation for retrieval operations. During the phase in which the BIO applies, no movement of any fissile material is expected to occur. Because movement of the waste is not intended and criticality is considered to be incredible given the nature of the waste, a full criticality safety program as detailed in this section was not implemented. The BIO, however, contains its own criticality safety program.

D.2.6 Criticality Safety Program

The purpose of the criticality safety program is to ensure that appropriate actions are taken to prevent and mitigate the consequences of a criticality accident. The program identifies the following:

- Nuclear Operations management responsibilities
- Facility/Operations Management responsibilities
- BNFL Inc. criticality safety staff responsibilities
- Process analysis and control
- Criticality safety review and assessment
- Criticality accident emergency response
- Criticality safety principles and criteria
- Criticality accident detection system
- Criticality safety training
- Firefighting.

Requirements and recommendations in this program are based on the requirements detailed in Appendix A (Requirements Tables). Following each requirement and recommendation in this section is a reference in parentheses listing the source document(s). The word "shall" denotes a requirement, the word "should" denotes a recommendation, and the word "may" denotes permission, neither a requirement nor a recommendation. To conform with this section, all operations will be performed in accordance with its requirements but not necessarily with its recommendations. When recommendations are not implemented, justification shall be documented. This applies to the criticality program as detailed in ANS 8.1.

D.2.6.1 Nuclear Operations Management Responsibilities



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- D.2.6.1.1 Nuclear Operations Management shall establish a criticality safety program that applies to fissile materials that pose a criticality accident hazard. (DOE O 420.1 4.3.2.a)
- D.2.6.1.2 Nuclear Operations Management shall establish a criticality safety program that applies to fissile materials that are produced, processed, stored, transferred, disposed, or otherwise handled in such a manner that the probability of a criticality accident is acceptably low. (DOE O 420.1 4.3 and 4.3.2-1) (ANS 8.19 4.1-2)
- D.2.6.1.3 Nuclear Operations Management shall establish a criticality safety program that ensures (to the extent practicable) the public, workers, property (both government and private), the environment, and essential operations are protected from the effects of a criticality accident. (DOE O 420.1 4.3.2-2)
- D.2.6.1.4 Nuclear Operations Management should ensure the criticality safety program is assigned importance in a manner compatible with all other safety disciplines and is not compromised by production, schedule, or other functions. (ANS 8.1 4.1.1-2) (ANS 8.19 4.3-2)
- D.2.6.1.5 Nuclear Operations Management shall establish a criticality safety program that provides personnel skilled in the physics pertinent to criticality safety. These personnel shall, to the extent practicable, be administratively independent of process supervision. (ANS 8.1 4.1.1-4 and 4.1.1-5) (ANS 8.19 4.4-1 and 4.4-2)
- D.2.6.1.6 Nuclear Operations Management shall establish a criticality safety program that includes nuclear *criticality safety* analysis (see definition in Section D.2.7) for normal and credible abnormal conditions documenting the parameters, limits, and controls required to ensure that the analyzed conditions are subcritical. (DOE O 420.1 4.3.1(i))
- D.2.6.1.7 Nuclear Operations Management shall assign, delegate, and accept overall responsibility for criticality safety. (ANS 8.1 4.1.1-1) (ANS 8.19 4.1-1 and 4.3-1)
- D.2.6.1.8 Nuclear Operations Management shall ensure that the criticality safety program is documented. (DOE O 420.1 4.3.1-4)
- D.2.6.1.9 Nuclear Operations Management shall establish a means for monitoring the effectiveness of the criticality safety program through periodic assessments. (DOE O 420.1 4.3.1-4) (ANS 8.19 4.5)
- D.2.6.1.10 Nuclear Operations Management shall periodically participate in auditing the overall effectiveness of the nuclear criticality safety program. (ANS 8.19 4.6)

D.2.6.2 Facility/Operations Management Responsibilities

- D.2.6.2.1 Facility/Operations management shall accept responsibility for the criticality safety of operations. (ANS 8.19 5.1)



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- D.2.6.2.2 Operations shall be reviewed by facility/operations management (at least annually) to ascertain that procedures are being followed. (ANS 8.7 4.1.3) (ANS 8.19 7.8-1)
- D.2.6.2.3 Methods of storage, control and operational practices approved by facility/operations management shall be described in written procedures. (ANS 8.7 4.1.2-1)
- D.2.6.2.4 Facility/operations management shall be knowledgeable in those aspects of criticality safety relevant to the operation and participate in the development of the *safety analysis* (see definition in Section D.2.7) for the facility. (ANS 8.19 5.2-1 and 5.4-1)
- D.2.6.2.5 Facility/operations management shall ensure that personnel are trained on, and require that they have an understanding of, criticality safety procedures and considerations (see Section D.2.6.9). (ANS 8.1 4.1.1-3 and 4. 1.3-2) (ANS 8.7 4.1.2-2) (ANS 8.19 5.3-1 and 5.6)
- D.2.6.2.6 Facility/operations management shall verify that new or modified equipment is covered by the authorization basis before it is used. (ANS 8.19 5.5)

D.2.6.3 BNFL Inc. Criticality Safety Staff Responsibilities

- D.2.6.3.1 The criticality safety staff shall document the requirements and recommendations for the BNFL Inc. criticality safety program by developing, issuing and maintaining this section of the Environment, Safety, and Health Program Operating Plan (ESHPOP). (ANS 8.1 4.1.1-6) (ANS 8.19 4.2)
- D.2.6.3.2 The criticality safety staff shall perform reviews of equipment and process designs, safety analyses and operating procedures. (ANS 8.19 6.1)
- D.2.6.3.3 The criticality safety staff shall document and validate criticality safety evaluations per DOE-STD-3007-93 to ensure sufficient detail and clarity exists to allow independent judgment of results. (ANS 8.19 8.3)
- D.2.6.3.4 The criticality safety staff shall maintain familiarity in criticality safety standards, guides and codes. (ANS 8.19 6.2-1,6.2-2 and 6.3)
- D.2.6.3.5 The criticality safety staff shall maintain familiarity with operations that require criticality safety controls. (ANS 8.19 6.4)
- D.2.6.3.6 The criticality safety staff shall assist Facility/Operations Management as requested in training personnel. (ANS 8.19 5.2-2 and 6.5)
- D.2.6.3.7 The criticality safety staff shall examine reports of criticality safety procedural violations and other deficiencies for possible improvement, and report findings. (ANS 8.19 6.7)
- D.2.6.3.8 The criticality safety staff shall validate criticality safety *calculational methods* (see definition in Section D.2.7) in accordance with ANSI/ANS 8.1 and as follows:

- Limits for the processing, handling and storage of fissile material shall be based on experimental data or the results of *validated computational techniques* (see definition in Section D.2.7). (ANS 8.1 4.2.5) (ANS 8.7 4.2.1)
- *Bias* (see definition in Section D.2.7.) shall be established by comparing criticality experiments with results obtained for systems by the method being validated. (ANS 8.1 4.3.1-1)
- Where the extension in the area of applicability is large, the method should be supplemented by other calculational methods to provide a better estimate of the bias. (ANS 8.1 4.3.2)
- A margin in the correlating parameter (operating limit) shall be prescribed that is sufficient to ensure subcriticality. (ANS 8.1 4.3.3-1)
- The margin of subcriticality shall include allowances for the uncertainty in the bias and for uncertainties caused by any extensions of the area(s) of applicability. (ANS 8.1 4.3.3-2)
- If the calculational method involves a computer program, checks shall be performed to confirm that the mathematical operations are performed as intended. (ANS 8.1 4.3.4-1)
- Changes in the computer program shall be followed by reconfirmation that the mathematical operations are performed as intended. (ANS 8.1 4.3.4-2)
- Validation of criticality safety calculational methods shall be documented and describe the following: (ANS 8.1 4.3 .6):
 - A. The calculational method with sufficient detail and clarity to allow independent duplication of results
 - B. Computer programs used, the options, cross section sets and any numerical parameters necessary to describe the input
 - C. The experimental data and parameters
 - D. The bias and the area(s) of applicability.



D.2.6.4 Process Analysis and Control

- D.2.6.4.1 Safety analysis shall document that the entire process will be subcritical under both normal and credible abnormal conditions before transferring fissile material or starting a new operation (including an existing operation that has been changed). (ANS 8.1 4.1.2-1) (ANS 8.19 8.1) (DOE O 420.1 4.3.1-1)
- D.2.6.4.2 An independent assessment shall confirm the adequacy of the criticality safety analysis before starting a new operation. (ANS 8.19 8.4)
- D.2.6.4.3 The safety analysis shall determine and identify the *controlled parameters* (see definition in Section D.2.7.) and limits upon which criticality safety depends (see Section D.2.6.7). (ANS 8.1 4.1.2-2 and 4.2.1) (ANS 8.19 8.2-1)
- D.2.6.4.4 The safety analysis shall be sufficient to determine the effect of changes in the controlled parameters, i.e., the margin of safety or in the conditions to which they apply. (ANS 8.19 8.2-2)
- D.2.6.4.5 Safety analysis shall evaluate the criticality accident hazard and document the controls necessary to mitigate consequences to personnel and property. (DOE O 420.1 4.3.1-2)
- D.2.6.4.6 New or revised safety analyses impacting criticality safety shall be reviewed by the criticality safety staff. (ANS 8.19 7.5)
- D.2.6.4.7 The handling, processing, and storage of fissile materials shall be controlled by operating procedures. (ANS 8.1 4.1.4-1) (ANS 8.19 9.1)
- D.2.6.4.8 Access to areas where fissile material is handled, processed or stored shall be controlled. (ANS 8.7 4.1.4) (ANS 8.19 9.4)
- D.2.6.4.9 Material labeling, where practicable, that enhances the safe handling and storage of fissile materials shall be used. (ANS 8.1 4.1.4-2) (ANS 8.19 9.2)
- D.2.6.4.10 Procedures shall include all controls and limits specified in the criticality safety analysis. (ANS 8.1 4.1.3-3) (ANS 8.19 7.2-1 and 9.5) (DOE O 420.1 4.3.1.(ii))
- D.2.6.4.11 Procedures shall be such that no single, inadvertent departure from a procedure can cause a criticality accident. (ANS 8.19 7.2-2)
- D.2.6.4.12 Active procedures shall be reviewed periodically and revised as necessary. (ANS 8.19 7.3 and 7.4)
- D.2.6.4.13 Procedures shall be supplemented with posted criticality safety limits when the safety analysis determines these postings are an aid to operations. (ANS 8.7 4.1.2-3) (ANS 8.19 7.6)
- D.2.6.4.14 Procedures and postings should be organized for convenient use by operators. (ANS 8.19 7.1-1 and 7.1-2)



D.2.6.4.15 Procedural violations and process conditions outside the authorization basis shall be reported to facility/operations management and the criticality safety staff and investigated promptly. (ANS 8.1 4.1.5-1) (ANS 8.19 7.7-1)

D.2.6.4.16 Action to prevent a recurrence of violations and process conditions outside the authorization basis, shall be taken. (ANS 8.1 4.1.5-2) (ANS 8.19 7.7-2)

D.2.6.5 Criticality Safety Review and Assessment

D.2.6.5.1 An annual review shall be performed in consultation with operations by the criticality safety staff to ascertain that process conditions have not been altered so as to affect the criticality safety evaluations. (ANS 8.1 4.1.6-1 and 4. 1.6-2) (ANS 8.19 7.8-2 and 7.8-3) (DOE O 420.1 4.3.1(iii))

D.2.6.5.2 The criticality safety staff shall conduct or participate in assessments and audits that involve criticality safety as directed by management. (ANS 8.19 6.6)

D.2.6.5.3 Operations to which nuclear criticality safety is pertinent shall be governed by written procedures. (ANS 8.1 4.1.3-1)

D.2.6.5.4 Supervisors shall develop or participate in the development of written procedures applicable to the operations under their control. (ANS 8.19 5.4-1)

D.2.6.6 Criticality Accident Emergency Response

D.2.6.6.1 Emergency procedures shall be prepared and approved by Facility/Operations Management. (ANS 8.1 4.1.7-1) (ANS 8.19 10.2-1)

D.2.6.6.2 Emergency procedures shall include instructions regarding response to criticality alarm signals. (ANS 8.3 7.1)

D.2.6.6.3 Emergency procedures shall clearly designate evacuation routes. (ANS 8.19 10.3-1)

D.2.6.6.4 Evacuation routes shall be posted and follow the quickest and most direct routes to avoid recognized areas of higher risk to minimize radiation exposure to evacuating personnel. (ANS 8.19 10.3-2 and 10.3-3)

D.2.6.6.5 Personnel accountability during evacuation shall be established. (ANS 8.19 10.4-2)

D.2.6.6.6 Personnel assembly stations shall be designated. (ANS 8.19 10.4-1)

D.2.6.6.7 Personnel shall be trained in evacuation procedures. (ANS 8.19 10.5-1)

D.2.6.6.8 Evacuation procedures shall include provisions for visitors. (ANS 8.19 10.5-2)

D.2.6.6.9 Evacuation drills shall be performed at least annually. (ANS 8.19 10.5-3)



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- D.2.6.6.10 Evacuation drills shall be announced in advance. (ANS 8.19 10.5-4)
- D.2.6.6.11 Organizations, local and offsite, that are expected to respond and provide assistance at emergencies shall be made aware of conditions that might be encountered. (ANS 8.1 4.1.7-2) (ANS 8.19 10.2-2)
- D.2.6.6.12 Assistance to local and offsite organizations in preparing emergency response procedures should be provided as necessary. (ANS 8.1 4.1.7-3) (ANS 8.19 10.2-3)
- D.2.6.6.13 Emergency response plans shall include the care and treatment of injured, exposed, and contaminated personnel. (ANS 8.19 10.6-1 and 10.6-2)
- D.2.6.6.14 Plans shall include a program for immediate identification of exposed personnel that includes the use of personnel dosimetry. (ANS 8.19 10.7)
- D.2.6.6.15 If a criticality accident occurs, procedures and instrumentation shall be provided for determining radiation levels at the evacuated and assembly areas. (ANS 8.19 10.8-1)
- D.2.6.6.16 During emergencies, radiation level information should be correlated at a central control point. (ANS 8.19 10.8-2)
- D.2.6.6.17 Emergency response procedures shall include organization of response teams and re-entry requirements. (ANS 8.19 10.9)

D.2.6.7 Criticality Safety Principles and Criteria

D.2.6.7.1 Contingency Principle

1. Process design and controls shall be established such that at least two unlikely, independent and concurrent changes (contingencies) in system conditions are required before a criticality accident is possible. (DOE O 420.1 4.3.2.d.(1)-1) (ANS 8.1 4.2.2).
2. Protection against accidental criticality shall be provided by either the control of two independent process parameters (which is the preferred approach, if practical) or a system of multiple (at least two) controls on a single parameter. (DOE O 420.1 4.3.2 .d.(1)-2)
3. The number of controls required upon a single controlled process parameter shall be based upon control reliability and any features that mitigate the consequences of control failure.(DOE O 420.1 4.3.2.d(1)-3)
4. In all instances, no single credible event or failure shall result in a criticality accident. (ANS 8.1 4.1.3-4) (DOE O 420.1 4.3.1-3 and 4.3.2.d.(1)-4)
5. The basis used to demonstrate that no single event can result in a criticality accident shall be documented. (DOE O 420.1 4.3.2.d.(1)-5)

D.2.6.7.2 General Criteria

1. Where a significant quantity of fissile material is being processed and criticality safety is a concern, passive engineered controls such as geometry control shall be considered as a preferred control method. (**DOE O 420.1** 4.3.2.d.(2)-1) (**ANS 8.1** 4.2.3-1) (**ANS 8.7** 4.2.4)
2. Where passive engineered control is not feasible, the preferred order of controls is active engineered controls, followed by administrative controls. (**DOE O 420.1** 4.3.2.d.(2)-2)
3. The double *contingency* (see definition in Section D.2.7) analysis shall justify the chosen controls. (**DOE O 420.1** 4.3.2 .d.(2)-3)
4. Process equipment used in areas where immediate evacuation is required to protect personnel shall be designed or controlled such that leaving equipment will not introduce significant risk. (**ANS 8.3** 4.1.2)
5. A monitoring and surveillance program shall be established, where applicable, to prevent and detect accumulation of fissile materials in, but not limited to, process equipment and storage, pipe and ventilation systems. (**DOE O 420.1** 4.3.2.i.)
6. Single and multi-parameter limits of ANSI/ANS 8.15 for special actinides shall be used according to the requirements specified in sections 5 and 6 of ANSI/ANS 8.15. (**ANS 8.15** 5. and 6.)
7. Single parameter limits listed in ANSI/ANS 8.1 shall be used according to the requirements specified in sections 5 and 6 of ANSI/ANS 8.1. (**ANS 8.1** 5.-1, 5.-2 and 6.)
8. Subcritical limits for mixtures of plutonium and uranium in ANSI/ANS 8.12 shall be used according to sections 5 and 6 of ANSI/ANS 8.12. (**ANS 8.12** 5. and 6.)

D.2.6.7.3 Criticality Safety Parameters

1. All dimensions, nuclear properties, and other features that are relied on shall be documented and verified before beginning operations and control exercised to maintain them. (**DOE O 420.1** 4.3.2.d.(2)-4) (**ANS 8.1** 4.2.3-2)

Fixed and soluble neutron absorbers are not used by the AMWTP, hence the requirements are not repeated in this program.

D.2.6.7.4 Fissile Material Storage and Transport

1. Storage facilities and structures shall be designed, fabricated, and maintained in accordance with good engineering practices. (**ANS 8.7** 4.2.2,4.2.3 and 4.2.5)
2. Combustible materials should be controlled within fissile material storage and handling areas. (**ANS 8.7** 4.2.6-1)
3. Fire protection systems shall be installed in fissile material storage and handling areas where combustion hazards exist. (**ANS 8.7** 4.2.6-2)

4. Containers of fissile materials shall be designed to prevent the unsafe accumulation of water in areas with water fire suppression systems. (ANS 8.7 4.2.7)
5. Where water fire suppression systems are used in fissile material storage areas, consideration shall be given to the possibility of a criticality occurring in an accumulation of runoff water. (ANS 8.7 4.2.8)
6. Good housekeeping within fissile material storage and handling areas shall be incorporated as an important part of criticality safety practices. (ANS 8.7 4.2.10)
7. Fissile material storage and handling area mass limits listed in ANSI/ANS 8.7 shall be used according to the requirements specified in Sections 5 and 6 of ANSI/ANS 8.7. (ANS 8.7 5 -6)

D.2.6.8 Criticality Accident Detection System

D.2.6.8.1 Criticality Alarm System Applicability

1. The nuclear criticality safety program shall include an assessment of the need for criticality accident detection devices and alarm systems, and the installation of such equipment where total risk to personnel will be reduced. (DOE O 420.14.3.1.(iv)) (ANS 8.3 4.2.1-1 and 4.2.1-2)
2. Criticality alarm systems and criticality detection systems coverage shall be required as follows: (DOE O 420.1 4.3.2.e). [NOTE: In what follows, 1×10^{-6} per year is used as a measure of credibility and does not mean that a probabilistic risk assessment (PRA) has to be performed. Reasonable grounds for incredibility may be presented on the basis of commonly accepted engineering judgment.]

In those instances where the mass of fissile material exceeds 700 grams of U-235, 520 grams of U-233, 450 grams of Pu-239, or 450 grams of any combination of these three isotopes and the probability of criticality is greater than 1×10^{-6} per year (as documented in a DOE-approved *documented safety analyses* (see definition in Section D.2.7), a criticality alarm system meeting ANSI/ANS-8.3 shall be provided to cover occupied areas in which the expected dose exceeds 12 rads in free air, where a criticality alarm system is defined to include a criticality accident detection device and a personnel evacuation alarm. (DOE O 420.1 4.3.2.e.(1))

In those instances where the mass of fissile material exceeds 700 grams of U-235, 520 grams of U-233, 450 grams of Pu-239, or 450 grams of any combination of these three isotopes and the probability of criticality is greater than 1×10^{-6} per year (as documented in a DOE-approved *documented safety analyses*), but there are no occupied areas in which the expected dose exceeds 12 rads in free air, a criticality detection system shall be provided where a criticality detection system is defined to be an appropriate criticality accident detection device but without an immediate evacuation alarm. The criticality accident detection system response time should be sufficient to allow for appropriate process-related mitigation, recovery actions, and minimization of personnel exposure. (DOE O 420.1 4.3.2.e.(2))



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In those instances where the mass of fissile material exceeds 700 grams of U-235, 520 grams of U-233, 450 grams of Pu-239, or 450 grams of any combination of these three isotopes, but a criticality accident is determined to be impossible because of the physical form of the fissile material or the probability of occurrence is determined to be less than 1×10^{-6} per year (as documented in a DOE-approved documented safety analyses), neither a criticality alarm system nor a criticality detection system is required. Neither a criticality alarm system nor a criticality detection system is required for fissile material during the shipment of fissile material packaged in approved shipping containers awaiting transport, provided no other operation involving fissile material not so packaged is permitted in the area. **(DOE O 420.1 4.3.2.e.(3))**

If a criticality accident is possible wherein a slow (i.e., quasistatic) increase in reactivity could occur leading from subcriticality to supercriticality to self-shutdown without setting off emplaced criticality alarms, then a criticality alarm system might not be adequate to protect against the consequences of such an accident. To help protect workers against the consequences of slow criticality accidents in facilities where analysis has shown such accidents are credible, criticality alarm systems should be supplemented by warning devices, such as audible personnel dosimeters (e.g., pocket chirpers/flashers or their equivalents), area radiation monitors, area dosimeters or integrating criticality alarm systems. **(DOE O 420.1 4.3.2.e.(4))**

D.2.6.8.2 Alarm Requirements

1. Where alarm systems are installed, emergency plans shall be maintained. **(ANS 8.3 4.1.1)**.
2. Criticality alarm signals shall be for prompt evacuation or other protective actions. **(ANS 8.3 4.3.1-1)**
3. The mode of detection and alarm systems should be uniform for each operation. **(ANS 8.3 4.3.1-2)**
4. The signals shall be distinctive from other signals or alarms that require a response different from that necessary in the event of a criticality accident. **(ANS 8.3 4.3 .1-3)**
5. For all occupied areas where personnel protective action is required, the number and placement of criticality alarm signal generators shall be such that the signals are adequate to notify personnel promptly throughout those areas. **(ANS 8.3 4.3 .5)**
6. The audio generators should produce an overall sound pressure level of at least 75 dB, but not less than 10 dB above the maximum ambient noise level typical of each area for which audio coverage is to be provided. **(ANS 8.3 4.3 .6)**
7. The signal generators should not produce an A-weighted sound level in excess of 115 dB (referenced to 20 $\mu\text{N}/\text{m}^2$) at the ear of an individual. **(ANS 8.3 4.3.7)**
8. In areas with very high audio background or mandatory hearing protection, visual signals or other alarm means should be considered. **(ANS 8.3 4.3 .8)**

9. The signal-generating system(s) shall be automatically and promptly actuated upon detection of a criticality accident. (ANS 8.3 4.3 .2)
10. The alarm trip point shall be set high enough to minimize the probability of an alarm from sources other than a criticality. (ANS 8.3 5.7.2-1)
11. The alarm trip point shall be set low enough to detect the *minimum accident of concern*(see definition in Section D.2.7). (ANS 8.3 5.7.2-2)
12. After actuation, the signal generators shall continue to function as required by emergency procedures. (ANS 8.3 4.3 .3-1)
13. Manual alarm resets with limited access, should be provided outside the areas to be evacuated. (ANS 8.3 4.3 .3-2)
14. All components of the system should be located or protected to minimize damage from fire, explosion, corrosive atmosphere, or other extreme conditions. (ANS 8.3 5.2-1)

D.2.6.8.3 Dependability/Reliability

1. Alarm system(s) shall be designed and operated to detect a criticality and minimize false alarms. (ANS 8.3 4.1.3,4.2.3 and 4.4.1-1)
2. In redundant systems, failure of any single channel shall not prevent compliance with the detection criterion. (ANS 8.3 4.4.1-2)
3. The system shall be sufficiently robust as to actuate the alarm signal when exposed to the maximum radiation expected. (ANS 8.3 4.4.4)
4. Alarm systems shall be designed for high reliability and the design should be as simple as is consistent with the single objective of reliable activation of the alarm. (ANS 8.3 5.1-1 and 5.1-3)
5. The system should be designed to minimize the effects of non-use, deterioration, power surges and other adverse conditions. (ANS 8.3 5.12)
6. The system should be designed to minimize the potential for failure, including false alarm, due to human error. (ANS 8.3 5.2-2)
7. Major system components should be labeled. (ANS 8.3 5.2-3)
8. *Process areas* (see definition in Section D.2.7) in which activities will continue during a power outage shall have emergency power supplies for alarm systems or such activities shall be monitored continuously with portable instruments. (ANS 8.3 4.4.3)
9. Where portable instruments are used, the usage shall be evaluated to determine appropriate criteria of this standard (ANSI/ANS 8.3). (ANS 8.3 4.4.2-1 and 6.5-2)

10. Criteria for use of portable instruments shall be specified in procedures. (ANS 8.3 4.4.2-2)
11. Alarm systems should remain operational in the event of seismic shock equivalent to the site specific design basis earthquake or the equivalent value specified by the Uniform Building Code. (ANS 8.3 5.3)
12. A visible or audible warning signal should be provided at some normally occupied location, to indicate system malfunction or the loss of primary power. (ANS 8.3 5.4)
13. Criticality alarm systems shall be designed to respond immediately to the minimum accident of concern. (For this purpose, in areas where material is handled or processed, the minimum accident may be assumed to deliver the equivalent of an absorbed dose rate in free air of 0.2 Gy/min [20 rad/min] at 2 meters.) (ANS 8.3 5.6-1)
14. The basis for a different minimum accident of concern shall be documented. (ANS 8.3 5.6-2)
15. The alarm system shall be designed to produce the desired evacuation signal within one-half second of recognition of a criticality accident. (ANS 8.3 5.5)
16. Alarm systems shall be designed so that instrument response and alarm latching shall occur as a result of transients of 1 ms duration. (ANS 8.3 5.7.1)
17. The location and spacing of detectors should be chosen to avoid the effect of shielding by massive equipment or materials. (ANS 8.3 5.8-2)
18. The spacing of detectors shall be consistent with the selected alarm trip point and with the detection criterion. (ANS 8.3 5.8-1)

D.2.6.8.4 Testing

1. Procedures for system testing shall minimize false alarms and inadvertent initiation of emergency response. (ANS 8.3 6.6-1)
2. The alarm system shall be returned to operating conditions immediately following tests. (ANS 8.3 6.6-2)
3. Initial tests, inspections and checks of the alarm system shall verify that the fabrication and installation were made in accordance with design plans and specifications. (ANS 8.3 6.1)
4. Following significant modification or repair to an alarm system, there shall be tests and checks equivalent to the initial installation tests. (ANS 8.3 6.2)
5. Alarm system response to radiation shall be measured periodically to confirm continuing instrument performance. (ANS 8.3 6.3-1)

6. The alarm system test interval should be determined on the basis of experience; however, in the absence of experience the tests should be performed at least monthly. (ANS 8.3 6.3-2 and 6.3-3)
7. Records of alarm system tests and corrective actions shall be maintained. (ANS 8.3 6.3-4 and 6.7)
8. The entire alarm system shall be tested periodically. (ANS 8.3 6.4-1)
9. Each signal generator should be tested at least annually. (ANS 8.3 6.4-2)
10. Field observations shall establish that the alarm signal is audible above background throughout all areas to be evacuated. (ANS 8.3 6.4-3)
11. All personnel in affected areas shall be notified in advance of an audible alarm system test. (ANS 8.3 6.4-4)
12. When alarm system tests reveal inadequate performance, corrective action shall be taken without unnecessary delay. (ANS 8.3 6.5-1)

D.2.6.9 Criticality Safety Training

- D.2.6.9.1 Each employee's criticality safety training record shall be documented and retained for a minimum of four years. (ANS 8.19 5.3-2)
- D.2.6.9.2 Criticality safety training shall make each individual, regardless of position, aware that nuclear criticality safety in their work area is their responsibility. (ANS 8.19 4.3-3)

D.2.6.10 Firefighting

- D.2.6.10.1 Firefighting guidelines shall be based on comparisons of the risks and consequences of postulated fires for the respective area(s). (DOE O 420.1 4.3.2k.-1)
- D.2.6.10.2 Facility fire suppression restrictions shall be documented in the documented safety analysis. (DOE O 420.1 4.3.2k.-2)

D.2.7 Definitions

Bias A measure of the systematic disagreement between the results calculated by a method and experimental data.

Bias uncertainty The uncertainty in the bias is interpreted as a measure of both the accuracy of the calculation and the precision of the experimental data. Bias uncertainty is assumed also to include (a) the precision of the calculation if the calculation is stochastic (notwithstanding that such precision often can be made as great as desired) and

	(b) the accuracy of the experimental data if the experiment is a mock -up of a referenced system.
<i>Calculational method</i>	The mathematical equations, approximations, assumptions, associated numerical parameters (e.g., cross sections), and calculational procedures that yield the calculated results.
<i>Contingency</i>	A possible but unlikely change in a condition/control important to the nuclear criticality safety of a fissile material operation that would, if it occurred, reduce the number of barriers (either administrative or physical) that are intended to prevent an accidental nuclear criticality.
<i>Controlled parameter</i>	A parameter that is kept within specified limits and, when varied, influences the margin of subcriticality.
<i>Criticality accident</i>	The release of energy as a result of accidentally producing a self-sustaining or divergent neutron chain reaction.
<i>Criticality safety</i>	Protection against the consequences of an inadvertent nuclear chain reaction, preferably by prevention of the reaction. This encompasses procedures, training and other precautions, in addition to physical protection.
<i>Effective multiplication factor (k_{eff})</i>	The ratio of the total number of neutrons produced during a time interval (excluding neutrons produced by sources whose strengths are not a function of fission rate) to the total number of neutrons lost by absorption and leakage during the same interval.
<i>Fissile material</i>	Materials containing nuclides capable of a fission chain reaction (e.g., Pu-239, U-235, etc.)
<i>Hazard</i>	A source of danger (i.e., material, energy source or operation) with the potential to cause illness, injury or death to personnel or damage to a facility or to the environment (without regard for the likelihood or credibility of accident scenarios or consequence mitigation) .
<i>Minimum accident of concern</i>	The smallest accident a criticality alarm system is required to detect.
<i>Process area</i>	An area in which fissile material is handled, stored, or processed.
<i>Safety analysis</i>	A documented process (a) to provide systematic identification of hazards within a given DOE operation, (b) to describe and analyze the adequacy of the measures taken to eliminate, control or



mitigate identified hazards, and (c) to analyze and evaluate potential accidents and their associated risks.

Documented safety analysis (DSA) The report that documents the adequacy of safety analysis for a nuclear facility to demonstrate that the facility can be constructed, operated, maintained, shut down and decommissioned safely and in compliance with applicable laws and regulations.

D.2.8 Criticality Detection and Alarm Systems

In accordance with the requirements of this section, criticality detection systems are located in each area of the AMWTF where the probability of a criticality incident is determined to be greater than or equal to 1×10^{-6} per year or where a criticality incident cannot be shown to be incredible. Criticality alarm systems are located in specific areas within the AMWTF and announce the alarm signal both inside and outside the AMWTF. Areas are also equipped with fixed nuclear accident dosimeters.

If a criticality incident occurs, AMWTP has interface agreements with the INEEL dosimetry group and analysis laboratory for immediate processing of personal and fixed nuclear accident dosimeters and for processing special bioassay samples (DOE-ID, 2000a). As required by 10 CFR 835.1304, *Nuclear Accident Dosimetry*, nuclear accident dosimeters are immediately processed to help calculate dose rates in various AMWTP locations. Bioassays are conducted on an as-needed basis to determine if internal contamination of personnel has occurred.

D.2.9 Implementing Documents

The following documents implement the AMWTP criticality safety program:

- AMWTP criticality safety procedures.
- AMWTP criticality implementation matrix(s)
- *AMWTP Training Implementation Matrix.*



D.3. Safety Analysis Process

D.3.1 Introduction

The safety analysis process for the Advanced Mixed Waste Treatment Project (AMWTP) is developed incorporating the necessary requirements to provide a level of safety assurance for workers and the public, which is also acceptable to regulators.

The purpose and objectives of the safety analysis process are as follows:

1. To define the safety basis and commitments for design, procurement, construction, and operation
2. To support management and safety oversight of the AMWTP. To provide a uniform, up-to-date reference on facility safety with which to plan, budget, and manage nuclear operations
3. To provide the primary reference on facility safety for use by project management and oversight personnel
4. To document the safety bases for and commitments to the control of supporting operations.

D.3.2 Requirements

Table 3 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for the safety analysis process.

10 CFR 830.204(a) requires that DOE approve the methodology to be used for the development of the documented safety analysis. Appendix A to 10 CFR 830 establishes DOE-STD-3009-94, *Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports*, as one of the “safe harbors” for the development of a documented safety analysis that would meet the requirements of Subpart B, “Safety Basis Requirements,” of 10 CFR 830, *Nuclear Safety Management*. BNFL intends to develop the documented safety analysis for the AMWTP in accordance with this particular “safe harbor.” DOE-STD-3009-94 indicates that the documented safety analysis is not intended to address those hazards and risks considered standard industrial hazards, unless they initiate or exacerbate a radiological release. Accordingly, programs that address general conventional safety considerations, would fall within the overall project authorization basis. This would include any environmental protection matters beyond those required by Section 3.3.2.3.4 “Environmental Protection,” p. 47 of DOE-STD-3009-94. DOE-ID Order ID O 420.D Attachment III specifies INEEL accident evaluation guidelines for determination of AMWTP safety structures, systems, and components (SSCs) and technical safety requirements.

The AMWTP Technical Safety Requirements (TSRs), derived as part of the safety analysis process, include operational controls and mitigative measures to limit exposure to workers, the public, and the environment in accordance with the requirements of 10 CFR Part 830; 10 CFR Part 835, *Occupational Radiation Protection*, 29 CFR Part 1910, *Occupational Safety and Health Standards*; 29 Part CFR 1926, *Safety and Health Regulations for Construction*; 40 CFR Part 302, *Designation, Reportable Quantities, and Notification*; and 40 CFR Part 355, *Emergency Planning and Notification*.



D.3.3 Graded Approach

A graded approach is required by 10 CFR 830.7, which specifies that a contractor must use a graded approach to implement the requirements of 10 CFR Part 830, document the basis of the graded approach used, and submit that documentation to DOE. As defined in 10 CFR 830.3, graded approach means the process of ensuring that the level of analysis, documentation, and actions used to comply with a requirement in 10 CFR Part 830 is commensurate with the following:

1. The relative importance to safety, safeguards, and security
2. The magnitude of any hazard involved
3. The life cycle stage of a facility
4. The programmatic mission of a facility
5. The particular characteristics of a facility
6. The relative importance of radiological and nonradiological hazards
7. Any other relevant factor.

The graded approach is used to eliminate unproductive or unnecessary features or activities that add to the costs of implementation, narrow the envelope of permissible operation, or make the facility management unnecessarily ponderous or burdensome. BNFL Inc. documents the basis of the graded approach used and submits that documentation to DOE.

The graded approach is applied during all phases of the AMWTP safety analysis process to ensure that safety objectives are achieved in an innovative and cost-effective manner. However, the graded approach does not relieve management from the obligation to maintain and operate the AMWTP safely. As directed by 10 CFR 830.7, the graded approach is not applied to the development of TSRs or the unreviewed safety question (USQ) process.

D.3.4 AMWTP Safety Basis

In accordance with 10 CFR 830.202, BNFL Inc. is responsible for establishing and maintaining the safety basis for the AMWTP. The safety basis for the AMWTP is the documented safety analysis and hazard controls that provide reasonable assurance that the AMWTP can be operated safely in a manner that adequately protects workers, the public, and the environment.

The preliminary safety basis for the AMWTP was established by the *AMWTP Preliminary Safety Analysis Report* (PSAR) (BNFL, 1999) which was approved by DOE in June 1999. The AMWTP PSAR served as the principal safety basis for the decision by management and regulators to authorize procurement and construction of the AMWTP facilities (Phase II, construction and preoperational testing). Construction of the AMWTP facilities began in August 2000. The AMWTP PSAR satisfies the following requirements of 10 CFR 830.202:

1. Defines the scope of the work to be performed by the AMWTP
2. Identifies and analyzes the hazards associated with the work



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3. Categorizes the AMWTP as a Hazard Category 2 facility based on the methodology in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*
4. Documents the preliminary safety analysis for the AMWTP using the methodology of DOE-STD-3009
5. Establishes preliminary hazard controls upon which BNFL Inc. will rely to ensure adequate protection of workers, the public, and the environment.

The accident analysis documented in the preliminary safety analysis report provided the basis for designating candidate safety structures, systems, and components. Natural phenomena events that could potentially initiate accidents were considered in the accident analysis according to the requirements in DOE O 420.1, *Facility Safety*, and guidance in related DOE standards for natural phenomena hazards mitigation (see Section D.3.12).

The preliminary safety analysis report also served as the process hazards analysis for construction as required by 29 CFR Part 1926 (see Section D.3.11). The AMWTP PSAR was developed and approved by DOE before the new rule was codified. Because construction at the AMWTP began before December 11, 2000, BNFL Inc. was not required to formally submit a preliminary documented safety analysis under 10 CFR 830.206. The PSAR, however, meets the intent of a preliminary documented safety analysis. The PSAR covered the entire project scope, including waste retrieval, stewardship, storage, characterization, treatment, and shipping. The result of this preliminary assessment is that AMWTP is classified as a Hazard Category 2 nuclear facility. No distinction was made between buildings or areas within the AMWTP complex and no segmentation of buildings or areas was developed.

The products of the safety analysis process have been the following:

- ***AMWTP Preliminary Safety Analysis Report***, which documents the safety basis during Phase I (permitting) and Phase II (construction and preoperational testing), including the final hazard assessment and categorization, an Occupational Safety and Health Administration (OSHA) process hazards analysis for construction, and candidate TSRs governing facility parameters important to the safety basis. The *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999) was approved by BNFL Inc. management and DOE-ID before procurement and construction began.
- ***Unreviewed Safety Question (USQ) Procedure*** (BNFL, 2001), which is used during operations to determine when DOE approval must be obtained before implementing changes to (a) facilities, (b) implementing procedures and documented safety analysis, or (c) proposed tests and experiments at these facilities. The USQ procedure is also used when potential inadequacies in the safety analysis are discovered to determine if a safety evaluation is required.
- ***AMWTP Basis for Interim Operations for the Transuranic Storage Area Retrieval Enclosure Stewardship and Construction Activities (TSA-RE BIO)***, which was prepared at the request of DOE during Phase II (construction and preoperational testing). The TSA-RE BIO documents the interim safety basis during Phase II under which BNFL Inc. assumes custody of the TSA-RE and



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performs waste stewardship and construction activities to prepare the facility for waste retrieval operations. The TSA-RE BIO was approved by BNFL Inc. management and DOE-ID before BNFL Inc. assumed custody of the facility and began construction activities.

During Phase II of the AMWTP, 10 CFR 830, Subpart B, *Safety Basis Requirements*, became codified with an effective date of April 10, 2001. Introduced with this requirement were a revised set of requirements, together with a revised set of concepts and definitions including the terms “safety basis” and “documented safety analysis.”

The term “safety basis” includes the documented safety analysis and hazard controls that provide reasonable assurance that a DOE nuclear facility can be operated safely in a manner that adequately protects workers, the public, and the environment. The AMWTP safety basis encompasses the documented safety analysis, the TSRs, and any facility-specific commitments made to comply with DOE requirements, the DOE safety evaluation reports (SERs), and the USQ process.

The term “documented safety analysis” means a documented analysis of the extent to which a nuclear facility can be operated safely with respect to workers, the public, and the environment, including a description of the conditions, safe boundaries, and hazard controls that provide the basis for ensuring safety.

With this in mind, BNFL Inc. proposes to produce and implement a revised set of documents to support Phase III (operations and Hazardous Waste Management Act (HWMA) closure). The products of this safety analysis process are the following:

- ***AMWTP Documented Safety Analysis (Final Safety Analysis Report)***, which documents the safety basis during Phase III beginning with the start of Retrieval Operations. This final safety analysis report will be equivalent to the documented safety analysis as required by 10 CFR 830, and will be approved by BNFL Inc. line management and DOE-ID before operations may begin. At least one known major revision will be made to the final safety analysis report for Retrieval Operations when the safety basis for the Advanced Mixed Waste Treatment Facility is added. At this point, the safety basis for the entire AMWTP will be contained in the AMWTP Documented Safety Analysis.
- ***AMWTP Technical Safety Requirements***, which document the limits, controls, and related actions that establish the specific parameters and requisite actions for the safe operation of AMWTP nuclear facilities. The technical safety requirements are based on the work and hazards in the approved documented safety analysis and are approved by BNFL Inc. management and DOE-ID before operations may begin.
- ***Unreviewed Safety Question (USQ) Evaluations***, which screen proposed changes to nuclear facilities, their implementing procedures and safety analysis documents, and proposed tests and experiments at these facilities. These evaluations are also used to screen and discoveries of potential inadequacies in the safety analysis for these facilities to determine if a safety evaluation is required.



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- ***Authorization Basis Supplement (AB)***, which will document those additional requirements of environmental, general, and construction safety measures not within the scope of the documented safety analysis. Specific commitments that might impact or limit operations will be identified.
- ***Authorization Agreement (AA)***, which will establish the general terms and conditions agreed upon by BNFL Inc. and DOE for the authorization of operations of the AMWTP.

The AMWTP safety basis documentation will be reviewed annually and updated if necessary. Any annual update will be submitted to DOE for approval.

As buildings and areas of the AMWTP become operational they will be incorporated into the AMWTP documented safety analysis as appropriate. By April 10, 2003, BNFL Inc. is required to submit for DOE approval a safety basis that meets the requirements of 10 CFR 830 Subpart B.

D.3.5 DOE Safety Evaluation Report

DOE review and approval of the AMWTP documented safety analysis will be contained in safety evaluation reports issued by DOE pursuant to 10 CFR 830.207(d). The DOE safety evaluation report may include additional requirements that become part of the AMWTP safety basis.

D.3.6 Safety Basis Maintenance

The *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999), which has been approved by DOE, will be reviewed at least annually to determine if any facility changes have adversely affected the safety basis approved by DOE until such time as the documented safety analysis is approved by DOE. In general, changes in design that differ from that described in the PSAR are reviewed in accordance with the *AMWTP Quality Assurance Program Plan and Program Quality Procedures*. The USQ process is not applied to the AMWTP PSAR. The final design being developed during Phase II (construction and preoperational testing) and the operations regime being adopted will be incorporated into the final documented safety analysis.

Following approval by DOE, the final documented safety analysis is reviewed at least annually (and no later than 15 months shall elapse between each review cycle). The documented safety analysis will be updated as necessary and submitted to DOE for approval to ensure that the information remains current as the facility changes or is modified. The annual update is due on the anniversary of the original submittal. Any unreviewed safety question review or material in support of these approvals is considered an addendum to the documented safety analysis until the information is incorporated into the documented safety analysis as part of the next update.

During operations, any changes approved by DOE, including positive USQ resolution, are treated as immediately effective addenda to the documented safety analysis before that information is formally incorporated into the next update. Positive USQ resolutions (which have been approved by DOE) will be included in the DSA annual update, up to 6 months prior to submission of this update to DOE. Maintenance of the AMWTP safety basis includes incorporation of any changes, conditions, or hazard controls directed by DOE.



D.3.7 Unreviewed Safety Question (USQ) Process

BNFL Inc. is responsible for establishing, implementing, and taking actions consistent with a USQ process that meets the requirements of 10 CFR 830.203. The concept of the USQ process was established to allow physical and procedural changes and to conduct tests and experiments without prior DOE approval, as long as these changes do not explicitly or implicitly affect the safety basis of the facility. The USQ process provides the flexibility needed to conduct day-to-day operations. Those issues with a potential impact on the safety basis are brought to the attention of management and regulators—thus maintaining the proper safety focus.

The AMWTP Unreviewed Safety Question determination procedure (BNFL, 2001b) was submitted to DOE for approval before April 10, 2001, as required by 10 CFR 830.203(b). DOE approved the procedure on April 13, 2001. The AMWTP Unreviewed Safety Question determination procedure is implemented in the following situations

- Temporary or permanent change in the facility as described in the existing documented safety analysis
- Temporary or permanent change in the procedures as described in the existing documented safety analysis
- Test or experiment not described in the existing documented safety analysis
- Potential inadequacy of the documented safety analysis because the analysis potentially may not be bounding or may be otherwise inadequate

The USQ process requires safety evaluations for changes to the documented safety analysis and facility safety procedures. This includes alterations to the design, function, or method of performing the function of a safety structure, system, or component described in the documented safety analysis either by text, drawing, or other information relied upon for the safety basis. Screening criteria are identified in the AMWTP Unreviewed Safety Question determination procedure (BNFL, 2001b) for change evaluation and are in accordance with DOE Order 5480.21, *Unreviewed Safety Question*, and DOE G 424.X, *Draft Implementation Guide for Addressing Unreviewed Safety Question (USQ) Requirements*.

As required by 10 CFR 830.203(e), BNFL Inc. must obtain DOE approval before taking any action determined by the USQ determination process to be a positive USQ. BNFL Inc. must submit to DOE an annual summary of the USQ determinations performed since the prior submission in accordance with 10 CFR 830.203(f).

As required by 10 CFR 830.203(g), if BNFL Inc. discovers or is made aware of a potential inadequacy of the documented safety analysis, it must do the following:

1. Take action, as appropriate, to place or maintain the facility in a safe condition until an evaluation of the safety of the situation is completed
2. Notify DOE of the situation



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3. Perform a USQ determination and notify DOE promptly of the results
4. Submit the evaluation of the safety of the situation to DOE before removing any operational restrictions initiated to meet Item 1 of this list.

DOE personnel responsible for review and approval of documented safety analysis and USQ resolutions are allowed reasonable access to AMWTP facilities and safety analysis documentation.

D.3.8 Technical Safety Requirements

As required by 10 CFR 830.205(a) and DOE Order 5480.22, *Technical Safety Requirements*, BNFL Inc. is responsible for developing technical safety requirements that are derived from the documented safety analysis. These requirements define the conditions, safe boundaries, and the management or administrative controls necessary to the safe operation of a nuclear facility and to reduce the potential risk to the public and facility workers from uncontrolled releases of radioactive materials or from radiation exposures from an inadvertent criticality. Preliminary or candidate technical safety requirements are derived in the preliminary safety analysis report process during AMWTP Phase I (permitting). The AMWTP technical safety requirements are fully developed, finalized, and approved along with the documented safety analysis during Phase II (construction and preoperational testing) as part of the safety basis for the project.

Before use, BNFL Inc. must obtain DOE approval of technical safety requirements and any change to technical safety requirements (10 CFR 830.205(a)(2)). BNFL Inc. shall notify DOE of any violation of a technical safety requirement (10 CFR 830.205(a)(3)).

In the development of set points, limits, staffing requirements, and other parameters for consideration in the technical safety requirements, the documented safety analysis serves as the source document. The requirements are derived from the accidents analyzed in the documented safety analysis, including maximum credible releases of radioactive and other hazardous materials, criticality scenarios, and the accidental releases anticipated during the lifetime of the facility.

The accident analysis yields parameters for defining the operational limits necessary to ensure that facility operation is maintained within the bounds assumed in the analysis. Each technical safety requirement specifies the following:

- A clear, concise, quantified requirement
- The facility operating mode the requirement applies to (i.e., operation, shutdown, standby, repair, etc.)
- The surveillance requirements to verify that the requirement is met
- The actions to be taken to put the facility in a safe condition if the requirement is violated
- The technical basis for the requirement.



BNFL Inc. may take emergency actions that depart from an approved technical safety requirement when no actions consistent with the technical safety requirement are immediately apparent, and when these actions are needed to protect workers, the public or the environment from imminent and significant harm. Such actions must be approved by a person in authority as designated in the technical safety requirements. BNFL Inc. must report the emergency actions to DOE as soon as practicable (10 CFR 830.205(b)).

Technical safety requirements are kept current throughout the life cycle of the AMWTP. Additional guidance for technical safety requirements is provided in DOE G 423.X-X, *Draft Implementation Guide for Use in Developing Technical Safety Requirements (TSRs)*.

D.3.9 Basis for Classification of Structures, Systems, and Components

DOE has established evaluation guideline values for use (exclusively) in classifying structures, systems, and components (SSCs) with respect to their safety importance. The national DOE evaluation guideline value in DOE-STD-3009-94, Appendix A, is 25 rem radiation exposure to a member of the offsite public. As this value is applied to the classification of SSCs, if a structure, system, or component is necessary to meet the evaluation guideline value, than it must be classified as a safety-class SSC.

In addition, DOE-ID has established supplementary evaluation guideline values for the classification of safety SSCs, as shown in Table D.3-1. These values are consistent with the guideline value that DOE has established nationally and govern the AMWTP. Events with estimated frequencies beyond those associated with the “extremely unlikely” category (that is, less likely than once in a million years) are “beyond extremely unlikely,” assumed to be incredible, and therefore, beyond those that need to be considered in the design process.

The structures, systems, and components within the AMWTP will be classified to ensure that important items are recognized and accordingly given appropriate care and control. Structures, systems, and components within the AMWTP will be classified into the following safety SSC categories:

- Safety class
- Safety significant
- Other equipment important to safety.

Safety-Class Structures, Systems, and Components means those SSCs, including portions of process systems, whose preventative or mitigative function(s) are necessary to limit radioactive hazardous material exposure to the public, as determined from the safety analysis (10 CFR 830.3). This means that any SSC that is necessary to limit radiological exposures during a potential accident to the offsite public to the evaluation guideline values shown in Table D.3-1 would be classified as a safety-class SSC. Safety-class SSCs are identified during the accident analysis portion of the safety analysis process by comparison of the calculated consequences to safety evaluation guideline values.

Table D.3-1. Advanced Mixed Waste Treatment Project documented safety analysis evaluation guidelines for accidents.^{a,b,c}

Event frequency	Event frequency	Radiological release/event	Chemical release ^d
		(rem)	



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category	(per yr)	Onsite	Offsite	Onsite	Offsite
Anticipated	>1E-02 to #1E-01	5	0.5	ERPG-1	TLV-TWA
Unlikely	>1E-04 to #1E-02	25	5	ERPG-2	ERPG-1
Extremely unlikely	>1E-06 to #1E-04	100 ^e	25	ERPG-3	ERPG-2

- a. Acronyms: ALARA—as low as reasonably achievable; ERPG—Emergency Response Planning Guide; IDLH—immediate danger to life or health; TLV-TWA—threshold limit value- time weighted average.
- b. Source: Attachment III of DOE ID O 420.D, *Requirements and Guidance for Safety Analyses* (DOE-ID, 2000b).
- c. Evaluation guidelines are used for comparison of accidents only and are not used for operational events. Operational events are evaluated to ensure that the combination of design features and administrative controls provide for occupational and public doses that are within established limits and ALARA, in accordance with in 10 CFR Part 835, *Occupational Radiation Protection*, and DOE Order 5400.5, *Radiation Protection of the Public and the Environment*.
- d. ERPG values from American Industrial Hygiene Association (AIHA, 1993). Where ERPG values have not been established, concentrations of hazardous chemicals causing potential health effects similar to ERPG levels are used (e.g., TLV, IDLH).
- e. These guidelines apply only to workers in a neighboring facility, not to in-facility workers.

At that time, as a minimum, the safety function(s) for each such SSC are identified. Safety functions shall be as specific as practical, given the information available at the time. They shall identify the situations, and any specific potential accidents, during which the system may be called upon to perform its safety function(s); identify the specific objective of the system in its role of preventing, detecting or mitigating undesirable occurrences; and identify those performance characteristics that have been specifically relied upon in the documented safety analysis (which may include initial conditions or assumptions regarding the system or its operation).

Safety-Significant Structures, Systems, and Components means those SSCs that are not designated as safety-class but whose preventative or mitigative function(s) are a major contributor to defense in depth and/or worker safety as determined from the safety analysis (10 CFR 830.3). As explained further in DOE-STD-3009-94, defense in depth is an approach to facility safety that builds layers of defense against release of hazardous materials so that no one layer by itself, no matter how good, is completely relied upon to avert damage to the facility, to prevent damage to protective barriers, and to avoid harm to people. SSCs that are major contributors to defense in depth are classified as safety significant. DOE ID O 420.D specifies quantified evaluation guidelines for safety-significant SSCs as follows:

"The Safety Significant SSCs identified in nonreactor nuclear facility SARs for worker safety can be limited to those which prevent or mitigate postulated abnormal events in the "anticipated" or "unlikely" frequency range which could result in consequences to on-site workers as follows: (1) >25 Rem (TEDE), (2) exposure to life-threatening concentrations of hazardous chemicals (e.g., >ERPG-3 levels), or exposure to explosion over-pressures causing serious injury (>10 psi). In cases where postulated accidents meet these criteria and additional barriers are needed to achieve acceptable risk, Safety Significant SSCs may be identified for defense-in-depth. Consistent with [DOE-ID O 420.D Section 2.a], identification of Safety Significant SSCs for worker safety will not be required where a postulated accident is already deemed "extremely unlikely."



For postulated accidents with severe in-facility worker consequences, such as unshielded criticalities or process explosions, it is seldom possible to identify a consequence-mitigation barrier that will allow meeting any guideline value. Therefore, in accordance with DOE-ID O 420.D, Section 2.a, if a postulated accident is “extremely unlikely” (that is potential accidents with a frequency in the range of once per 10,000 years to once per 1,000,000 years, compared with an expected facility lifetime of about 25 years), identification of safety-significant SSCs for the protection of facility workers is not appropriate. Instead, for extremely unlikely events, workers at co-located facilities (e.g., workers in adjacent AMWTP, or Radioactive Waste Management Complex facilities) are the focus of safety-significant SSCs.

Other Equipment Important to Safety means equipment that is not designated as safety-significant SSCs or safety-class SSCs, but that provides a function that is a significant contributor to the protection of either the public, co-located workers, or facility workers or is a significant contributor to defense in depth. “Such features (protective barriers, preventive features, or mitigative features) derived from the hazards analysis or safety analysis must not be ignored in managing operations. Such a gross discrepancy would violate the safety basis documented in the documented safety analysis SAR even if the controls are not designated safety class or safety significant because programmatic commitments extend to these SSCs as well” (DOE-STD-3009-94).

D.3.10 Classification of Safety Management Programs

The safety management programs at the AMWTP will be classified to ensure that their importance is recognized and accordingly given appropriate attention and control. Safety management programs at the AMWTP will be classified into the following two categories:

1. Significant safety management programs
2. Other safety management programs.

Significant safety management programs are those programs whose absence or programmatic failure might lead to substantial consequences, require the highest level of control, and hence, will be the subject of Administrative Controls in the TSRs.

Other safety management programs (including general safety programs, construction safety, and environmental protection and permits) do not rise to the level of importance that necessitates the highest level of control (afforded by TSRs) but remain under the internal administrative control of BNFL Inc.

D.3.11 Process Hazards Analysis

For commercial facilities containing hazardous chemicals in excess of quantities specified in Appendix A to 29 CFR 1910.119, a process hazards analysis is required by 29 CFR 1910.119 and 29 CFR 1926.64. The AMWTP is not expected to process or handle at one time regulated quantities of any of the toxic, reactive, flammable, or explosive chemicals listed in Appendix A to Section 29 CFR 1910.119. Thus, a process hazards analysis is not required. If regulated quantities of any of these materials are identified at a later date, a process hazards analysis will be performed in conjunction with the hazard and operability



(HAZOP) reviews discussed in Section D.16 (Hazards Analysis and Control) of the Environment, Safety, and Health Program Operating Plan.

D.3.12 Natural Phenomenon Hazards Assessment

The AMWTF is designed, constructed, and operated so that the general public, workers, and the environment are protected from the impacts of natural phenomena hazards. The AMWTF hierarchy of authority for natural phenomena hazards mitigation conforms to DOE O 420.1, which covers all natural phenomena hazards such as seismic, wind, flood, and lightning. Where no specific requirements are in DOE O 420.1, model building codes such as the *Uniform Building Code* are used. The series of DOE standards that address natural phenomena hazards (DOE-STD-1020 through -1024) is used as guidance for analyzing natural phenomena hazards in the AMWTF documented safety analysis. Natural phenomena design criteria are documented in the *AMWTF Project Design Criteria*.

The AMWTF documented safety analysis analyzes the ability of systems, structures, and components, proposed operations, and personnel to perform their intended safety functions under the effects of natural phenomena. The evaluation of the AMWTF facilities to withstand natural phenomena is based on an assessment of the likelihood of future natural phenomena occurrences. The natural phenomena hazard analysis is conducted commensurate with the graded approach discussed in Section D.3.3. All types of natural phenomena hazards are considered in site planning.

D.3.13 Implementing Documents

The following documents implement the safety analysis process, and will be phased in as the project develops:

- *AMWTF Preliminary Safety Analysis Report* (BNFL, 1999)
- AMWTF Authorization Agreement
- DOE Safety Evaluation Reports
- *AMWTF Unreviewed Safety Question Determination Procedure* (BNFL, 2001b)
- DOE approved Unreviewed Safety Question resolutions
- AMWTF Documented Safety Analysis (final safety analysis report, etc.)
- AMWTF Technical Safety Requirements.



D.4. Worker Safety and Health

D.4.1 Introduction

The purpose of this section is to present the program requirements to ensure the safety and health of the Advanced Mixed Waste Project (AMWTP) workers. This program implements the regulations of 29 CFR Part 1926, *Safety and Health Regulations for Construction*, and 29 CFR Part 1910, *Occupational Safety and Health Standards*. In addition, this section describes the AMWTP Industrial Hygiene Program, which implements the functional requirements of DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees."

The AMWTP team uses safety and health procedures, safe work controls and practices, and safety training to effectively eliminate or mitigate the safety and health hazards present during the construction and operation of the AMWTP facilities.

BNFL Inc. minimizes the risk of exposure to hazardous substances through monitoring and overpacking breached containers during retrieval, and through confinement design and environmental controls in the Advanced Mixed Waste Treatment Facility (AMWTF). The operational risk is reduced by completing ergonomic evaluations (man/machine interface) and associated corrective measures, and incorporating technical safety requirements based on the documented safety analysis. Also, BNFL Inc. implements waste management requirements as described in Section D.15 (Waste Management Program). This comprehensive approach minimizes the AMWTP employee's exposure to radiation and to physical and chemical hazards.

BNFL Inc management and personnel commit to maintaining a safe work environment by conducting assessments establishing team safety philosophy, promoting openness in resolving safety concerns, performing routine work area monitoring, and instituting appropriate safety programs (e.g. behavior based safety).

As indicated in Section D.16 (Hazards Analysis and Control), an extensive safety review of the AMWTP facilities is completed during the documented safety analysis. Fault analysis (to look at potential accidents that impact workers) and hazard and operability assessments (performed for radiological and conventional safety) are performed in support of the documented safety analysis. These studies identify the expected hazards and potential accidents at the AMWTP facilities. Initiating events are identified and impacts to workers and the public are assessed. Engineering features to preclude the initiating event and/or to mitigate the impact of the hazard are then added to the design.

The safety and health of the worker during Phase II (construction and preoperational testing) and Phase III (operations and Hazardous Waste Management Act (HWMA) closure) are governed by Occupational Safety and Health Administration (OSHA) regulations in 29 CFR Part 1926, *Safety and Health Regulations for the Construction Industry*, and 29 CFR Part 1910, *Occupational Safety and Health Standards*, respectively. Worker safety and health programs for Phases II and III are implemented by the *AMWTP Construction Services Manual Number 3: Safety and Health Program* (CSM No. 3) and the AMWTP operations safety and health procedures, respectively. These documents implement the applicable requirements of 29 CFR Part 1926 and 29 CFR Part 1910.

The AMWTP industrial hygiene program includes the following functional elements:



- Conduct baseline surveys of work areas to identify potential worker health and safety risks
- Coordinate with planning and design personnel to anticipate and control hazards that proposed facilities and operations would introduce (including mitigation of exposure to carcinogens)
- Conduct periodic resurveys and/or exposure monitoring
- Document exposure assessment for chemical, physical, and biological stressors using recognized assessment methodologies and accredited industrial hygiene laboratories
- Specify appropriate engineering, administrative, work practice, and personnel protective control methods to limit hazardous exposure to acceptable levels (ensuring exposures are below the more stringent of OSHA permissible exposure limits or ACGIH threshold limit values)
- Involve workers through safety and health education, awareness training, and work planning
- Coordinate with trained environmental, safety, health, and work planning professionals inside BNFL Inc. and at the INEEL
- Implement an occupational medical program
- Implement a hazardous substance disease prevention and bioassay program for such materials as beryllium, lead, mercury, polychlorinated biphenyls, and radionuclides as appropriate
- Implement a respiratory protection program using National Institute of Occupational Safety and Health (NIOSH) approved equipment. Respiratory protection equipment approved under the DOE Respirator Acceptance Program will be used when NIOSH-approved respiratory protection does not exist.
- Prepare procedures to mitigate the risk from identified and potential carcinogens per American Conference of Government Industrial Hygienists (ACGIH)
- Employ a professionally and technically qualified industrial hygienist to manage the industrial hygiene program

D.4.2 Requirements

Table 4 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for worker safety and health.

D.4.3 Construction Phase

AMWTP construction work is conducted in compliance with the applicable subparts of 29 CFR Part 1926 and subparts of 29 CFR Part 1910 implemented from 29 CFR 1926. These regulations are implemented through the construction safety and health program. This safety and health program is implemented by *AMWTP Construction Services Manual No. 3*, which contains the procedures and policies required by 29 CFR Part 1926 and any other controls identified as needed during the documented safety analysis processes or hazard and operational studies.

BNFL Inc. has safety oversight responsibility for its construction subcontractor to ensure that the BNFL Inc. safety policies and programs are implemented. The construction safety organization is fully

responsible for the safety of the construction workers at the DOE site and for implementing the *AMWTP Construction Services Manual No. 3*. The construction safety organization has access to technical expertise within the company to provide the technical resources to perform internal oversight and self-assessments to ensure that safety implementation is effective. The construction safety organization performs appropriate notification of incidents and provides reports directly to the DOE occurrence-reporting system.

D.4.3.1 General Interpretations

29 CFR 1926 Subpart B contains the rules of construction, which specify the need for establishing arrangements or agreements between BNFL Inc. and all subcontractors. These agreements define the individual and joint obligations needed to comply with the regulations. Before initiating the work activities, BNFL Inc. provides needed procedures and instructions, training, and equipment to its employees, including applicable subcontractor employees, to ensure construction activities are conducted safely. Any other arrangements between BNFL Inc. and its subcontractors are established contractually before construction activities begin.

D.4.3.2 General Safety and Health Provisions

29 CFR 1926 Subpart C contains regulations specifying the general safety provisions required during the AMWTP construction phase. Requirements include those for safety training, first aid and medical attention, fire protection and prevention, housekeeping, illumination, sanitation, personal protective equipment, employee access to exposure and medical records, egress, and emergency action plans.

BNFL Inc. has developed an Occupational Medical Program Plan for AMWTP that provides for (a) a baseline health assessment of affected employees and (b) medical surveillance of employees who may be exposed to hazardous or radioactive material. This program is applicable to Phases II (construction and preoperational testing) and III (operations and HWMA closure).

D.4.3.3 Occupational Health and Environmental Controls

29 CFR 1926 Subpart D contains regulations for occupational health and environmental controls for construction. AMWTP construction activities may not involve all the hazards cited in the subpart (e.g., ionizing radiation, lasers, and exposure to methylenedianline, lead). However, the *AMWTP Construction Services Manual No. 3* constitutes the implementation of the requirements applicable to AMWTP activities.

Before construction begins, the construction safety organization reviews the hazards applicable to the construction work area and modifies its safety procedures and instructions accordingly.

Before construction activities, the AMWTP construction safety organization inspects sanitation and medical equipment, emergency notification postings, and any spray booths used to verify compliance with the regulations. The AMWTP construction safety organization measures illumination and assesses ventilation systems to ensure that these systems comply with requirements. The construction safety organization monitors noise levels throughout construction and implements applicable requirements for hearing conservation, as described in the *AMWTP Construction Services Manual No. 3*.



After construction begins, the construction safety organization continuously evaluates processes involving chemicals/substances to determine if permissible exposure limits are exceeded. If a limit is exceeded, the construction safety organization informs construction management, who collaboratively initiate corrective actions.

BNFL Inc. has established a memorandum of agreement with DOE-ID and the Idaho National Engineering and Environmental Laboratory (INEEL) Management and Operating (M&O) Contractor (DOE-ID, 2000a) that allows construction personnel, during an emergency, to access ambulance services and medical services at the Central Facilities Area dispensary. That dispensary provides immediate medical services from staff nurses and physicians.

D.4.3.4 Personal Protective and Life Saving Equipment

29 CFR 1926, Subpart E, contains regulations on personal protective and life saving equipment required during construction. Requirements include those for personal protective equipment (foot, head, hearing, eye and face, and respiratory protection) and safety harnesses, lifelines, lanyards, and safety nets.

As a minimum, construction employees are provided with and wear eye protection and hard hats for construction work. Construction employees also wear boots as a minimum, and safety shoes for activities required by 29 CFR 1926. All safety toe footwear, when required, meets the requirements and specifications in ANSI standard for men's safety-toe footwear, ANSI Z41.1-1967, *Men's Safety-Toe Footwear*, and helmets meet the specifications contained in ANSI Z89.1-1981, *Requirements for Protective Headgear for Industrial Workers*. Eyewear meets specifications in ANSI Z87.1-1989, *Practice for Occupational and Educational Eye and Face Protection*.

The AMWTP hearing conservation program is implemented by the construction safety organization and consists of monitoring construction site sound levels. If the sound levels exceed limits specified in Table D-2 (Permissible Noise Exposures) of 29 CFR 1926.52, earplugs or muffs are provided to the exposed employees. The construction safety organization assesses operations to determine additional needed personal protective equipment and ensures that the equipment is purchased and worn.

If respirators are used, a respiratory protection program, including standard operating procedures governing the selection, issuance, use, and care of respirators and respirator user training, is included in the *AMWTP Construction Services Manual No. 3*. The construction safety organization or trained competent worker administers the respiratory program. The construction safety organization inspects safety harnesses, lifelines, lanyards, and safety nets before use to ensure that the equipment meets the requirements.

D.4.3.5 Fire Protection and Prevention

29 CFR 1926 Subpart F contains regulations for fire protection and prevention required during the construction of the AMWTF. Specific requirements include control of flammable and combustible liquids, liquefied petroleum gas, and temporary heating devices.

A fire protection program for construction, including control of hazardous ignition sources, is contained in the *AMWTP Construction Services Manual No. 3*. The construction safety organization inspects the construction area to verify that the area is protected from these hazards in accordance with the subpart.

BNFL Inc. has established a memorandum of agreement with DOE-ID and the INEEL M&O Contractor (DOE-ID, 2000a) that allows supplemental coverage with the fire department detection and notification systems currently operating at the Radioactive Waste Management Complex.

D.4.3.6 Signs, Signals, and Barricades

29 CFR 1926 Subpart G contains regulations on signs, signals, and barricades required during construction. In addition, the regulations require operators to use the crane and hoisting signals as specified in the associated ANSI standards. These requirements are consistent with the guidance contained in DOE Standard 1090-96, *Hoisting and Rigging*. Barricades conform to applicable portions of the ANSI Standard D6.1-1988, *Manual on Uniform Traffic Control Devices for Streets and Highways*.

Only signs and tags that meet requirements are purchased from safety suppliers, and only barricades that meet the specifications of the ANSI standard are used. Flagmen or other appropriate traffic controls are provided as needed. Crane and hoist operators use the specified crane and hoisting signals.

The construction safety organization inspects the work site before work begins to ensure that the appropriate signs and tags are correctly posted

D.4.3.7 Materials Handling, Storage, Use, and Disposal

29 CFR 1926 Subpart H contains regulations on the handling, storage, use, and disposal of materials that are required during construction. Requirements include those on general storage, rigging equipment, and disposal of waste materials.

Only workers trained and experienced to perform rigging operations are used, and they inspect the rigging equipment daily. Workers use chutes and barricades for dropping materials and debris, promptly remove scrap material, and safely store all solvent waste, oily rags, and flammable liquids in OSHA-approved containers until removed from the work site. The construction safety organization inspects construction areas to verify use of appropriate floor load limits, clear pathways, ramps, dockboards, and housekeeping. The construction safety organization also periodically inspects rigging operations.

D.4.3.8 Tools—Hand and Power

29 CFR 1926 Subpart I contains general and specific regulations for hand and power tools used in constructing the treatment facility. Requirements include those for hand and power tools, abrasive wheels and tools, woodworking tools, jacks, and mechanical power transmission apparatus.

Construction workers are trained in the use of the power-operated hand tools and remove from use any damaged or unsafe tools. The construction safety organization inspects all tools before use to ensure they are in safe working condition, that safety features are present and functional, and that equipment is being appropriately used. The construction safety organization also assesses operations to determine the need for additional personal protective equipment beyond safety glasses, hard hats, and safety toe boots.

D.4.3.9 Welding and Cutting

29 CFR 1926 Subpart J contains regulations for welding and cutting operations conducted during construction. A welding and cutting procedure is included in the *AMWTP Construction Services Manual No. 3*. Only trained and certified welders perform welding and cutting operations.

The construction safety organization inspects welding and cutting operations to verify that the ventilation is functioning as required and that the other required protective measures are established. The construction safety organization issues specific work releases for welding, cutting, or heating operations involving preservative coatings.

D.4.3.10 Electrical

29 CFR 1926 Subpart K contains general and specific regulations for electrical work conducted during the construction of the AMWTF. Requirements include applicability; wiring design and protection; wiring methods, components, and equipment for general use; specific purpose equipment; hazardous (classified) locations and installations, lockout and tagging of circuits, equipment maintenance, environmental deterioration of equipment, and batteries.

The regulations state that electrical installation will be deemed to be in compliance with 29 CFR 1926.403 through 1926.408 {except for 1926.404(b)(1) and 1926.405(a)(2)(ii)(E), (F), (G), and (J)} if the installation is made in accordance with the *National Electrical Code*, ANSI/NFPA 70-1984. Exception 29 CFR 1926.404(b)(1) requires the employee to use the specified ground-fault circuit interrupters or implement an equipment-grounding conductor program. Exception 29 CFR 1926.405(a)(2)(ii) includes requirements for temporary wiring. The AMWTP construction safety organization ensures that either provision is followed and audits construction operations to ensure compliance. For the exception on temporary wiring, the construction safety organization inspects operations to ensure compliance.

A procedure for locking and tagging out electrical systems is included in the *AMWTP Construction Services Manual No. 3*. The construction safety organization inspects operations to ensure compliance with the procedure.

Location of electrical wiring and components is considered during the design phase to prevent exposure to possible deteriorating agents. The construction safety organization inspects wiring components and utilization equipment to verify equipment is isolated from the hazardous environments and also inspects any batteries used to ensure compliance.

D.4.3.11 Scaffolds

29 CFR 1926 Subpart L contains general and specific regulations for scaffolds used during AMWTP construction. Requirements include those for scaffolds, aerial lifts, training, and retraining.

The safe use and inspection of scaffolding and aerial lifts are included in the *AMWTP Construction Services Manual No. 3*, and the AMWTP construction safety organization is responsible for implementing the procedure. Either the construction safety organization or a trainer with expert knowledge provides scaffolding training and retraining.

D.4.3.12 Fall Protection (General Requirements)

29 CFR 1926 Subpart M contains general and specific regulations for fall protection used during AMWTP construction. Requirements include those for fall protection, criteria and practices, and training.

Fall protection is included in the *AMWTP Construction Services Manual No. 3*, and the AMWTP construction safety organization ensures requirements are met. If the employees are engaged in leading edge work or precast concrete erection work and conventional fall protection equipment cannot be used or its use creates a greater hazard, a fall protection plan is developed. The construction safety organization provides the needed training and retraining.

D.4.3.13 Fall Protection (Cranes, Derricks, Helicopters, Hoists, Elevators, and Conveyors)

29 CFR 1926 Subpart N contains regulations for fall protection and other safety measures for various construction apparatuses that may be used during construction. Requirements include those for cranes and derricks, helicopters, hoists, elevators, and conveyors.

Safety protocols for cranes and derricks specify that only experienced and trained employees use this equipment; that equipment is inspected for compliance with specified load limits and safety features; and that specified safe work practices are used. The AMWTP construction safety organization assesses work operations involving listed cranes and derricks to determine compliance.

Use of helicopters is not expected during construction activities. If helicopters are to be used, however, a procedure will be included in the *AMWTP Construction Services Manual No. 3*. Because use of helicopters could potentially impact other activities at INEEL, specific criteria for the use of helicopters would be included in the memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL M&O Contractor (DOE-ID, 2000a).

D.4.3.14 Motor Vehicles and Mechanized Equipment

29 CFR 1926 Subpart O contains general and specific regulations for motor vehicles and mechanized equipment construction apparatuses that may be used during construction. Requirements include those for motor vehicles, material-handling and pile-driving equipment, and site clearing.

Before work, the construction safety organization inspects motor vehicles to verify that required safety features are present and operable. Workers also inspect their vehicles at the beginning of each shift. Before work, the construction safety organization inspects the material-handling and pile-driving equipment to verify compliance. Only construction workers experienced with pile-driving equipment use the equipment.

Before site clearing, the construction safety organization (a) inspects equipment to verify the required safety structures are present and (b) inspects the job site to assess the presence of any irritating or toxic plants (and vermin) and if needed, develops a preventative exposure plan.

D.4.3.15 Excavations

29 CFR 1926 Subpart P contains general and specific regulations for safe work practices for any excavation performed during AMWTP construction.

All entry and egress means, sloping, shoring, barricades, and other safety measures comply with Subpart P and its appendices. The AMWTP construction safety organization or trained competent worker inspects all excavations before entry to ensure the requirements of Subpart P and its appendices are followed.

D.4.3.16 Concrete and Masonry Work

29 CFR 1926 Subpart Q contains regulations for safe work practices for any concrete and masonry work performed during the AMWTP construction. Requirements include those for equipment and tools, cast-in-place concrete, precast concrete, lift-slab construction, and masonry.

The construction safety organization periodically inspects operations involving concrete and masonry work to ensure compliance before construction and during operations to verify the equipment safety features are present and operational.

The construction safety organization inspects equipment and material at each stage of construction: (a) before work begins, to ensure that the forms can be constructed according to drawing specifications and safety requirements; (b) after the forms are in place, to confirm that concrete can be poured; and (c) before forms/shoring/braces are removed or loads are placed on the concrete to determine if the concrete is structurally sound.

For precast concrete and lift-slab concrete, the construction safety organization inspects work operations to verify compliance. An professional engineer plans and designs the lift-slab concrete work. The construction safety organization (a) inspects the area before any masonry wall is constructed to verify the limited access zone is established and (b) inspects the wall as it is being erected to confirm that the wall is safely braced or supported per design.

D.4.3.17 Steel Erection

29 CFR 1926 Subpart R contains regulations for safe work practices for any steel erection work performed during AMWTP construction. Requirements include those for structural steel assembly bolting, riveting, fitting-up, and plumbing-up.

Construction workers involved in structural steel assembly are experienced in this work or receive the appropriate training from experienced workers. The construction safety organization inspects the operations to verify compliance.

D.4.3.18 Demolition

29 CFR 1926 Subpart T contains regulations to be followed during planning and executing demolition of the AMWTP facilities. Requirements include those for preparatory operations, removal of specific elements, storage, and explosives.

Applicable requirements of Subpart T are incorporated into the planning phase for demolition (should such work be performed) and are included in a safety procedure for demolition, which all demolition workers review before beginning work. The AMWTP construction safety organization inspects demolition operations to confirm that the work is proceeding safely. (Demolition work is not presently planned for the AMWTP construction activities.)

D.4.3.19 Blasting and the Use of Explosives

29 CFR 1926 Subpart U contains regulations for the safe use of explosives that may be used for the blasting operations conducted during construction. Subpart U does not apply to AMWTP construction activities because no blasting or use of explosives will be performed.

D.4.3.20 Power Transmission and Distribution

29 CFR 1926 Subpart V contains regulations for the safe erection of new electric transmission and distribution lines and equipment, and for the alteration, conversion, and improvement of existing electric transmission and distribution lines and equipment that may be required during AMWTP construction. Requirements deal with equipment, material handling, grounding, overhead and underground lines, construction in energized substations, and lineman's equipment.

Only trained and experienced electrical workers are permitted to work on transmission or distribution lines. As appropriate, the electrical workers use the proper tools and protective equipment, safely operate mechanical equipment, follow the established safe work protocols, and implement the safety measures as specified by the requirements of the regulations of Subpart V. The AMWTP construction safety organization evaluates these operations to verify that the tools and protective equipment are available, in good condition, and being used in accordance with Subpart V.

D.4.3.21 Rollover Protective Structures; Overhead Protection

29 CFR 1926 Subpart W includes regulations for the availability, functionality, and safety features of rollover and overhead protection for construction equipment that may be used during AMWTP construction.

D.4.3.22 Stairways and Ladders

29 CFR 1926 Subpart X contains regulations for the required training and retraining and for setup, safety features, and use of ladders and stairways.

The AMWTP construction safety organization initially and periodically inspects ladders and stairs throughout the construction site to verify compliance. The construction safety organization provides the required training before construction, as well as that needed for retraining.

D.4.3.23 Toxic and Hazardous Substances

29 CFR 1926 Subpart Z includes regulations for the safe use of various toxic and hazardous substances that may be present in the construction material used during AMWTP construction.



Whenever feasible, the hazardous and toxic substances listed in Subpart Z will not be used. Before any products are ordered, the AMWTP construction safety organization evaluates material safety data sheets to determine if they contain any of the substances listed. If so, a suitable alternate product is considered. If an alternate product cannot be used, the applicable requirements (for that particular substance) are implemented. The requirements typically include provisions for training, monitoring, personal protective equipment, and other safe practices necessary to reduce exposures to the hazardous or toxic substances.

D.4.4 Operations Phase

The AMWTP operations phase is conducted in compliance with 29 CFR Part 1910. The applicable subparts for operations requirements are further discussed in the following subsections.

BNFL Inc. has established safety and health procedures/instructions and workplace controls that incorporate requirements of the OSHA standards (29 CFR Part 1910). BNFL Inc will maintain a professional ES&H staff who are responsible for establishing, monitoring, and compliance with safety protocols.

The ES&H staff will provide technical assistance to line management who are responsible for maintaining safety and the implementation of the Environment, Safety; and Health Operating Plan (ESHPOP) and relevant procedures and instructions. The ES&H staff provides services necessary for safe operations of the AMWTP, including the following:

- Serving as technical resources to line management for industrial hygiene, industrial safety, fire protection, environmental compliance, radiation control, and nuclear and criticality safety
- Verifying that all safety and health standards are implemented and followed by operations personnel
- Notifying management of noncompliance occurrences, and suggesting corrective action to mitigate these occurrences
- Developing and modifying safety and health procedures and instructions, as needed
- Tracking and trending noncompliance with the ES&H program
- Conducting inspections, monitoring, and assessments required to maintain safe operation
- Providing technical support when responding to an emergency incident
- Identifying training needs.

This safety and health program is implemented by the AMWTP operations safety and health procedures and instructions required by 29 CFR Part 1910, the ESHPOP, the documented safety analysis, and the environment permits.

D.4.4.2 Walking–Working Surfaces

29 CFR 1910 Subpart D contains regulations on walking and working surfaces that maintain safe AMWTP operations. Requirements include those for protecting openings in floors and walls and for using and maintaining fixed and portable ladders, scaffolds, and stairs.

At the AMWTP facilities, the fixed equipment is designed and installed to comply with the regulations. Also, portable ladders and scaffolding, if required, are used and maintained in accordance with the specifications of the regulations.

D.4.4.3 Means of Egress

29 CFR 1910 Subpart E contains regulations for establishing and maintaining means of egress. Appropriate means of egress originated in the design and construction of the AMWTF. AMWTP facilities are routinely inspected to verify that the evacuation routes and exits are clearly marked and maintained unobstructed.

The *AMWTP Emergency Plan/Resource Conservation and Recovery Act (RCRA) Contingency Plan* specifies the evacuation routes, assembly locations, and other procedures and instructions that will aid in the safe evacuation of the AMWTP facilities (see ESHPOP Section D.9, Contingency/Emergency Planning and Response). Also, the AMWTP has developed a Fire Prevention Plan (see ESHPOP Section D.6, Facility, Construction, and Fire Safety–Design Basis).

D.4.4.4 Powered Platforms, Manlifts, and Vehicle–Mounted Work Platforms

29 CFR 1910 Subpart F contains regulations for the safe placement and operation of powered platforms used for building maintenance, vehicle-mounted elevating and rotating work platforms, and manlifts. If any of this equipment is used during AMWTP operations, Operations and Maintenance (O&M) personnel will be suitably trained in use of this equipment.

D.4.4.5 Occupational Health and Environmental Control

29 CFR 1910 Subpart G contains regulations for ventilation and occupational exposure to noise, and to nonionizing radiation.

Primary ventilation controls are incorporated in the *Project Design Criteria* and included in the basic operating system of the AMWTF. Appropriate work control documents are used for operations involving abrasive blasting, grinding, polishing, buffing, and spray finishing, if these operations are conducted.

AMWTP ES&H personnel monitor work areas to determine employee exposure to noise, electromagnetic radiation, and toxic substances. If exposure levels are exceeded, engineering controls are implemented and/or personal protective equipment (Section D.4.4.7) is provided and the area is posted. A hearing conservation program is implemented if noise exposures exceed the regulatory limits.

D.4.4.6 Hazardous Materials

29 CFR 1910 Subpart H contains regulations for safe storage, handling, and use of hazardous materials during the AMWTP operations. Requirements for hazardous materials include compressed gases



(including specific regulations for acetylene, hydrogen, oxygen, and nitrous oxide), flammable and combustible liquids, liquefied petroleum gases, process safety management of highly hazardous chemicals, and hazardous waste operations and emergency response.

Compressed gas cylinders, including cryogenic gas cylinders, are inspected, stored, handled, and used in accordance with OSHA requirements. The liquefied petroleum gases tank and piping system is installed with safety features.

A chemical inventory is maintained to minimize the amount of chemicals required in conducting operations. Process safety management measures are implemented if threshold quantities for highly hazardous chemicals are exceeded. Where possible, chemicals are used that do not constitute a hazardous waste when spent.

AMWTP operations are conducted in accordance with HWMA/RCRA permits and environmental regulations. Requirements are included in the AMWTP operations safety and health procedures and instructions.

D.4.4.7 Personal Protective Equipment

29 CFR 1910 Subpart I contains regulations on personal protective equipment. Requirements include those for eye, face, head, foot, and hand protection, protective clothing use, hearing and respiratory protection devices, protective shields and barriers, and electrical safety equipment. This equipment is maintained in good working order and is stored away from hazardous substances. Personnel use protective equipment as needed in the AMWTP, but the design of the facility precludes exposures during normal operation.

Personal protective equipment requirements are included in the AMWTP operations safety and health procedures and instructions. The ES&H personnel conduct assessments and monitor AMWTP operations to determine if personal protective equipment is required. The equipment selected conforms to the applicable regulatory requirements and ANSI standard.

If sound levels during Phase III (operations and HWMA closure) exceed limits specified in Table G-16 (Permissible Noise Exposures) of 29 CFR 1910.95, ear plugs or muffs are provided to the exposed employees, and a hearing conservation program is implemented as stated in Section D.4.4.5.

If respirators are used, a respiratory protection program, including standard operating procedures governing the selection, issuance, use and care of respirators and respirator user training, is included in the AMWTP operations safety and health procedures and instructions. ES&H staff administer the respiratory program ensuring respiratory protection requirements are implemented.

D.4.4.8 General Environmental Controls

29 CFR 1910 Subpart J contains regulations on environmental controls required during the AMWTP operations. Requirements include those for sanitation, standards for safety signs and tags, and safe activities when working in confined spaces or with energized equipment.

AMWTP facilities are constructed to meet the sanitary requirements of the regulation, and housekeeping and workplace inspections are performed to maintain a safe working environment. Facility equipment and building components contain the appropriate signs and tags to ensure personnel are apprised of the hazards present.



The AMWTP has operations safety and health procedures and instructions for conducting work involving confined space entries and lockout/tagout of energized equipment. The confined space procedure requires using an appropriate work control document before entering the confined space. The work control document review follows the integrated safety management core functions to ensure that work is performed in a safe manner. (See ESHPOP Part A for a discussion of integrated safety management core functions.) Pre-entry (remote) surveys are required to confirm the presence of appropriate oxygen levels. The procedure for lockout/tagout ensures that energized equipment is isolated before working on the equipment.

D.4.4.9 Medical and First Aid

29 CFR 1910 Subpart K contains a regulation for medical and first aid services required during the project.

BNFL Inc. maintains a group of personnel trained in cardiopulmonary resuscitation (CPR) and first aid. BNFL Inc. established a memorandum of agreement with DOE-ID and the INEEL M&O Contractor (DOE-ID, 2000a) that allows AMWTP operations personnel access to ambulance services and medical services at the Central Facilities Area dispensary during emergency incidents. That dispensary provides immediate medical services from staff nurses and physicians. Additional emergency medical services and nonemergency services (such as physicals, drug testing, bioassays, and pulmonary function testing) are received at contracted clinics or hospitals. See Section D.4.3.2 for a description of BNFL Inc.'s occupational medical program.

D.4.4.10 Fire Protection

The AMWTP Fire Protection Program will be implemented by the *AMWTP Fire Prevention Plan* and associated fire safety procedures. The Fire Protection Program is described in Section D.6.4, Fire Protection Program, of ESHPOP Section D.6 (Facility, Construction, and Fire Safety–Design Basis).

29 CFR 1910 Subpart L contains regulations for portable and fixed fire suppression equipment, and fire detection and alarm systems. Proper installation and routine testing of this equipment provides for safe operation of the AMWTP facilities.

The AMWTP portable, remote, and fixed fire suppression systems, and fire detection and alarm systems are designed, installed, maintained, and tested according to the requirements of the codes and INEEL protocol. The detection and suppression systems were designed and installed to be compatible with systems presently used at the INEEL, and will be periodically inspected and tested.

The AMWTP employees are typically trained on the use of portable fire suppression systems and are educated on the proper response to a fire alarm. Drills are conducted routinely to ensure that personnel understand the proper response to fire alarms.

D.4.4.11 Compressed Gas and Compressed Air Equipment

29 CFR 1910 Subpart M contains a regulation for air receivers used during AMWTP operations. Air receivers are selected, installed, and tested according to the requirements of this regulation to verify safe operations.

D.4.4.12 Material Handling and Storage

29 CFR 1910 Subpart N contains regulations for safe use of forklifts, lift trucks, cranes, slings, etc., used during AMWTP operations. All powered industrial trucks and cranes are selected and inspected before being placed in service to verify their safe operation.

Only trained operators are allowed to use the equipment in accordance with safe operating practices. A preventive maintenance program is established to ensure the material handling equipment is serviced, and repaired or replaced as needed.

D.4.4.13 Machinery and Machine Guarding

29 CFR 1910 Subpart O contains regulations for the installation and maintenance of machine guarding required to safely isolate point of operations, pinch points, and rotating parts on machines used during AMWTP operations.

AMWTP machinery is designed and installed with machine guarding or other engineering/administrative controls implemented to protect the workers from hazards such as pinch points, rotating shafts, crushers, and shears. Periodically the safety brakes, restraints, interlocks, and other safety features are verified to be operational.

D.4.4.14 Hand and Portable Powered Tools and Other Hand-Held Equipment

29 CFR 1910 Subpart P contains regulations for selecting and using hand and portable powered tools during AMWTP operations. These tools include saws, sanders, pneumatic tools, grinders, lawn mowers, and jacks.

AMWTP workers are provided safe tools and equipment that contain the required guarding, safety interlocks, and other safety features. The tools are inspected by the workers before use to ensure the tools are in safe operating conditions.

D.4.4.15 Welding, Cutting, and Brazing

29 CFR 1910 Subpart Q contains regulations for safe welding, cutting, and brazing operations that may occur during AMWTP operation. Requirements include those for oxygen-fuel gas welding and cutting, arc welding and cutting, and resistance welding. The safe work practices include welder safety, fire prevention, ventilation, and safe welding procedures.

Appropriate work control documents are prepared before any welding or cutting job is started. Only trained and qualified technicians perform welding and cutting operations using approved welding procedures and instructions.

The equipment is inspected before actual welding or cutting operations to verify that the ventilation is functioning as required, fire control measures are in place, and UV protection is provided and adequate.

D.4.4.16 Electrical

29 CFR 1910 Subpart S contains regulations for the design, installation, or repair of electrical components that may be conducted during AMWTP operations. The regulations are divided into two categories:

- Design safety standards for electrical systems
- Safety-related work practices.

Design safety standards include requirements for wiring design; wiring methods, components and equipment for general use; specific purpose equipment and installations; hazardous locations; and special systems. The treatment facility electrical systems/components are constructed and modified in accordance to the required design standards. The *AMWTP Project Design Criteria* document specifies that the National Fire Protection Association (NFPA) standard be followed. Redundant lockout provisions have been incorporated in the design to protect workers accessing equipment for maintenance.

Safety-related work practices include requirements for training, safe use of equipment, and personnel protection. Appropriate work control documents are completed before starting any electrical installation or repair job. Only trained and qualified technicians perform electrical installation and repair operations. A procedure for locking/tagging out electrical hazards is included in the AMWTP operations safety and health procedures and instructions. Personnel are provided with the appropriate tools and personal protective equipment to safely perform the work.

D.4.4.17 Toxic and Hazardous Substances

29 CFR 1910 Subpart Z includes regulations for the safe use of various toxic and hazardous substances that may be present during AMWTP operations. The subpart also contains regulations for employee access to medical records, hazard communication program, and retention of Department of Transportation (DOT) markings, placards, and labels.

Whenever feasible, the hazardous and toxic substances listed in Subpart Z are not used. Before any products are procured, ES&H staff evaluate material safety data sheets to determine if they contain any of the substances listed. If so, a suitable alternate product is considered. If an alternate product cannot be used, the applicable requirements (for the particular substance) are implemented. Also, a hazardous substance listed in Subpart Z may be present in the waste being treated (e.g., lead). If the substance is present in the waste, the specific requirements of the corresponding regulation are implemented in the operations safety and health procedures and instructions. The requirements typically include provisions for training, monitoring, personal protective equipment, and other safe practices necessary to reduce exposures to the hazardous or toxic substances.

The operations safety and health procedures and instructions also includes the hazard communication program, which includes a policy on retaining DOT markings, training, maintaining material safety data sheets, and labeling containers. During new employee orientation, all operations employees are trained on the hazard communication program and are also informed of their right to their medical records and the process for accessing those records.



D.4.4.18 Beryllium

Encounters with beryllium are considered unlikely. Any potential exposures will be limited to instances of ruptured drums and spills. Contingency plans will be developed to provide workers protection when performing remedial actions. Industrial Hygiene will conduct both initial and periodic monitoring of hazardous substances, including beryllium, to ensure that adequate mitigative controls are in place. If beryllium is detected or suspected, work controls will be put in place in compliance with 10 CFR 850, Chronic Beryllium Disease Prevention Program.

D.4.5 Implementing Documents

The following documents implement the AMWTP worker safety and health program:

- *AMWTP Construction Services Manual Number 3: Safety and Health Program*
- *AMWTP Occupational Medical Program Plan*
- AMWTP operations safety and health procedures
- *AMWTP Fire Prevention Plan* and procedures.



D.5 Permission to Commence Operations, Stop Work Authority, and Restart

D.5.1 Introduction

The purpose of this section is to specify the process for startup or restart of the Advanced Mixed Waste Treatment Project (AMWTP) and the authority for stopping work. BNFL Inc.'s policy is not to start or restart work at the AMWTP until (a) performance testing of the affected plant and equipment, personnel, policies, programs, and procedures has demonstrated that the project is ready for startup or restart, and (b) the state of readiness to operate has been verified. This section establishes the authorities for start and restart of operations and stop work orders for the AMWTP.

D.5.2 Requirements

Table 5 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for the permission to commence operations and stop work authority area.

D.5.3 Graded Approach

Startup or restart of the AMWTP facilities is performed in a manner that ensures safe, efficient, and compliant operation of the facilities. The startup or restart process may be as short and simple as a restart check procedure, or may approach the breadth and depth of an operational readiness review, depending on the causes and duration of the shutdown and the modifications accomplished during the shutdown. Similarly, the approval authority for restart depends on the reason for and duration of the shutdown. Startup and restart approval authority is described in Sections D.5.12 and D.5.14.

D.5.4 Phased AMWTP Initial Startup Process

Initial startup of the AMWTP is conducted in phases beginning with the Retrieval Operations and followed by the Advanced Mixed Waste Treatment Facility (AMWTF). The phased initial startup approach is illustrated in Figure D.5-1. In each of the two startup phases illustrated, BNFL Inc. systematically prepares to operate the AMWTP. In accordance with the AMWTP contract (DOE-ID, 1996a) and the guidance contained in DOE STD-3006-95, *Planning and Conduct of Operational Readiness Reviews*, BNFL Inc. prepares and transmits to DOE the following documents in sequence for each phase:

- Startup Notification Report
- System Operability Testing Plan
- Operational Readiness Review Plan of Action
- Operational Readiness Review Implementation Plan
- System Operability Testing Results Report
- BNFL Operational Readiness Review Report
- Readiness to Proceed Memorandum (identified in the AMWTP contract (DOE-ID, 1996a) as Readiness to Operate Report).
- Corrective Plans of Action for any DOE ORR Pre-start Findings.



System operability testing plans are prepared, approved by the AMWTP Operations Manager, and forwarded to DOE for approval for each of the two phases of startup. The system operability testing plans document the project's approach to testing of the plant and equipment, including the tests that demonstrate the functionality of the safety systems identified in the relevant documented safety analysis. Evaluation criteria for testing are summarized in the testing plan and specified in the detailed testing documents. Also, specific health and safety provisions for testing are documented in the test plan.

As shown in Figure D.5-1, system operability testing is conducted in three parts in accordance with the AMWTP contract, Section J, Appendix B (DOE-ID, 1996a):

- Part 1 consists of testing to find and correct individual process and system faults.
- Part 2 includes processing surrogate wastes through the entire system. Both radioactive and hazardous waste surrogates are used. The surrogates simulate the physical behavior of actual wastes to be treated in the process.
- Part 3 system operability testing may be conducted (with DOE concurrence) and includes tests on key components of the system that require testing with actual transuranic and alpha low-level mixed wastes.

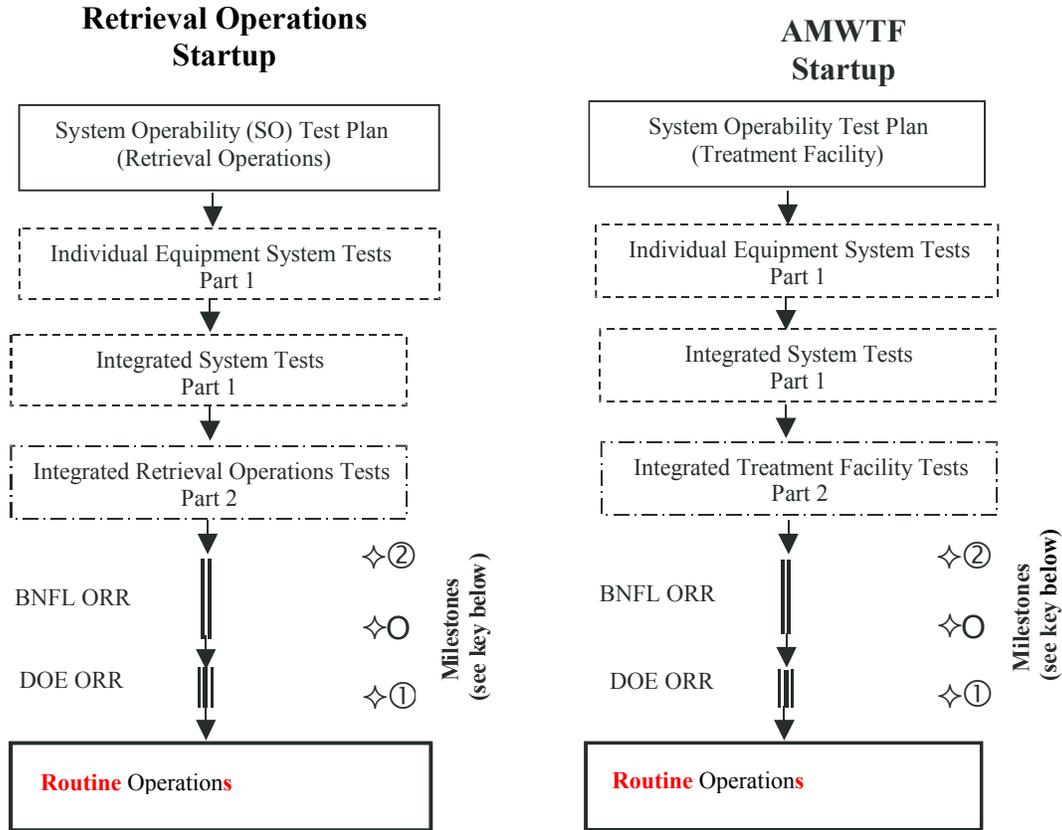
With the current baseline flowsheet of AMWTP, Part 3 System Operability Testing is not necessary and the transition will be from Part 2 Testing to Operations. The results of system operability testing are documented in the System Operability Test Results Report and referenced in the BNFL Inc. Operational Readiness Review Report. After the completion of system operability testing, the BNFL Inc. Operational Readiness Reviews, and submission of the Readiness to Proceed Memorandum, DOE conducts an independent operational readiness review to confirm BNFL's declaration of readiness to operate with actual radioactive materials. At the completion of the DOE operational readiness review and with DOE's approval (within 45 days of receipt of the BNFL Inc. Readiness to Proceed Memorandum as detailed in the AMWTP contract (DOE-ID, 1996a)), the AMWTP operations commence.

D.5.5 Startup Notification Report

BNFL Inc. notifies DOE that an initial startup of the AMWTP is planned. This notification includes the following information:

- Name and address of the facility
- Intent to conduct an operational readiness review
- Recommended startup authority
- Basis or justification for the recommended actions, per DOE O 425.1, *Startup and Restart of Nuclear Facilities*.

AMWTP COMMISSIONING AND STARTUP



Key to Symbols:

SO Testing (Contract Section J, Appendix B)

- SO Testing, Part 1 Individual equipment and Integrated Systems
- SO Testing, Part 2 – Surrogate materials
- SO Testing, Part 3 – Actual Waste

Preoperational Contract Milestones

- ✧② SO Testing Results Report

Operational Readiness Reviews (ORR)

- || BNFL ORR
- ✧○ BNFL ORR Report
BNFL Readiness to Proceed Memorandum
- ||| DOE ORR
- ✧① DOE approval for radioactive operations
(within 45 days of receiving the BNFL Inc. Readiness to Proceed memorandum)

Figure D.5 -1 Phased initial startup process for the Advanced Mixed Waste Treatment Project (AMWTP) Retrieval Operations, and for the Advanced Mixed Waste Treatment Facility (AMWTF).

D.5.6 System Operability Testing Plan

Part of the operational readiness process for initial startup is the execution of system operability tests. System operability testing is conducted to ensure that systems are operating according to specifications and within safety limits. In system operability tests, each process system will progress through a sequence of activities, each a more complex level of performance demonstration. Before system operability testing, initial tests on individual components, called Acceptance Tests, will be performed during the procurement/construction period. These tests are functional tests of electrical and mechanical components, and in some instances, subsystems and systems, to verify proper operation to the intended function. These tests will verify such things as proper component operation, correct rotation, proper connection of hardware, piping and wiring from end to end, and control of individual components. Where appropriate, tests on selected equipment will also demonstrate overall equipment effectiveness. Acceptance testing comprises factory acceptance testing (FAT) and construction acceptance testing and turnover (CATT).. Acceptance testing is not included in the scope of the System Operability Testing Plan, but continuity from acceptance testing to system operability testing and documentation of results will be maintained.

The system operability testing plans will define in detail the types and extent of testing and the documentation requirements for the startup activity for each of the two phases of startup (retrieval/characterization and AMWTF). These plans are submitted for DOE approval, and include the following information:

- Overall Commissioning Objectives
- Approval authority for commencement of testing
- Identify the scope of testing to be performed
- Identify tests to demonstrate the functionality of any identified safety structures, systems, and components
- Identify prerequisites for testing
- Identify documentation requirements
- Identify evaluation (success) criteria

D.5.7 Startup Plan of Action

The plan of action describes how BNFL Inc. will conduct a review to verify that the AMWTP is ready for safe operations. The plan of action is submitted to DOE for approval, and includes the following information:

- Notice of intent to conduct an operational readiness review
- Description of the facility
- Team leader
- Prerequisite conditions
- Definition of the breadth of the operational readiness review
- Estimated start date
- Estimated time required to complete the operational readiness review



- Description of management responsibilities for the operational readiness review.

D.5.8 Operational Readiness Review Implementation Plan

Before the projected date for the operational readiness review, an implementation plan is developed and approved by the BNFL Operational Readiness Review Team Leader. The implementation plan provides the review schedule (including estimated start date and duration), the review team leader and team members, the review core requirements, any other information required by DOE O 425.1, and information unique to the proposed operational readiness review. The implementation plan also specifies criteria and review approaches that will be used in the review.

D.5.9 System Operability Testing Results Report

The results of system operability testing are documented in the system operability test results report and referenced in the BNFL Inc. Operational Readiness Review Report. This report will reference results from procurement and construction acceptance testing, and will report the results from system operability testing. This report will document that the process systems are ready to proceed to radioactive operations for that phase (retrieval operations or AMWTF). This report will accompany the project's Readiness to Proceed Memorandum.

D.5.10 BNFL Operational Readiness Review and Reports

BNFL Inc. conducts the Operational Readiness Review in accordance with DOE O 425.1 and the guidance contained in DOE STD-3006-95. System operability testing and other facility/equipment, management controls, and personnel preparedness activities will be complete before the operational readiness review.

A BNFL Inc. report will be issued upon completion of the BNFL Inc. Operational Readiness Review. The AMWTF General Manager will issue the Readiness to Proceed Memorandum to DOE when the deficiencies noted in the BNFL Inc. report have been reduced to a manageable list of open issues with a well-defined schedule for completion. Once DOE receives the Readiness to Proceed Memorandum, they have agreed to complete the DOE Operational Readiness Review and authorize operations within 45 days (DOE-ID, 1996a).

D.5.11 DOE Operational Readiness Review

As shown in Figure D.5-1, the DOE Operational Readiness Review is conducted after the completion of the BNFL Inc. Operational Readiness Review.

A DOE Operational Readiness Review Report will be issued upon completion of the DOE Operational Readiness Review and will make a conclusion as to whether startup can proceed safely. BNFL Inc. is required to resolve all prestart findings of the DOE Operational Readiness Review before startup.



D.5.12 Initial Startup Authority

Issuance of a formal statement of completeness and authorization by DOE constitutes approval to commence operations. Once approval has been received from DOE, the AMWTP General Manager has overall authority for operation and stop work at the AMWTP. Day-to-day operation of the AMWTP, including safe startup and shutdown, is the responsibility of the Operations Manager and delegated to the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) as specified in Section D.14 (Conduct of Operations) of the *AMWTP Environment, Safety, and Health Program Operating Plan* (ESHPOP).

D.5.13 Stop Work Authority

Pursuant to contract clause H.15, “Stop-Work and Shutdown Authority–Environment, Safety, and Health” (DOE-ID, 1996a), the DOE Contracting Officer or authorized designee may direct a shutdown of the AMWTP facilities or stop work on specific activities for reasons of safety to workers, safety to the public, or violation of applicable laws, regulations, or agreements. The DOE Contracting Officer or designee who directed the shutdown or stop work has the authority for restart.

The BNFL Inc. General Manager has overall stop work authority for the AMWTP. This authority is delegated through the Operations Manager to the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) who is responsible to safely conduct facility operations through adherence to operating procedures, technical safety requirements, and compliant operating practices. The authority for operations is vested in the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) and transferred only through formal turnover to a qualified relief. The Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) maintains authority and responsibility for day-to-day operations in accordance with the authorization basis and has the authority to stop work and to shut down operations that may ultimately require restart.

All AMWTP personnel have the authority and responsibility to stop work if unsafe conditions are encountered. Personnel who become aware of operations involving actual or suspected unsafe conditions shall immediately notify the supervisor of the operation or the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) and request the operation or activity be suspended until safe conditions are restored.

AMWTP personnel are expected and encouraged to discuss concerns with their supervisor and achieve resolution through this interface or through the AMWTP Environment, Safety, and Health (ES&H) organization. AMWTP managers create an atmosphere where employees are able to express safety concerns without fear of reprisal or criticism. When, however, these resources do not satisfactorily resolve the issue or the employee believes some other type of contact is necessary, the employee has multiple channels to communicate safety issues, including the ES&H Manager, Safety Committee members, and the AMWTP Employee Concerns Program discussed in ESHPOP Part A (General).

As discussed in the *AMWTP Emergency Plan/RCRA Contingency Plan*, INEEL or DOE-ID personnel may order an evacuation of the AMWTP because of an emergency or event in an area or facility outside



the jurisdiction of the AMWTP that threatens human health or the environment. If an evacuation is ordered, the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) directs shutdown of AMWTP operations, and shutdown is accomplished according to established operating and emergency procedures. Under these circumstances, the AMWTP Operations Manager authorizes restart.

D.5.14 Startup and Restart Authority

The authority to start up the AMWTP (after the initial startup) depends on the cause of the stop work/shutdown. A local safety concern leading to a stop work raised by an AMWTP employee and resolved by supervisor/management will result in a startup authorized by Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) as governed by the requirements of ESHPOP Section D.14 (Conduct of Operations).

The Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) directs operators to follow normal startup steps in approved facility operating procedures and to document the results in operating logs, which will be monitored or reviewed by the Operations Manager. In these instances, the Retrieval Operations Manager (for Retrieval Operations) or the on-duty Shift Manager (for full Project Operations including Facility Operations) is the restart authority; and the Operations Manager review of the operating logs may be performed after the resumption of operations.

A stop work/shutdown caused by an abnormal condition or event (which, however, remains within the envelope of the authorization basis) may require a formal investigation, development and implementation of corrective actions, and review of adequacy of implementation before startup (in line with ESHPOP Section D.14, Conduct of Operations). The Operations Manager has the authority to direct a startup after such a shutdown.

A stop work/shutdown caused by an abnormal condition described in DOE O 425.1 will require formal restart in accordance with DOE O 425.1. Examples of such abnormal conditions include a DOE-directed unplanned shutdown; an extended shutdown greater than 12 months; substantial process, system, or facility modifications requiring modification to the safety basis or technical safety requirement violation.

D.5.15 Readiness Assessment

In instances of startup and restart where a formal operational readiness review is not required, a readiness assessment may be performed. The AMWTP Operations Manager evaluates the need for performing a readiness assessment before restart. Several principles relevant to operational readiness reviews are equally applicable to readiness assessments:

- Readiness assessment is a verification that AMWTP management has achieved readiness to resume operations before the actual restart.
- The readiness assessment is conducted using a formal procedure meeting the requirements of DOE O 425.1. By using the graded approach, the readiness assessment may be as simple as a simple checklist or as complex as a broad-based assessment similar to an operational readiness

review. In either instance, the procedure is formal, approved, and executed by a designated individual or team.

- The results of the readiness assessment are auditable and retained in the records of the facility with a record that any findings were resolved.
- The scope (breadth and depth) of the readiness assessment is an AMWTP management decision that uses the graded approach. For example, a routine resumption of operations following a short outage in which few and minor repairs and modifications were conducted but where a readiness assessment was required, could require little in addition to a preapproved checklist for the portion of the facility that was shut down. A defensible management decision is required to approve the scope. The decision and basis are documented in writing and approved by the AMWTP General Manager before beginning the readiness assessment. These decision documents are included as part of the record of the restart.
- Readiness assessment team members require technical and assessment qualifications to ensure the credibility of the results of the readiness assessment.

D.5.16 Implementing Documents

The following documents implement the AMWTP permission to commence operations and stop work authority area:

- AMWTP Procedure for Startup and Restart
- AMWTP Operational Readiness Review Plan-of-Action and Implementation Plan(s)
- AMWTP System Operability Testing Plan(s).

D.6. Facility, Construction, and Fire Safety – Design Basis

D.6.1 Introduction

The facility, construction, and fire safety design basis requirements for the Advanced Mixed Waste Treatment Project (AMWTP) are developed for Phases I (permitting), II (construction and preoperational testing), and III (operations and Hazardous Waste Management Act (HWMA) closure) to ensure the safety of workers and the public, while meeting all regulatory requirements. The environment, safety, and health design criteria are contained in the *AMWTP Project Design Criteria* document. The AMWTP Fire Protection Program is described in Section D.6.4, and the AMWTP maintenance program is described in Section D.6.5.

D.6.2 Requirements

Table 6 in Appendix A (Requirements Tables) lists environment, safety and health requirements for facility, construction, and fire safety design.

D.6.3 Facility

The *AMWTP Project Design Criteria* document defines the governing environment, safety, and health design criteria for the AMWTP and the primary design standards used in the development of the AMWTP design. The Project Design Criteria include requirements stated in the AMWTP Contract (DOE-ID, 1996a) and incorporate the Code of Federal Regulations, DOE Orders, and State of Idaho regulations applicable to the AMWTP. The Project Design Criteria establish the upper tier technical baseline for the AMWTP design. All lower tier design requirements, such as engineering design files, are derived from the criteria and provide the system level requirements for designing the AMWTP. Chapter 2 of the *AMWTP Project Design Criteria* addresses specific facility safety requirements.

D.6.4 Fire Protection

The following project design criteria presents BNFL's current design bases; however BNFL Inc. shall comply with DOE O 420.1 Programmatic Design requirements for fire safety.

- A Fire Hazards Analysis will be performed per DOE Order 420.1.
- The Fire Hazards Analysis should follow NFPA 801 and DOE-HE-31.3, "Guidance on the Performance of Fire Hazards Analysis," November 7, 1991.
- A Fire Hazards Analysis will be completed as part of the DSA process.
- Redundant safety class systems and components shall be in separate fire zones per DOE Order 420.1.
- Both active and passive fire protection features will be included, DOE O 420.1.
- Building fire protection systems shall include a combination of automatic fire sprinklers, fire extinguishers, standpipes, other fire suppression systems (gaseous or dry chemical) in special areas, and shall be designed and installed in accordance with NFPA requirements.

- All areas must have emergency lights, exit lights, and alarms permanently installed shall conform to NFPA 101-Life Safety Code.
- A detailed UBC analysis shall be completed which considers occupancy, travel distances, egress requirements, and ventilation.
- Emergency lighting shall conform to NFPA 101-Life Safety code.
- Fire alarm systems shall meet NFPA 72 and the INEEL-A/E standards.
- Any installed security system shall not impede emergency exit requirements per NFPA 101.
- Emergency power shall be provided in accordance with NFPA 110 to supply power to all safety-related equipment and systems.
- Vertical and horizontal penetrations through fire rated wall or ceiling construction shall be protected with rated fire doors or enclosures equivalent to the rating of the respective wall or ceiling.
- Fire sprinkler systems shall be installed in accordance with seismic criteria in NFPA 13 and fire protection-related electrical equipment and panels shall be installed in accordance with seismic criteria contained in the NEC.
- Fire suppression systems for the AMWTF shall be supplied by the existing RWMC dedicated fire water supply and mains.

D.6.4.1 Fire Protection Program

The AMWTF fire protection program addresses how the fire protection features designed and built into the AMWTF will be maintained throughout the life of the project. The fire protection program includes formal policies and procedures regarding fire prevention and protection. The fire protection program interfaces with AMWTF programs for emergency operations and preparedness, and development and delivery of formal training to personnel.

The fire protection program is applicable to Phase II (construction and preoperational testing) and Phase III (operations and HWMA closure) of the AMWTF. Program elements applicable to construction activities are included in the *AMWTF Construction Services Manual Number 3: Safety and Health Program*. For operations in Phase III, the fire protection program is implemented by the AMWTF Fire Prevention Plan and associated fire safety procedures.

In addition to the fire protection design features, the AMWTF uses administrative controls to ensure the reliability of physical protection features and to actively prevent accidents and incidents that would injure personnel or cause damage to operations, facilities, or the surrounding environment.

D.6.4.1.1 Fire Protection Program Objectives

The AMWTF fire protection program meets the requirements and the intent of DOE O 420.1, *Facility Safety*, and the requirements of the Occupational Safety and Health Administration, National Fire Protection Association, the *Uniform Building Code*, and the *Life Safety Code* (National Fire Protection

Association 101). The objective is to minimize the potential for the following situations:

1. Occurrence of a fire or related event
2. Unacceptable onsite or offsite release as a result of a fire of hazardous or radiological material that threatens the health and safety of employees, the public or the environment
3. Unacceptable interruptions of vital programs as a result of fire and related hazards
4. Damage of critical process controls and safety structures, systems, and components as a result of a fire and related events.

D.6.4.1.2 Elements of the Fire Protection Program

BNFL Inc. will have a fire protection program that meets the above objectives, and will have the following:

1. Written fire protection criteria for site-specific aspects of fire protection as required by DOE O 420.1.
2. Written procedures for fire safety for various operational aspects of the AMWTP. Required programs are noted in DOE O 420.1.
3. The fire hazards analysis (FHA) for the Advanced Mixed Waste Treatment Facility (AMWTF) and the AMWTP Retrieval Operations will be produced and revised before startup of operations. The FHA will be updated throughout the life of the facility as required by DOE O 420.1. The results of the fire hazards analysis will be incorporated into the accident analysis in the final documented safety analysis.
4. Access to a fully trained and qualified fire protection staff. The staff includes the following:
 - A fire protection specialist who meet the training, qualification, and experience requirements to implement the requirements of DOE O 420.1. This specialist may be a BNFL Inc. employee or maintained on contract to fulfill the needs of the project.
 - The INEEL Fire Department, under terms of the contract (DOE-ID, 1996a), provides fire-fighting personnel. The INEEL Fire Department provides fire suppression, equipment, ambulance emergency medical services, hazardous material protection, incident mitigation, and wildfire fighting. BNFL Inc. is responsible for ensuring that the AMWTP authorization basis recognizes the varying capabilities of the current INEEL Fire Department, based on staffing levels, available equipment, and simultaneous run histories.
5. Written pre-fire plans to enhance the effectiveness of fire fighting forces are developed before each stage of construction and start of operations. The pre-fire plans are formalized as a joint effort between the INEEL Fire Department and the AMWTP.
6. A self-assessment program to help ensure that the AMWTP is in compliance with fire protection requirements (see Section D.10, Continuous Improvement Process and Response to Internal and External Audits, of this Environment, Safety, and Health Program Operating Plan (ESHPOP)).

7. A deficiency tracking system used in conjunction with the self-assessment and response to internal/external audits program described in Section ESHPOP D.10 to track the status of fire protection compliance issues.
8. The AMWTF is designed, constructed, and maintained as a noncombustible or fire-resistive facility. To help ensure that the facility maintains this fire protection status, management strictly controls changes throughout the AMWTF. This configuration management includes a full review before actual construction of planned changes by the AMWTF. The DOE Authority Having Jurisdiction may receive for review selected modifications with major impact on fire protection features.
9. Fire protection systems inspected and tested on a regular schedule. Routine inspection and testing is conducted as required by NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Protection Systems*, or the recommended schedule of the manufacture. Testing for equipment is conducted using procedures developed in accordance with the manufacturer's instructions and recognized national standards. Testing results are formally recorded. Testing documentation is reviewed by the responsible management and fire protection personnel for corrective action, reviewed by the assigned department for trends or performance indicators, and retained for reference. Deficiencies are tracked until closed.
10. Maintenance of the AMWTF fire protection system is conducted in accordance with the *AMWTF Maintenance Implementation Plan* described in Section D.6.5.
11. Fire alarm and detection systems installed, tested, and maintained in accordance with NFPA 72, *National Fire Alarm Code*.
12. Construction features such as fire walls, fire doors, dampers, etc., tested and maintained in accordance with NFPA requirements.

D.6.5 Maintenance Implementation Plan

AMWTF has a maintenance program developed in conformance with the policy and objectives of DOE Order 4330.4B, *Maintenance Management Program*, implemented in a maintenance implementation plan.

Specific procedures and instructions implement maintenance processes unique to the AMWTF. These procedures and instructions are developed and maintained by the AMWTF.

The maintenance training program includes the skill and knowledge required to effectively and safely perform AMWTF maintenance activities. The applicable requirements are further discussed in ESHPOP Section D.7 (Training and Qualification Program).

Inspections and tests that verify conformance of maintenance work to applicable codes, standards, or other specified requirements and are accomplished through the use of approved procedures and work planning.

D.6.6 Implementing Documents

The following documents implement facility, construction, and fire safety:

- *AMWTP Construction Services Manual Number 3: Safety and Health Program*
- *AMWTP Fire Prevention Plan* and associated fire safety procedures
- *AMWTP Maintenance Implementation Plan* (documenting the maintenance program in conformance with the policy and objectives of DOE Order 4330.4B).

D.7 Training and Qualification Program

D.7.1 Introduction

The training and qualification program for the Advanced Mixed Waste Treatment Project (AMWTP) is applicable to Phase II (construction and preoperational testing) and Phase III (operations and Hazardous Waste Management Act (HWMA) closure). The statements in the following subsections apply to both phases unless otherwise indicated. The purpose of this section is to describe the training and qualification program, which establishes training requirements for all personnel involved in the construction, operation, maintenance, and technical support of the project. The objectives of the training and qualification program are the following:

- Assign responsibilities and provide requirements for establishing, implementing, documenting, and evaluating the training for employees.
- Commit to the continuing development of employees to ensure safe and quality performance from a technically competent, additionally skilled work force.
- Establish the requirements for the training and qualification of the employees who provide management direction or oversight that could impact the safe construction and operation of the AMWTP.
- Establish training in the continuous improvement systems that enhance safety, quality and reliability for facility operations.

Training for AMWTP construction personnel is managed by the WGI Construction Training Organization in accordance with the “Construction Training Plan,” CSM 3P-4.01, in the *AMWTP Construction Services Manual Number 3: Safety and Health Program*. Specific training requirements for personnel involved in Transuranic Storage Area-Retrieval Enclosure (TSA-RE) activities during Phase II are described in Chapter 4.11 of the *AMWTP Basis For Interim Operations, TSA-RE Stewardship, and Construction Activities*.

D.7.2 Requirements

Table 7 of Appendix A (Requirements Tables) lists environment, safety, and health requirements for training and qualification.

D.7.3 Organizational Structure for Training and Qualification Programs

Line management is responsible for implementing and helping develop the training. The training organization is responsible for developing and maintaining the *Training Implementation Matrix* and supporting procedures and helps the line organizations implement training. The *Training Implementation Matrix* will be submitted to DOE for review and approval. The training organization ensures that technical training uses a systematic approach to training (performance-based) and that qualified individuals perform on-the-job training and assessments. The training organization approves course content for project technical training courses; ensures that the qualification documents are prepared,

reviewed, and approved; and ensures that appropriate records are maintained. All training records are maintained in a computerized information system to ensure data integrity and to provide easy access for routine operations, self-assessments, and external audits. All training records are retained in accordance with the *AMWTP Quality Assurance Program Plan (QAPP)* and implementing procedures.

BNFL Inc. contractors are responsible for implementing their own training programs in compliance with the applicable requirements of this Environment, Safety, and Health Program Operating Plan (ESHPOP). BNFL Inc. is responsible for performing oversight of subcontractor training records to the applicable requirements.

The training organization also monitors technical training provided by vendors and subcontractors to ensure that the training meets AMWTP performance objectives. The training organization arranges for specialized classes when classes are not available locally.

The training lead or designee is responsible for reviewing and approving the qualification documents, and for procedures relating to training and qualifications. The training lead or designee also establishes the training records system. In addition, the training lead or designee:

- Ensures AMWTP training meets the requirements of this ESHPOP
- Assists in updating job analysis data as positions, procedures, instructions, permits, hazards, or facilities change
- Assists in developing training materials for classes provided by the training organization
- Reviews the training materials prepared by AMWTP organizations for nuclear facility on-the-job training
- Ensures the personnel performing training meet the minimum requirements for their training responsibilities
- Obtains subject matter expert input for written and verbal examinations and assessments
- Ensures an examination bank of questions for use in examinations and/or evaluations is maintained and updated
- Ensures training materials are updated
- Ensures scheduling and notification of personnel for required training and retraining
- Ensures training and qualification records are maintained
- Ensures qualification cards are issued when required
- Ensures subcontractor personnel are qualified to work at the AMWTP facilities.

Representatives from relevant AMWTP functional areas assist the training organization in determining qualification standards.

D.7.4 Subcontract Training Resources

- Training support may be provided to the AMWTP by subcontracted organizations. All subcontractor personnel must demonstrate qualification requirements for the job function to be performed.

D.7.5 Personnel Selection Requirements

- AMWTP management selects personnel on the basis of their relevant experience and education, as described in the AMWTP recruitment procedure.

D.7.6 Development of Qualification and Certification Standards

The training organization maintains a summary of positions requiring qualification and certification before tasks may be performed. The training requirements for specific positions and tasks within the project are identified from a job task analysis.

D.7.7 AMWTP Training

AMWTP training implements a combination of classroom and on-the-job training. Training may also include simulator and laboratory training as it applies to the position. Classroom training includes lectures, seminars, computer-based training, and structured self-study activities, as applicable.

Program implementation consists of activities related to the actual conduct of training, as well as resource allocation, planning, and scheduling. Implementation requires assigning instructors and support staff, scheduling training and facilities, and conducting training.

Trainers are qualified to instruct employees about the subject matter being presented in accordance with the relevant management procedure.

The training organizations use either standardized DOE course material or develop project-specific training materials to fulfill training requirements associated with each qualification standard. The training design, development, and implementation are based on the learning objectives developed from the qualification standards.

Materials (e.g., lesson plans and on-the-job training guides, training aids, student materials, test items, examinations, and assessments) are designed to incorporate methods and activities that maximize training effectiveness.

Mastery of the learning objectives by the trainees is evaluated. Evaluation methods include oral questioning, written examinations, and task performance, as applicable. Training/evaluation standards are also developed to provide guidance for on-the-job training and continuing training. Initial and continuing training programs ensure that personnel are qualified to perform job requirements.



AMWTP operations personnel receive new employee orientation and training designed to familiarize the employees with the information and protocols necessary to maintain a safe work environment at the AMWTP. The new employee orientation includes such topics as AMWTP description, AMWTP emergency plans, evacuation alarms, radiological health and safety program, industrial safety and hygiene program, fire protection program, security program, operational alarms, quality assurance program, hazard communication program, and the hazards associated with the AMWTP.

Because of the various tasks and responsibilities of the employees, required training is tailored to each position at the AMWTP. Training is provided for personnel in such job categories as management/supervisory, administrative, professional/technical, and technician. AMWTP technicians and certain specialists receive specialized training in the areas commensurate with their job assignments. This training is required for acquiring and maintaining certification in their trade, or validating proficiency to perform certain tasks. Certification/proficiency training may be required for certain positions.

During the operations phase, each new employee and all contracted personnel, temporary personnel, and visitors to the AMWTP facilities must attend a general operations orientation meeting in order to have unescorted access to the facilities. Any person who has not attended the general orientation meeting must be escorted at all times. In addition, unescorted access to Resource Conservation and Recovery Act (RCRA)-regulated mixed waste areas of the AMWTP requires additional training in RCRA waste management and radiological controls.

The AMWTP line managers work with the training organization lead to define competence commensurate with responsibility standards for project operations personnel. Qualification is defined, as appropriate, in terms of education, experience, training, examination, and any special requirements necessary for performance of assigned responsibilities. Certification is the process by which management endorses and documents the qualification of a person for a position.

Qualification and requalification of technician and supervisor candidates is described in the AMWTP management procedures. Training exceptions, exemptions and extensions are described in the *AMWTP Exceptions, Exemptions and Extensions Procedure*.

D.7.8 Changes in Training and Qualification Materials

Changes to training and qualifications materials must be approved by the AMWTP Training Manager or designee. Documentation to support changes includes (a) the responsibility for approval of changes, (b) a description of changes, (c) the reason for changes, and (d) the training requirements. The documentation for changes is retained as part of the course record.

D.7.9 Documentation of Training and Qualification

The training organization maintains documents and records for positions requiring training, as identified in the *AMWTP Training Implementation Matrix*. A training information system is used to store individual records and course records and to produce reports from the records. The training lead is responsible for accurate and complete data entries, training status updates, and the review of records to ensure validity. The training information system provides for the following records:

- *Individual Records.* Training records on current personnel are kept until the AMWTP is closed while training records on former employees are kept for at least three years from the date the employee last worked on the AMWTP. Individual training records include the following:
 - Individual training plans
 - Individual training histories of applicable course and qualification completion
 - Completed qualification program checklists
 - Examinations and assessments
 - Remedial training documentation
 - Copies of current certificates of training or qualification as applicable to the job position
 - Documentation of training equivalency or exceptions.
- *Course Records.* Course records are maintained for approved AMWTP technical training courses. The following information is included for each approved course:
 - Course title
 - Course number
 - Terminal learning objective(s) or course goal(s)
 - Duration of the course
 - Qualification standard competencies covered by the course
 - Course revisions.

In some cases, it may be necessary to extend an individual's certification or qualification, or to except an individual from a specific training or qualification requirement. This should not be used for operational convenience and will be controlled through a written procedure. The AMWTP procedure for controlling training exceptions and extensions will be submitted to DOE for review and approval. The AMWTP procedure for controlling training exceptions and extensions will include a provision to obtain written approval from the DOE Operations Office Manager for extensions of certification.

D.7.10 Implementing Documents

The following documents implement the AMWTP training and qualification program:

- *AMWTP Training Implementation Matrix.*



- AMWTP supporting management procedures

D.8 Environmental Protection and Monitoring

D.8.1 Introduction

The purpose of this section is to provide an overview of the Advanced Mixed Waste Treatment Project (AMWTP) environmental protection and monitoring program. This program establishes the necessary requirements for managing radionuclides and hazardous chemicals generated during construction, operation, and closure phases of the AMWTP. The program emphasizes radiation and chemical protection, and applies to all AMWTP departmental elements and contractors performing AMWTP work.

The term environmental monitoring is used to describe two separate activities: effluent monitoring and environmental surveillance. Effluent monitoring is the measurement of the waste stream before its release to the environment, such as the monitoring of stacks or discharge pipes. Environmental surveillance is the measurement of pollutants in the environment. Surveillance involves determining whether pollutants are present or measurable, and, if present, in what concentrations.

Monitoring requirements vary during the various phases of AMWTP but are conducted to maintain an accurate record of the potential impact of the AMWTP on the surrounding environment and to demonstrate compliance with permit requirements and federal, state, and local regulations. Monitoring is addressed in the applicable environmental program, such as, but not limited to, those for the National Emissions Standards for Hazardous Air Pollutants (NESHAPs), the *Clean Water Act of 1977*, and the *Safe Drinking Water Act of 1996*. In accordance with Section J of AMWTP Contract (DOE-ID, 1996a), BNFL Inc. is responsible for sufficient environmental monitoring of radioactive materials within the boundaries of the AMWTP. BNFL Inc. is not responsible for environmental surveillance outside the confines of AMWTP; this function is performed by the INEEL Management and Operating (M&O) contractor. The effluent monitoring conducted by BNFL Inc., in conjunction with the environmental surveillance conducted by the INEEL M&O Contractor satisfies the requirements of DOE 5400.1 *General Environmental Protection Program*, Chapter IV. Refer to Section D.8.4 for additional details on the AMWTP monitoring and surveillance responsibilities of BNFL Inc., DOE-ID, and the INEEL M&O Contractor. The memorandum of agreement will be revised during Phase III (operations and Hazardous Waste Management Act (HWMA)) to clearly delineate responsibilities between DOE-ID, the INEEL M&O contractor, and BNFL Inc. AMWTP requirements relating to the control of solid waste are addressed in Section D.15 (Waste Management Program) of this *AMWTP Environment, Safety, and Health Program Operating Plan* (ESHPOP).

AMWTP air emission controls provide adequate protection for the public and the environment. In addition to these controls, emissions from the Advanced Mixed Waste Treatment Facility (AMWTF) are continuously monitored per 40 CFR 61, Subpart H.

Specific permits and documents have been issued that establish certain environmental protection and monitoring criteria for the AMWTP. These include the *Advanced Mixed Waste Treatment Facility (AMWTP) Hazardous Waste Management Act/Resource Conservation and Recovery Act (HWMA/RCRA) Treatment Permit*, the *AMWTP HWMA/RCRA Storage Permit*, the *AMWTF Permit to Construct*, the *Transuranic Storage Area-Retrieval Enclosure (TSA-RE) Permit to Construct*, the *National Pollution Discharge Elimination System (NPDES) Construction General Permit*, *NPDES Industrial Storm Water General Permit*, *HWMA/RCRA Part A Permit Application for INEEL Pads TSA-1/TSA-2 and TSA-2 and TSA-RMF at the Transuranic Storage Area*, and the *AMWTP HWMA/RCRA TSA Interim Status Document*. These permits and documents establish (a) applicable emission limitations and standards; (b) monitoring and related recordkeeping and reporting requirements; (c) compliance certification,

testing, monitoring, reporting, and recordkeeping requirements to ensure compliance with the permit; (d) inspection and entry requirements for permitting authority officials; and (e) a schedule of compliance and regular progress reports consistent with that schedule.

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, requires DOE operations to monitor radiological liquid effluents from all discharge points with releases to the environment. Potentially contaminated liquids, such as water from decontamination showers in the AMWTF, will be sampled, analyzed, and managed in accordance with applicable federal, state, and local requirements. BNFL Inc. intends to treat any known or potentially radiological liquids by absorption. The only liquid effluents discharged from the AMWTF will be liquids that have no potential to have become radiologically contaminated.

D.8.2 Scope

Environmental monitoring ensures regulatory compliance by identifying the necessary requirements and by clearly defining the appropriate authorities and responsibilities. Areas of focus include identifying and tracking new requirements, reducing radiation and chemical exposure to the public and environment, managing emissions and wastes through effective monitoring and surveillance, and maintaining effective quality assurance and recordkeeping protocol.

Critical objectives of the program (DOE Order 5400.1, *General Environmental Protection Program*) include the following:

- Conducting all operations in an environmentally safe and sound manner
- Protecting both the public and the environment
- Meeting established environmental protection goals through restoration and enhancement of environmental quality and public health
- Conducting operations in compliance with applicable laws
- Implementing good management practices to identify and correct problems, minimize risks, and prevent problems from occurring
- Ensuring that subcontractors share a commitment to implement good management practices by actively overseeing all subcontracted efforts.

D.8.3 Requirements

Table 8 in Appendix A (Requirements Tables) lists environment, safety and health requirements for environmental protection and monitoring.

D.8.4 Responsibilities

BNFL Inc. is responsible for monitoring for applicable effluents from the AMWTF. The constituents monitored are consistent with waste stream characteristics, permit requirements, and federal, state, and local regulations. The results of these monitoring activities are used to satisfy various permit requirements and provide data for use in reports such as the annual radiological dose evaluation of the



INEEL NESHAPs report. BNFL Inc. is responsible for performing a preoperational assessment to determine the types and quantities of airborne emissions to be expected from the facilities, and to establish the associated airborne emission monitoring needs of the facilities.

The annual radiological dose evaluation of the INEEL is the responsibility of DOE-ID. The dose evaluations show compliance with IDAPA 58.01.01.591 (40 CFR Part 61, Subpart H), *National Emissions Standards for Hazardous Air Pollutants*, and are performed by the INEEL M&O Contractor using the appropriate computer code (e.g., CAP-88). These evaluations are based on effluent data from the individual INEEL facilities and meteorological data from the same year supplied by the National Oceanic and Atmospheric Administration (NOAA).

Environmental surveillance outside the immediate confines of the AMWTP facilities is performed by the INEEL M&O Contractor.

BNFL Inc.'s environmental "as low as reasonably achievable" (ALARA) policy is to operate the facility and conduct operations such that the radiation exposures are as far below the dose limits of DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, as is reasonably achievable to protect the environment from radioactive contamination to the extent practicable. BNFL Inc. is committed to monitoring routine and nonroutine releases to the environment and for the assessment of doses to members of the public.

Results of environmental monitoring and dose assessments are periodically reviewed to determine how exposures might be reduced in accordance with the ALARA philosophy. This includes assessing design, operating, and maintenance procedures and past environmental monitoring records. The Radiological Control Manager has responsibility for ALARA programs, as described in ESHPOP Section D.1 and D.1A (Radiation Protection Program).

D.8.5 Environmental Protection

Environmental protection at the AMWTP facilities is implemented by compliance with radiological and nonradiological release guidelines, emission controls, and environmental monitoring, as discussed in the following sections.

D.8.5.1 Radiological Releases

Radioactive releases to the environment are minimized through the use of airborne emission control systems (Section D.8.5.3) and administrative controls. AMWTP controls and monitors the release of radioactive materials to ensure compliance with the following public dose guidelines and with Chapter II of DOE Order 5400.5.

Public Dose Guidelines. Public exposures from AMWTP sources are limited as described in the following paragraphs:

Public Dose Guideline: All Exposure Modes, All AMWTP Sources of Radiation. The exposure of members of the public to radiation sources as a consequence of all routine DOE activities (including AMWTP) shall not cause, in a year, an effective dose equivalent greater than 100 mrem (1 mSv).

Airborne Emissions Only: All AMWTP Sources of Radionuclides. To the extent required by the *Clean Air Act of 1990*, as amended, the exposure of members of the public to radioactive materials

released to the atmosphere as a consequence of routine AMWTP activities will not exclusively or in combination with the total radionuclide emissions from all other facilities located at the INEEL cause members of the public to receive, in a year, an effective dose equivalent greater than 10 mrem (0.1 mSv) pursuant with IDAPA 58.01.01.591 (40 CFR Part 61, *National Emissions Standards for Hazardous Air Pollutants*). This 10-mrem dose limit applies to total dose from airborne emissions from all INEEL facilities.

Drinking Water Pathway Only: All AMWTP Sources of Radionuclides. Although no liquid discharges to soil are anticipated, AMWTP provides a level of protection equivalent to that provided to the public by the public community drinking water standards of 40 CFR Part 141, *National Primary Drinking Water Regulations*. These systems shall not cause persons consuming the water to receive an effective dose equivalent greater than 4 mrem (0.04 mSv) in a year. Combined radium-226 and radium-228 shall not exceed 5E-09 $\mu\text{Ci}/\text{mL}$ and gross alpha activity (including radium-226 but excluding radon and uranium) shall not exceed 1.5E-08 $\mu\text{Ci}/\text{mL}$.

Drinking water at the AMWTP originates from a well at the Radioactive Waste Management Complex (RWMC) maintained by the INEEL M&O Contractor; therein, and according to IDAPA 58.01.08, *Idaho Rules for Public Drinking Water Systems*, the drinking water monitoring that is required to ensure that the AMWTP drinking water consumers have a level of protection equivalent to that provided to the public by the public community drinking water standards of 40 CFR Part 141, *National Primary Drinking Water Regulations*, must be conducted by the INEEL M&O Contractor.

Demonstration of Compliance with Public Dose Limits. The monitoring and surveillance performed plays an essential role in ensuring that public dose limits are not exceeded. Compliance with public dose limits is demonstrated through dose calculations using facility monitoring results, waste stream and emission controls data, and other site-specific information. Dose conversion factors and other data appropriate to these calculations will follow the specifications in Chapter III of DOE Order 5400.5. These calculations include dose to the maximally exposed individual and the collective effective dose equivalent (population dose) to the population within an 80-km (50-mile) radius of the operations center of the INEEL.

Release of Materials and Equipment. The bases for release limits for material and equipment from the AMWTP are 10 CFR Part 835, *Occupational Radiation Protection*, and DOE Order 5400.5. Additionally, material released and destined for a disposal facility (e.g., INEEL landfill) must meet the waste acceptance criteria for the disposal facility. These limits shall also apply to dry wood and plastic encountered during retrieval operations. No material or equipment will be released from the AMWTP except to other BNFL Inc. or DOE facilities or to an appropriate waste treatment or disposal facility. Procedures and release criteria for materials and equipment are contained in the *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures.

Disposition of Soils from Retrieval Operations. Soils from the TSA-RE are handled and monitored according to the *AMWTP Soil Sampling and Disposition Plan*. Release limits for soil during retrieval are presented in the *AMWTP Soil Sampling and Disposition Plan*, which is approved separately from the ESHPOP by DOE.

D.8.5.2 Nonradiological Releases

Routine air emissions at the AMWTP facilities are minimized through the use of confinement systems and HEPA filters (Section D.8.5.3).



Public Exposure Limits to Hazardous Materials. Public exposure to hazardous materials is evaluated on the basis of standards established to protect and preserve ambient air and water quality. For air, National Ambient Air Quality Standards (NAAQS) [40 CFR Part 50] are considered in establishing permit guidelines. For surface and ground water, published standards from water quality criteria and State of Idaho Water Quality Standards [IDAPA 58.01.02, *Water Quality Standards and Wastewater Treatment Requirements*] are considered in establishing permit guidelines. For drinking water, the National Drinking Water Standards (primary and secondary) establish criteria for defining safe public drinking water supplies [40 CFR Part 141 and 40 CFR Part 143, *National Secondary Drinking Water Regulations*]. Emissions exceeding published standards and permit limits are considered detrimental to human health and the environment.

Air. Emissions to air are limited by permit conditions that specify maximum throughput limits for waste. The AMWTP air permits specify maximum emission limits for radionuclides. In addition, the State of Idaho Air Toxics Regulations (IDAPA 58.01.01, *Rules for the Control of Air Pollution in Idaho*) contain concentration limits for hazardous chemicals.

Water. *National Primary Drinking Water Standards* (NPDWS) [40 CFR Part 141] and *National Secondary Drinking Water Standards* (NSDWS) [40 CFR Part 143] have been established for radioactive and hazardous pollutants of concern. Standards are established as maximum contamination limits. Drinking water at the AMWTP originates from a well maintained by the INEEL M&O Contractor. Thus, according to IDAPA 58.01.08, *Idaho Rules for Public Drinking Water Systems*, the drinking water monitoring required to ensure that the AMWTP drinking water meets the standards of 40 CFR Part 141, *National Primary Drinking Water Regulations* and 40 CFR Part 143, *National Secondary Drinking Water Standards*, must be conducted by the INEEL M&O Contractor.

Site-specific storm water controls are established in the AMWTP storm water pollution prevention plans for construction and industrial activities. BNFL Inc. prepared a storm water pollution prevention plan to cover AMWTF construction activities through Phase II (construction and preoperational testing). The plan conforms to the NPDES requirements of the storm water general permit maintained by DOE-ID. In July of 1999, BNFL Inc. submitted a "Notice of Intent for Storm Water Discharges Associated with Construction Activity Under a NPDES General Permit." On September 22, 1999, U.S. Environmental Protection Agency (EPA) approval was obtained and NPDES construction storm water general permit number IDR10A429 was assigned to the AMWTF.

BNFL Inc. prepared an *AMWTP Storm Water Pollution Prevention Plan for Industrial Activities*. In May 2001, BNFL Inc. submitted a "Notice of Intent for Storm Water Discharges Associated with Industrial Activity under the NPDES Multi-sector General Permit." On May 30, 2001, the EPA issued Industrial Storm Water General Permit No. IDR05A492 to the AMWTP for the discharges of storm water associated with industrial activities at the AMWTP.

The BNFL Inc. Memorandum of Agreement with the DOE-ID and the INEEL M&O Contractor (DOE-ID, 2000a) addresses storm water pollution prevention. Under this agreement BNFL Inc. is responsible for storm water inspections and resolution of issues that arise at the AMWTP.

Nonhazardous industrial wastewater and domestic sewage discharges are evaluated on the basis of engineering and administrative controls and/or characterization to ensure that pollutants do not endanger human health or the environment.



Chemical Exposure Philosophy. Administrative and engineering controls are used to reduce chemical exposure to the public and the environment. Exposure is maintained at or lower than established guidelines and standards.

Demonstration of Compliance with Limits. Adherence to permit operating restrictions determines compliance status. A combination of techniques is used to collect the data. Air emissions are evaluated through the use of process information and mathematical calculations. The INEEL M&O Contractor collects and analyzes samples of drinking water to ensure that maximum concentration limits are not exceeded. Grab samples of storm water are collected and analyzed by the INEEL M&O Contractor to ensure that permit limits are not exceeded.

Implementing procedures are developed to accomplish necessary sampling and analyses and to identify the records and reports required for compliance verification.

As part of the HWMA/RCRA permitting process, a screening level risk assessment was performed for the facility. "Theoretical" receptors, representing the points of maximum air concentration and maximum combined deposition at or near the boundary of the INEEL, were used for risk calculations. The AMWTP is not required to conduct any further risk assessments, therefore the screening level risk assessment will be maintained as a bounding assessment.

D.8.5.3 Emission Controls

Control of air pollution, nonradioactive liquid wastes and effluents, and secondary wastes are discussed in the following sections.

Air Pollution

Advanced Mixed Waste Treatment Facility (AMWTF). Air emissions from the process area are routed through high-efficiency particulate air (HEPA) filters and monitored and discharged through individual stacks. Monitoring for radioactive particles is conducted at all discharge points with the potential to emit radionuclides. Alarms are provided to alert operators of problems, such as emissions exceeding allowed values or significant changes in airflow rates.

The dedicated HEPA filter system is used at all times during operations. The primary function of the system is to remove entrained particulate, metals and radionuclides from the air before release to the environment. The air pollution control system is operated, maintained, and monitored to ensure compliance with established permit limits. Records of all monitoring activities and operating data are maintained.

Transuranic Storage Area-Retrieval Enclosure (TSA-RE). The ventilation system will be used to vent retrieval equipment combustion gases and fugitive volatile organic compounds (VOCs). Localized filtration via HEPA-filtered tents, and portable vacuum units may be used if loose contamination or contaminated soil is detected during operations. For general dust suppression and control, water or surfactant may be sprayed on the soil during retrieval operations to minimize suspension of dust.

Other AMWTP Facilities. Waste containers are not opened in the Type II storage modules (except for the Characterization Facility (WMF-634)). Air from these storage modules is vented, unfiltered, by exhaust fans. The Characterization Facility has been modified to meet the AMWTP requirements for characterizing waste. Within most of the Characterization Facility, the waste containers

are not breached and there are minimal emissions to the building interior. Drum venting and drum coring activities within the Characterization Facility involve breaching the waste containers, and these activities take place within Zone 2 or Zone 3 ventilation areas that provide confinement of emissions. Both of these activities are conducted within gloveboxes, whose exhaust passes through HEPA filters before discharge to the Characterization Facility exhaust.

Gas generation testing will be performed in the Type I storage module for certain waste types. Waste containers are not opened inside the Type I storage module, so there are minimal emissions from the waste containers in this building. Any emissions from the drum venting silo inside the Type I storage module will be controlled using the drum vent exhaust system, which contains HEPA filters to control the release of particulates.

The AMWTP may use the Waste Aggregation Facility (WMF-618) to assemble waste containers into shipping packages and for loading transuranic package transporter (TRUPACT)-II casks. The SWEPP facility may be used for assay and radiography in support of waste characterization. The waste containers are not opened inside these buildings, so there are minimal emissions from the waste containers.

Nonradioactive Liquid Wastes and Effluents

The liquid effluent system includes drinking water systems, process water systems, domestic sewage systems, and industrial wastewater systems. Each of these systems is discussed in the following paragraphs. Each system is designed to meet plant needs and periodic maintenance is performed to keep the systems in good operating condition. Monitoring is performed as needed to provide operators sufficient data to ensure compliance with standard operating conditions. Records of all monitoring activities and operating data are maintained.

Drinking Water System. Potable drinking water at the site is pumped from a deep well at the RWMC into a storage tank. The tank feeds a large system of header pipes for the RWMC, including the AMWTF. Under a Memorandum of Agreement between DOE-ID, BNFL Inc., and the M&O Contractor (DOE-ID, 2000a), the INEEL M&O Contractor monitors the drinking water for compliance per the requirement IDAPA 58.01.08, *Idaho Rules for Public Drinking Water Systems*. BNFL Inc. will also pull coliform samples to ensure quality of the water in the distribution system at AMWTP facilities.

Process Water System. The source of the AMWTF process water is the potable water service to the building, and has the same water quality as the potable water at the point of connection. The process water is connected to the potable water system through an approved reduced pressure back flow preventor, which is inspected and tested per State of Idaho and DOE-ID requirements.

Domestic Sewage System. The AMWTF has its own domestic sewage system. The system includes collection pipes in the facility for nonhazardous sources, including floor drains, sinks, toilets, drinking fountain drains, and nonhazardous process wastewater sumps. The collection system discharges into a large common sewer sump fitted with a sewage grinder and lift pump. The pump discharges the sanitary waste into an existing pressurized sewer that discharges into the RWMC wastewater lined lagoon system for treatment and disposal. The lagoon system uses evaporative means to eliminate discharge wastewater. The volume of sanitary waste pumped from the system is monitored and recorded by the INEEL M&O Contractor.

Industrial Wastewater System. Nonhazardous industrial wastewater is generated from various unit processes (boilers; compressors condensate drains; heating; ventilating; and air conditioning

condensate drains). Each industrial discharge is collected in a small sump where it can be sampled and then drained or pumped to the building sanitary sewer and into the main sewer sump and pump/grinding station. From this station, the water intermixes with the building sanitary sewage and is pumped to the sewage lagoons for treatment.

Storm Water Runoff. Best management practices are used at the AMWTP to minimize the pollutant content of storm water discharged to the existing RWMC storm water runoff system.

Control of Secondary Wastes. The waste management program (ESHPOP Section D.15) discusses the control of secondary wastes generated at the facility. The secondary waste control systems provide for sound management of secondary wastes in satellite and temporary accumulation areas, and interim/permitted storage areas.

D.8.5.4 Environmental Monitoring

Environmental monitoring encompasses two separate activities, effluent monitoring and environmental surveillance, as noted in Section D.8.1. The AMWTP effluent monitoring is addressed in the applicable environmental program, such as, but not limited to, that for NESHAPs, the *Clean Water Act of 1977*, and the *Safe Drinking Water Act of 1996*.

BNFL Inc. will revise the memorandum of agreement for Phase III (operations and HWMA closure) with DOE-ID and the M&O contractor to identify environmental monitoring responsibilities, define the adequacy of existing INEEL background data, and address the involvement of the NOAA in gathering meteorological data.

Monitoring Air Pollution

Advanced Mixed Waste Treatment Facility (AMWTF). Emissions from the ventilation systems from the process areas are discharged through individual stacks, which are gathered and routed together from the building and up to a single discharge point. Individual discharges are monitored at distinct locations inside the AMWTF. In-line flow monitoring is performed for radionuclides from each of the major sources. Details associated with emissions monitoring are outlined in the *AMWTF Air Permit to Construct*, including NESHAPs. The air permit to construct is discussed in ESHPOP Part C (Interface with Other Permits, Authorizations, and Agreements).

Emissions from the testing and maintenance of diesel generator systems are also evaluated. As necessary, these systems have been assessed for inclusion in the air permit to construct [IDAPA 58.01.01, *Rules for the Control of Air Pollution in Idaho*]. The systems evaluated include the backup generator for the facilities.

Transuranic Storage Area-Retrieval Enclosure (TSA-RE). A NESHAPs analysis attached to the *TSA-RE Permit to Construct* determined that the facility does not require continuous monitoring for radionuclides. Periodic confirmatory measurements will be conducted as required by NESHAPs (40 CFR 61.93).

Other AMWTP Facilities. Air from the Type I and Type II storage modules (except WMF-634, the Characterization Facility), SWEPP, and the Waste Aggregation Facility is vented, unfiltered and unmonitored, by exhaust fans. Emissions from the Characterization Facility ventilation system that could be contaminated are discharged through HEPA filters.



Monitoring Liquid Wastes and Effluents. The following paragraphs discuss monitoring of drinking water, process water, sanitary sewer system discharges, wastewater discharges, and storm water system discharges.

Drinking Water. Drinking water is evaluated by the INEEL M&O Contractor at the well-head to determine compliance with national primary and secondary drinking water standards for public community drinking water systems. BNFL Inc. will also pull coliform samples to ensure quality of the water in the distribution system at AMWTP facilities.

Process Water. Process water is not monitored at the AMWTF because it is supplied from the drinking water supply through a back flow prevention device.

Discharges to Sanitary Sewer System. Discharges to the sanitary sewer system include domestic sewage generated at the AMWTP facilities and nonhazardous industrial wastewater. Monitoring of discharges to the sewer system is not required.

Wastewater Discharges to the Holding Tank. Decontamination showers in potentially contaminated areas of the treatment facility discharge to a decontamination wastewater holding tank. Water stored in the tank is characterized before disposition. Records are maintained of the volumes collected. Characterization is performed through evaluation of process wastes that could be discharged to the tank.

Discharges to Storm Water System. Samples are collected at the existing discharge point locations by the INEEL M&O Contractor. Data support compliance with the INEEL storm water pollution prevention plans and the overall INEEL storm water management process. Parameters for monitoring are selected in accordance with the methodology used in the storm water pollution prevention plans. Data are also used to support participation in the overall INEEL storm water pollution prevention program. BNFL Inc. prepared a storm water pollution prevention plan that covers AMWTF construction activities through Phase II (construction and preoperational testing). The plan, which was approved September 22, 1999, conforms to the NPDES requirements of the storm water general permit maintained by DOE-ID. In addition, BNFL Inc. prepared a *Storm Water Pollution Prevention Plan for Industrial Activities* at the AMWTP. In May 2001, BNFL Inc. submitted a "Notice of Intent for Storm Water Discharges Associated with Industrial Activity under the NPDES Multi-Sector General Permit." On May 30, 2001, the EPA issued Industrial Storm Water General Permit No. IDR05A492 to the AMWTP for the discharges of storm water associated with industrial activities at the AMWTP. The storm water pollution prevention plans and process are discussed further in Section C.5 (Storm Water Pollution Prevention Memorandum of Agreement) of ESHPOP Part C (Interface with Other Permits, Authorizations, and Agreements).

Environmental Surveillance

Offsite Surveillance. The memorandum of agreement between BNFL Inc., DOE-ID, and the INEEL M&O Contractor for Phase III operations will contain a statement that states the M&O Contractor is responsible for performing surveillance outside the facility fence before operations. All offsite surveillance is integrated with the existing INEEL environmental monitoring program. Data collected from offsite surveillance are presented in the annual INEEL Site Environmental Report.

Onsite Surveillance. Environmental surveillance inside the facility fence is the responsibility of BNFL Inc. During operations onsite surveillance will be evaluated to determine the need. Data collected from onsite monitoring will be presented in the annual INEEL Site Environmental Report.

D.8.5.5 Quality Assurance

Specific AMWTP implementing procedures and instructions as required by the *AMWTP Quality Assurance Program Plan* have been developed to support the AMWTP environmental protection and monitoring program. These procedures and instructions include the necessary elements to ensure that collected data are both accurate and precise. They also provide descriptions of organizational responsibilities, program objectives and goals, and procedures.

BNFL Inc. management is committed to the safe and efficient operation of the AMWTP. Continuous improvement is directed and monitored by management through the implementation of the *Quality Assurance Program Plan* and its implementing procedures. BNFL Inc. implements continuous improvement and appropriate response to internal and external audits through the *Quality Assurance Program Plan*, supplemented by the self-assessment program described in ESHPOP Section D.10.

D.8.6 Implementing Documents

The following documents implement the environmental protection and monitoring program:

- AMWTP Environmental programs and implementing procedures.
- Memorandum of Agreement between DOE-ID, BNFL Inc., and the INEEL M&O Contractor (DOE-ID, 2000), plus subcontracts for services, including on- and off-site monitoring and surveillance, safe drinking water monitoring, storm water run-off monitoring, assessment of adequacy of INEEL background data, reporting requirements, coordination of the annual NESHAPs Report, and involvement of NOAA in collecting meteorological data.
- *AMWTP Radiological Control Implementation Matrix* and associated implementing procedures
- *AMWTP Soil Sampling and Disposition Plan*
- *AMWTP Storm Water Pollution Prevention Plan for Construction Activities*
- *AMWTP Storm Water Pollution Prevention Plan for Industrial Activities*



D.9 Contingency/Emergency Planning and Response

D.9.1 Introduction

The purpose of contingency/emergency planning and response is to identify equipment, planning, training, and assignment of responsibilities necessary to respond to emergency conditions at the Advanced Mixed Waste Treatment Project (AMWTP). Contingency/emergency planning is required by federal regulations codified by the Occupational Safety and Health Administration (OSHA) (Title 29 of the Code of Federal Regulations (CFR)), in the Resource Conservation and Recovery Act (RCRA) (CFR Title 40), by the Department of Transportation (CFR Title 49), and by the State of Idaho.

The *AMWTP Emergency Plan/RCRA Contingency Plan* documents the overall process for responding to and mitigating any consequences of emergencies that might arise at the AMWTP facilities. The *AMWTP Emergency Plan/RCRA Contingency Plan* is integrated with the existing *Idaho National Engineering and Environmental Laboratory (INEEL) Emergency Plan/RCRA Contingency Plan* to ensure the coordination of notification and response activities. Interface agreements with other INEEL contractors are established in the memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL Management and Operating (M&O) Contractor (DOE-ID, 2000a). To ensure consistency and compatibility with existing INEEL emergency planning activities, DOE-ID reviews and approves the *AMWTP Emergency Plan/RCRA Contingency Plan*. The criteria for approving the plan is consistent with the requirements in Attachment I of DOE O 151.1, *Comprehensive Emergency Management System*, as applicable to DOE-ID and other INEEL emergency plans/RCRA contingency plans.

The *AMWTP Emergency Plan/RCRA Contingency Plan* is approved by DOE-ID for Phase II (construction and preoperational testing) activities. The plan will be revised before the startup of retrieval operations and again before the startup of operations in the Advanced Mixed Waste Treatment Facility (AMWTF).

D.9.2 Requirements

Table 9 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for contingency/emergency planning and response.

D.9.3 Implementing Documents

The following documents implement contingency/emergency planning and response:

- *AMWTP Emergency Plan/RCRA Contingency Plan*

D.10 Continuous Improvement Process and Response to Internal and External Audits

D.10.1 Introduction

The purpose of this section is to establish the processes for ensuring continuous improvement in the safe and reliable operation of the Advanced Mixed Waste Treatment Project (AMWTP) facilities in all elements of facility management and operation. This section invokes the AMWTP quality assurance program and establishes the AMWTP requirements for assessments and corrective actions.

BNFL Inc. management is committed to the safe and efficient operation of the AMWTP and to the implementation of processes for the purposes of self-identification, correction, and prevention of conditions that do not meet established requirements or affect continued safe operations. In accordance with 10 CFR 830, Subpart A, *Nuclear Safety Management—Quality Assurance Requirements*, and the Waste Isolation Pilot Plant *Quality Assurance Program Document* (DOE, 1999b), BNFL Inc. management directs and monitors continuous improvement and early detection of problems by implementing the *AMWTP Quality Assurance Program Plan* (QAPP) and its project implementing procedures for Assessment, Reporting, and Corrective Action. DOE has reviewed and approved the *AMWTP Quality Assurance Program Plan*, and reviews all annual updates for approval. In addition, the AMWTP is managed and operated in a manner consistent with Recommendation 95-2, *Integrated Safety Management* (DOE, 1995c), published by the Defense Nuclear Facilities Safety Board.

BNFL Inc. implements continuous improvement, identifies adverse conditions, and effects comprehensive corrective actions to address the cause of problems. The self-assessment process is a basic element of the continuous improvement process because it acknowledges BNFL Inc.'s responsibilities for critical self-evaluation under the oversight of DOE-ID. In accordance with 10 CFR Part 820, *Procedural Rules for DOE Nuclear Activities*, self-assessment becomes part of the BNFL Inc. safety culture and is a systematic process for the identification and correction of noncompliant conditions reportable under DOE's nuclear safety requirements and the *Price Anderson Amendments Act of 1988*.

The *AMWTP Quality Assurance Program Plan* applies to all phases of the project. BNFL Inc. imposes appropriate quality assurance requirements from the *Quality Assurance Program Plan* and project implementing procedures in contracts with its subcontractors and suppliers.

Pursuant to 10 CFR 830.121 (b) (3), BNFL Inc. will, in the anniversary month of December, either (1) submit to DOE the annual revision to the *Quality Assurance Program Plan* (QAPP), (2) notify DOE that no changes are needed to the QAPP, or (3) notify DOE in writing if delay of the annual submittal is justified.

D.10.2 Requirements

Table 10 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for continuous improvement process and response to internal and external audits.

D.10.3 Management Policy on Continuous Improvement

Various elements of the *AMWTP Quality Assurance Program Plan* (i.e., management assessment, independent assessment, surveillances, lessons learned, quality improvement, corrective action and root



cause analysis) implement BNFL Inc.'s commitment to continuous improvement. In recognition of BNFL Inc.'s responsibilities under the *Price Anderson Amendments Act of 1988*, management performs self-identification and reporting of events requiring reporting under the Act. Quality assurance audit reports, including identification of any noncompliant safety conditions and resulting corrective actions, are provided to DOE-ID in order for DOE to exercise its oversight responsibilities. Access to self-assessment reports and resulting corrective actions will be provided to DOE-ID at the time of the semi-annual review and annual audit of the self-assessment program, and as requested to support ongoing oversight of AMWTP activities.

BNFL Inc. cooperates with DOE-ID by reporting conditions and occurrences covered by DOE's Occurrence Reporting Program (DOE O 232.1A, *Occurrence Reporting and Processing Operations Information*). BNFL Inc. provides DOE-ID with copies of reports and correspondence given to other regulatory agencies (State of Idaho, U.S. Environmental Protection Agency, etc.) and makes the AMWTP facilities and employees accessible to DOE-ID for inspection and interview. DOE-ID provides BNFL Inc. with reasonable notice, normally 30 days notice, and an agenda before formal DOE-ID audits. Notice is not required, however, for access related to DOE routine inspections, periodic oversight, accident investigations, cause inspections, etc. Unencumbered access is granted by BNFL Inc. to a limited number of DOE personnel, including DOE Facility Representative(s), as identified and approved by the DOE Contracting Officer or Contracting Officer's Representative. DOE Facility Representative(s) may maintain a daily presence at AMWTP facilities.

Continuous improvement is built into other programs and processes in the AMWTP through periodic, routine revisions and upgrades to training programs and operating procedures. Lessons learned are reflected in equipment modifications, procedural changes, and training to ensure safe and efficient operation of the facility. Subcontractors are required to implement continuous improvement programs commensurate with their responsibilities in AMWTP.

D.10.4 Self-Assessment Program

BNFL Inc. management endorses the concept of self-assessment through management and independent assessments as a means of ensuring continuous performance improvement. To this end, management has established and implemented procedures defining self-assessment requirements. Independent assessments are conducted both as internal and external audits. Management assessment activities are conducted on departmental and functional work activities at AMWTP. The process contains the following elements:

- Purpose and types of assessments
- Organizational activity levels
- Assessment personnel
- Program planning
- Assessment integration
- Assessment agendas
- Performance criteria
- Assessment planning tools
- Assessment conduct
- Corrective actions and root cause analysis
- Deficiency tracking
- Post-assessment follow-up.



In accordance with the AMWTP contract (DOE, 1996a), DOE-ID reviews the AMWTP self-assessment process semiannually and audits the process annually.

D.10.5 Corrective Action

BNFL Inc. managers are responsible for reviewing the results of internal and external audits and for taking appropriate action to correct deficiencies and implement suggested improvements and lessons learned. Corrective action plans include descriptions of the work to be accomplished, names of responsible persons, and schedules for completion. Management schedules follow-up evaluations to determine the effectiveness of the corrective action and the timeliness of its implementation. For external audits, audit response reports that include corrective action plans are sent to the auditing agency for review and approval. Closeout reports on completed corrective actions and follow-up evaluations are also sent to the external auditing agency. All external audits and corrective action plans are made available to DOE at the AMWTP site. (DOE is considered an external agency as defined in DOE-HNBK-1089-95, *Guidance for Identifying, Reporting, and Tracking Nuclear Safety Noncompliance.*)

In accordance with 10 CFR Part 820, Appendix A, noncompliances with DOE safety requirements that have been codified in the Code of Federal Regulations are reported promptly to DOE-ID using the DOE Noncompliance Tracking System (NTS). Root cause analysis and corrective actions designed to prevent recurrence are undertaken immediately. The *AMWTP Occurrence Reporting Procedure* and the *Price Anderson Amendments Act of 1988* screening and reporting procedure (Program Quality Procedure 1.1 of the QAPP) are used to report, categorize, and correct reportable noncompliant conditions.

D.10.6 Implementing Documents

The following documents implement the continuous improvement process and response to internal and external audits program:

- *AMWTP Quality Assurance Program Plan* and Program Quality Procedures
- *AMWTP Occurrence Reporting Procedure.*



D.11 Records and Reports

D.11.1 Introduction

The purpose of records management is to document and control the development, review, revisions, distribution, and final disposal of all required Advanced Mixed Waste Treatment Project (AMWTP) records and reports.

This section describes the AMWTP environment, safety, and health records management requirements. Records management and reporting requirements for all personnel involved in the design, construction, preoperational testing, operations, maintenance, and technical support of the AMWTP are established. Details of the program are contained in the *AMWTP Quality Assurance Program Plan* and Program Quality Procedures for “Records Management” and “Document Control.” This section is consistent with the guidance presented in DOE M 231.1-1, *Environmental Safety and Health Reporting Manual* (DOE, 1995a). All reports created according to this section and sent to external agencies will be copied to DOE-ID.

D.11.2 Requirements

Table 11 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for records and reports.

D.11.3 Responsibilities

The AMWTP Quality Assurance Manager ensures that AMWTP records for Phase I (permitting), Phase II (construction and preoperational testing), and Phase III (operations and Hazardous Waste Management Act (HWMA) closure) are managed and maintained in accordance with the *AMWTP Quality Assurance Program Plan*. The Quality Assurance Manager, working with line management, is responsible for monitoring all AMWTP documents, procedures, and records generated, reviewed, approved, distributed, and maintained in accordance with the requirements and Program Quality Procedures for “Records Management,” and “Document Control.” The Quality Assurance Manager ensures controlled documents and records are managed in accordance with the *AMWTP Quality Assurance Program Plan*.

D.11.4 Records and Document Control Management Process

The records management and document control processes documented in the AMWTP implementing procedures include control of the development, review, approval, configuration, revisions, distribution, storage, and final disposal of applicable documents, records, and reports required for the AMWTP. Records are not removed from the AMWTP without proper authorization, and employees are trained in the procedures for proper handling of records. Sensitive, proprietary, and privacy act records are maintained with sufficient safeguards and controls on automated record systems, centralized file areas, and individual office files to prevent unauthorized disclosure of the information.

The AMWTP records and document management process includes a controlled document handling system for maintaining and distributing only current, approved AMWTP procedures, instructions, and documents. When the need for a new document or a change to an existing controlled document has been



identified, the process is conducted and managed in accordance with the requirements and procedures for “Change Control,” and “Document Control.”

The implementing procedure for records management promotes the use of standardized methods for collecting information. Storage areas are provided for both active and inactive records. Records are moved between active storage and inactive storage in accordance with the implementing procedure for records management. The procedure also controls the migration of the data from one storage medium to another. Records are transferred to archived storage on the basis of records retention requirements.

Federal records are identified in accordance with 36 CFR 1222.34, *Identifying Federal Records*, and confirmed with the agent (Idaho National Engineering and Environmental Laboratory (INEEL) Management and Operating (M&O) contractor) retaining federal records for DOE. The recordkeeping methods used by BNFL Inc. are comparable to the system used by DOE’s agent to ensure consistency in organization, labeling, and marking of federal records, and to facilitate turnover of records at the end of Phase III, (operations and HWMA closure) of the AMWTP.

Federal records (as defined by 36 CFR 1222.12) are retained by BNFL Inc. during Phase II (construction and preoperational testing) and Phase III (operations and HWMA closure). These records are prepared for archiving and turnover to the DOE records management agent in accordance with the agent’s written procedures. Epidemiological records are maintained in accordance with DOE’s moratorium on epidemiological records (Watkins, 1990).

Any records destined for turnover to DOE’s agent that contain BNFL Inc. proprietary information shall be handled in accordance with the memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL M&O Contractor (DOE-ID, 2000a).

Remaining records, which are not federal records, are reviewed periodically to reduce storage and maintenance requirements. BNFL Inc. maintains its (nonfederal) environment, safety, and health records in accordance with the retention periods listed in project implementing procedures.

D.11.5 Information Security

The purpose of information security for records management is to maintain data integrity, protect BNFL Inc. proprietary information, and ensure the privacy of personal employee records. The AMWTP provides employees and their designated representatives access to relevant Occupational Safety and Health Administration (OSHA) exposure and medical records.

D.11.5.1 Access to Exposure and Medical Records

The AMWTP responds to requests for access to employee exposure and medical records in accordance with 29 CFR 1910.1020(e)(1)(i). Exposure or medical records are made available to an employee or an employee’s designated representative within 15 days of the request, whenever practicable. If more than 15 days are required, the employee or designated representative requesting the record is apprised of the reason for the delay. A copy of the record is furnished to the employee at no cost. The AMWTP may delete any trade secret data disclosing manufacturing processes or other proprietary information from records requested by an employee as long as the employee is notified that information has been deleted.



D.11.5.2 Access to Occupational Safety and Health Act Records

AMWTP responds to requests for access to employee OSHA records in accordance with 29 CFR Part 1904, *Recording and Reporting Occupational Injuries and Illnesses*.

The log and summary of recordable occupational injuries and illnesses (applicable OSHA Form) are made available upon request to the employee, former employee, and/or their representatives for examination and copying in a reasonable manner and at reasonable times.

D.11.5.3 Access to Hazardous Waste Records

In accordance with IDAPA 58.01.05.008 (40 CFR 264.74), *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*, and IDAPA 58.01.05.009 (40 CFR 265.74), *Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*, and upon request, AMWTP furnishes records pertaining to the operation of a hazardous waste treatment, storage, or disposal facility, including plans for inspection, to any officer, employee, or representative of the U.S. Environmental Protection Agency (EPA) or the State of Idaho Department of Environmental Quality who is duly designated to regulate AMWTP operations.

D.11.6 Tracking and Trending

The AMWTP collects information from occurrences related to activities at the AMWTP and similar DOE facilities, including lessons to be learned from this information. AMWTP data is evaluated for patterns of deficiencies, such as operator errors or inadequate procedures, for detection and correction of root causes. Trends in the information are identified and reported to plan and implement corrective actions. Corrective actions are then monitored for effectiveness in addressing the cause of the problem. AMWTP personnel also use the information from DOE's Occurrence Reporting and Processing System database to identify good practices and lessons learned from other facilities. See also Section D.14 (Conduct of Operations) of the *AMWTP Environment, Safety, and Health Program Operating Plan* (ESHPOP).

D.11.7 Quality Assurance Records

The AMWTP quality assurance records are maintained according to the *AMWTP Quality Assurance Program Plan* and project implementing procedures.

D.11.8 Environmental Protection and Monitoring Records and Reporting

AMWTP maintains records of environmental protection and monitoring during Phase II (construction and preoperational testing), and Phase III (operations and HWMA closure). The environmental protection and monitoring during the construction phase involves the baseline environmental monitoring of the site. Auditable records from environmental monitoring are maintained to evaluate the preoperational monitoring of the AMWTP and also to evaluate the onsite/offsite effects, if any, of AMWTP activities. The INEEL M&O is responsible for performing environmental surveillance outside the facility fence before operations, and BNFL Inc. is responsible for environmental surveillance inside the facility fence. ESHPOP Section D.8 (Environmental Protection and Monitoring) provides specific information regarding environmental monitoring and surveillance.



D.11.9 Occupational Safety and Health Act

The OSHA recordkeeping and reporting requirements apply to Phase II (construction and preoperational testing), and Phase III (operations and HWMA closure) of the AMWTP. As required by 29 CFR 1904.8, AMWTP will report orally, within eight hours, to the OSHA area office any death or hospitalization of three or more employees that occurred as a result of a work-related incident. AMWTP, in accordance with 29 CFR 1904 (f)(8), retains an accurate record of medical surveillance. The record includes the items specified in 29 CFR 1904 (f)(8)(ii).

D.11.9.1 Log of Occupational Injuries and Illness

As required by 29 CFR 1904.8, AMWTP will report orally, within eight hours, to the OSHA Area Office any death or hospitalization of three or more employees that occurred as a result of a work-related incident.

As required by 29 CFR Part 1904, AMWTP maintains a log and summary of recordable occupational injuries and illnesses. Each recordable injury and illness is entered on the log and summary as early as practicable, but no later than six working days after receiving information that a recordable injury or illness has occurred. The applicable OSHA Form is used. These records are established on a calendar year basis.

D.11.9.2 Supplemental Record for Occupational Injuries and Illness

Within six working days after receiving information that a recordable case has occurred, the AMWTP has available for inspection a supplementary record of each occupational injury or illness. The applicable OSHA Form is used.

D.11.9.3 Annual Summary of Occupational Injuries and Illness

The AMWTP posts an annual summary of occupational injuries and illnesses. This summary consists of a copy of the yearly totals plus the following information from the applicable OSHA Form: calendar year covered, company name, establishment name, establishment address, certification signature, title, and date.

D.11.10 Radiation Exposure Information Records

AMWTP maintains monitoring and workplace records for occupational radiation protection in accordance with 10 CFR 835, *Occupational Radiation Protection*.

D.11.11 Training Records and Reports

The AMWTP training department maintains training records and generates training reports as described in ESHPOP Section D.7 (Training and Qualification).

D.11.12 Operational Records and Reports

The AMWTP data management system (DMS) continuously maintains information about the waste being processed. Records are kept that detail the characterization of waste, compliance with *Waste Acceptance*



Criteria for Waste Isolation Pilot Plant (DOE, 1999c) and transuranic package transporter (TRUPACT) criteria, and compliance with criticality safety. Records management for operational records and reports is sufficient to obtain Waste Isolation Pilot Plant certification.

D.11.12.1 Packaging and Off/Site Transportation

The AMWTP establishes, as required by 10 CFR 71.113, measures to control the issuance of documents pertaining to packaging and transportation, such as instructions, procedures, and drawings, including changes, that prescribe activities affecting quality.

In addition to the *Waste Acceptance Criteria for Waste Isolation Pilot Plant* (DOE, 1999c) and TRUPACT-II compliance records, AMWTP maintains the following records pertaining to packaging and transportation (10 CFR 71.91):

1. Identification of the packaging by serial number (bar codes used)
2. Verification that there are no significant defects in the packaging, as shipped
3. Type and quantity of material in each package, and the total quantity of each shipment
4. Date of the shipment.

These records are signed and dated by authorized shipping personnel. AMWTP maintains sufficient written records to furnish evidence of the quality of packaging.

D.11.12.2 Operational Readiness Reviews and Readiness Assessments

ESHPOP Section D.5 (Permission to Commence Operations, Stop Work Authority and Restart) provides specific information regarding the readiness to operate report. The results of the readiness assessment are auditable and retained in the records of the facility, along with documentation showing that any findings were resolved.

D.11.12.3 Tests and Calibration of Safety Systems

To ensure the operability of AMWTP safety systems, periodic testing is performed to ensure that the systems operate as designed. The equipment also is periodically calibrated to ensure that current specifications are within design parameter limits. Records are maintained to show the frequency and results of the tests and calibrations.

D.11.12.4 Log of Facility Operations

AMWTP maintains logbooks that summarize shift and daily activities, including unusual incidents, radiation and contamination problems, interpretation of unusual chart recordings, and other similar items. Records and logs for facility operations are maintained as required by the AMWTP environmental permits.

Records for Hazardous Waste Generation. AMWTP maintains a hazardous waste manifest for each hazardous waste shipment, as required by IDAPA 58.01.05.006 (40 CFR 262.40). Also, in accordance with IDAPA 58.01.05.006 (40 CFR 262.11), AMWTP maintains records of test results, waste analyses, or other determinations.



Approval of shipment to Waste Isolation Pilot Plant requires assembling data packages for each container and each TRUPACT-II load. This information is transmitted electronically to the Waste Isolation Pilot Plant, and authorization to ship is transmitted electronically back to AMWTP.

Records for Hazardous Waste Operations. AMWTP maintains, in accordance with IDAPA 58.01.05.008 (40 CFR 264.71), *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*, manifests and shipping papers of each hazardous waste shipment received. AMWTP also maintains an operating record at the facility, as required by IDAPA 58.01.05.008 (40 CFR 264.73). The *AMWTP HWMA/RCRA Treatment Permit* contains a description of the records maintained for facility operations.

AMWTP submits an unmanifested waste report to the Director of the Department of Environmental Quality within 15 days of arrival of any hazardous waste for treatment, storage, or disposal from an offsite source without an accompanying manifest or shipping papers. This is required by IDAPA 58.01.05.008 (40 CFR 264.76). Also in accordance with IDAPA 58.01.05.008 (40 CFR 264.77), AMWTP reports the following to the Director of the Department of Environmental Quality:

1. Unusual operating occurrences
2. Releases, fires, and explosions as specified in IDAPA 58.01.05.008 (40 CFR 264.56(j))
3. Facility closures specified in IDAPA 58.01.05.008 (40 CFR 264.115)
4. As otherwise required by IDAPA 58.01.05.008 (subparts F, K through N, AA, BB, and CC of 40 CFR Part 264).

D.11.12.5 Emergency Operations Drills

AMWTP maintains records of each emergency drill. The record contains information, such as date, type of drill, evacuation time, and an evaluation of response functions.

D.11.12.6 Occurrence Reporting

Immediately following an occurrence, the AMWTP line management, the INEEL M&O Contractor, and DOE-ID are promptly notified, and appropriate information pertaining to the occurrence is recorded. Additional steps include preparation of a written notification report and closure of the occurrence report (includes update versions and final report).

Documentation and distribution requirements are satisfied by using the centralized unclassified DOE operational database, Occurrence Reporting and Processing System. All final reports, with the exception of final canceled reports, are placed in the system. Lessons learned from all occurrences in the database are shared with the AMWTP.

D.11.12.7 Unreviewed Safety Questions

In accordance with the *AMWTP Unreviewed Safety Question Procedure* (BNFL, 2001b), AMWTP personnel will complete a safety evaluation to determine if there is an unreviewed safety question or a need to revise AMWTP Technical Safety Requirements. The safety evaluation is the record required to document the review of a change in the AMWTP safety systems. Documentation requirements are discussed in the procedures implementing the unreviewed safety question process.



D.11.12.8 Transuranic Waste Characterization Reports and Records

Waste characterization data and related quality assurance/quality control records in the AMWTP files for Transuranic waste to be shipped to the Waste Isolation Pilot Plant facility are designated as lifetime or nonpermanent records, as specified in Attachment B of the Waste Isolation Pilot Plant Hazardous Waste Facility Permit (NM, 1999)

D.11.13 Implementing Documents

The following documents implement the AMWTP environment, safety, and health records management program for construction and operations:

- *AMWTP Quality Assurance Program Plan* and project implementing procedures
- Records Management procedure
- Document Control procedure



D.12 Supporting Environment, Safety, and Health Documents, Manuals, and Agreements

The specific subtier documents needed to implement each functional area are given in each section of Part D. BNFL Inc. commits to developing and implementing these documents.

D.13 Security

D.13.1 Introduction

The purpose of this section is to establish and implement an AMWTP security program consistent with DOE, Resource Conservation and Recovery Act (RCRA), State of Idaho, and good industrial security practices.

The advanced mixed waste treatment facility is an unclassified facility containing transuranic (TRU) and low-level radioactive waste and nuclear material reference standards (sealed sources). Thus, security measures and procedures are designed to restrict access to the facility to prevent unplanned exposure to radiation and to protect equipment and proprietary information related to the processes used in the facility from theft and sabotage. Standard industrial security practices are in place for the project to protect BNFL Inc. property against theft and sabotage and to protect proprietary information and records related to the waste treatment technologies and processes used at the facility.

The AMWTP is designated a Hazard Category 2 because of the type, form, and quantity of radioactive materials present within the buildings. Radioactive materials require access control to prevent access to work areas that might be hazardous to untrained and/or unescorted personnel [IDAPA 16.01.05.008]. The AMWTP facilities are located within the physical security boundaries of the Radioactive Waste Management Complex at the INEEL. As a result, existing security arrangements at the complex restrict access to authorized personnel and provide property protection for the AMWTP facilities. Because the AMWTP is part of the Radioactive Waste Management Complex, its perimeter is patrolled and protected by the INEEL site-wide guard force under an interface agreement included in the memorandum of agreement between DOE-ID, BNFL Inc., and the Management and Operating (M&O) Contractor (discussed in Part C, Interface with Other Permits, Authorizations, and Agreements), which includes physical security at the AMWTP facilities.

Because there is no classified material, restricted data, or nuclear material in excess of the minimum quantities for which security access authorizations are required at the AMWTP facilities, no security clearances are required for facility access. Facility employees, however, are required to obtain INEEL badges or passes so that they can move freely through unrestricted areas of the AMWTP facilities, Radioactive Waste Management Complex, and INEEL. AMWTP badging responsibilities are included in the memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL M&O Contractor.

Because the AMWTP is under management of BNFL Inc., the Operational Security Plan specifically addresses visits and assignments of foreign nationals. Visits and assignments, including badging, of foreign nationals are handled in accordance with the requirements specified in DOE Order 1240.2B, *Unclassified Visits and Assignments of Foreign Nationals*. The AMWTP is not a “security facility,” however, and does not contain security interests requiring special protection.

The AMWTP security program is applicable during Phases II (construction) and III (operations and closure) of the project.

D.13.2 Requirements

Requirements to be met for the security program are contained in the following document:

IDAPA 16.01.05.008, *Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities*, Subpart B (security section only).

D.13.3 Security Planning

The Operational Security Plan for the AMWTP establishes policies and procedures related to the physical protection of the facility and to the personnel security programs already in place for the INEEL. The Operational Security Plan references other security documentation in place at the Radioactive Waste Management Complex and the INEEL and takes credit for the policies and procedures directed by those documents that are in effect for the AMWTP.

The AMWTP Operational Security Plan is submitted to DOE-ID for approval and includes the following elements:

1. Protection strategies
2. Implementing plans and procedures
3. Resources needed to sustain the security program
4. Security staff personnel qualifications
5. The results of vulnerability analyses
6. Corrective and mitigating actions to reduce vulnerabilities
7. Sources of supporting documentation
8. Approved deviations
9. Security training
10. Contingency plan for processing material that does not meet contractual specifications

D.13.3.1 Visits by Foreign Nationals

BNFL Inc. conducts unclassified visits and assignments of foreign nationals in accordance with the requirements of DOE Order 1240.2B, *Unclassified Visits and Assignments by Foreign Nationals*, and local DOE-ID guidance, *Unclassified Foreign Visits and Assignments*, provided by the DOE-ID Security Program Manager (Benson, 1997). Even though the unclassified facility contains only proprietary BNFL Inc. information, visiting or assigned foreign nationals must pass through the AMWTP Accountability Station, the Radioactive Waste Management Complex gates, or the appropriate access points to in-town facilities. Visitors must comply with the requirements imposed by the M&O Contractor and DOE-ID for visits and assignments to secure facilities at the INEEL site or in town.

D.13.3.2 Information Security

The AMWTP does not involve classified information, but does involve company-proprietary information and intellectual property related to the processes and costs associated with waste treatment technologies. BNFL Inc. uses standard industry security practices and legal protection to control the dissemination of proprietary information.



In those instances where the AMWTP Facility shares computer databases with the M&O Contractor or other government agencies, BNFL Inc. adopts unclassified computer security controls in accordance with the memorandum of agreement between DOE-ID, BNFL Inc., and the M&O Contractor.

D.13.4 Implementing Documents

The following documents implement the security program:

- AMWTP Operational Security Plan

- Memorandum of agreement between DOE-ID, BNFL Inc., and the M&O Contractor
 - Badging
 - Physical security of the AMWTP facilities
 - Computer security controls.



D.14 Conduct of Operations

D.14.1 Introduction

The purpose of this conduct of operations section is to establish policies and procedures for the operation of the Advanced Mixed Waste Treatment Project (AMWTP). The AMWTP conduct of operations program maintains quality and uniformity of operations. BNFL Inc. conducts AMWTP operations using a standard set of operating policies and procedures as required for safe and reliable operation, and as specified by DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*. Additionally, operating performance and trends are recorded, analyzed, and reported to ensure continuing operational efficiency and employee safety [DOE O 210.1, *Performance Indicators and Analysis of Operations Information*]. BNFL Inc. participates in the DOE occurrence reporting program to identify and categorize facility occurrences, determine root causes, and provide appropriate corrective actions [DOE O 232.1A, *Occurrence Reporting and Processing of Operations Information*].

BNFL Inc. management is committed to the safe and efficient operation of the AMWTP. Conduct of operations is viewed as a set of requirements, published and enforced by management, that institutionalize the policies established by law and corporate directive to ensure rigor in plant operations. The policy categories and subsections published in the DOE Orders (noted in Table 13 of Appendix A (Requirements Tables)) are implemented by AMWTP management using the *AMWTP Conduct of Operations Implementation Matrix* and other AMWTP procedures. The *AMWTP Conduct of Operations Implementation Matrix* is approved by DOE for Phase II activities (construction and preoperational testing). The matrix will be revised before the startup of retrieval operations and again before the startup of operations in the AMWTF. A permitting matrix was created to insure all permitting requirements are placed into procedures.

Contractually (AMWTP Contract [DOE-ID 1996a], Section H.44), BNFL Inc. retains title to any equipment, facilities, and/or systems manufactured or purchased by BNFL Inc. These items are not deliverable items. Therefore, BNFL Inc. reserves the right to manage its property using practices commensurate with safety and business strategies.

D.14.2 Requirements

Table 13 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for conduct of operations.

D.14.3 Implementing Documents

The following documents implement the conduct of operations program:

- *AMWTP Conduct of Operations Implementation Matrix*
- AMWTP operations safety and health procedures
- *AMWTP Quality Assurance Program Plan* and Project implementing procedures
- AMWTP Occurrence Reporting procedure.



D.15 Waste Management Program

D.15.1 Introduction

The purpose of this section is to describe the Advanced Mixed Waste Treatment Project (AMWTP) waste management program to ensure complete regulatory compliance by identifying applicable requirements and relevant authorities and responsibilities. The waste management program addresses primary waste, as well as other wastes arising from the construction and operation of the AMWTP facilities, including Phase II (construction and preoperational testing) and Phase III (operations and Hazardous Waste Management Act (HWMA) closure) activities. The program applies to all AMWTP departmental elements and subcontractors directly involved in waste management activities.

The AMWTP waste management program also supports a key goal of BNFL Inc. to process U.S. Department of Energy (DOE) TRU waste and alpha low-level mixed waste streams while minimizing the production of non-TRU waste.

D.15.2 Requirements

Table 14 in Appendix A (Requirements Tables) lists environment, safety, and health requirements for the waste management program.

D.15.3 Definitions

Terms used in this section are as defined below. The definitions are consistent with those given in Section J of the AMWTP Contract (DOE-ID, 1996a).

Alpha Low-Level Mixed Waste: Low-level mixed waste containing, at the time of assay, concentrations of at least 10 but less than or equal to 100 nCi/g of waste of alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years. The term “mixed” connotes waste containing both radioactive and hazardous constituents as defined by the *Atomic Energy Act of 1954*, as amended, and the *Resource Conservation Recovery Act (RCRA)*, respectively.

Hazardous Waste: Those materials that are designated as hazardous wastes under IDAPA 58.01.05.005 (40 CFR 261.3), *Identification and Listing of Hazardous Waste*.

Hazardous Waste Constituent: A constituent that caused the Director or Administrator to list the hazardous waste in IDAPA 58.01.05.005 (40 CFR Part 261, Subpart D), or a constituent listed in IDAPA 58.01.05.005 (Table 1 of 40 CFR 261.24).

Hazardous Waste Management Unit: A contiguous area of land on or in which hazardous waste is placed, or the largest area in which there is significant likelihood of mixing hazardous waste constituents in the same area.

Low-Level Mixed Waste (LLMW): Waste containing (a) radioactive constituents as defined by the *Atomic Energy Act of 1954*, as amended, and not classified as high-level waste, transuranic waste, or



spent nuclear fuel or 11e(2) by-product material, and (b) hazardous constituents as defined by RCRA. The term “mixed” connotes waste containing both radioactive and hazardous components as defined by the *Atomic Energy Act of 1954*, as amended, and RCRA, respectively.

Low-Level Waste (LLW): Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, spent nuclear fuel, or 11e(2) by-product material. Test specimens of fissionable material irradiated only for research and development, and not for the production of power or plutonium, may be classified as low-level waste provided the concentration of transuranic elements is less than or equal to 100 nCi/g of waste.

Mixed Waste: Waste containing both radioactive and hazardous waste constituents as defined by the *Atomic Energy Act of 1954*, as amended, and RCRA.

Primary Waste Treatment Product: The product produced from the treatment of transuranic and alpha low-level mixed waste by the AMWTP that is the key high volume waste generated during processing. Primary waste is the key high volume product that results from the treatment of transuranic and alpha low-level mixed waste.

Process-Generated Hazardous Waste (includes mixed waste and low level waste): Wastes that are newly generated as a result of waste processing, maintenance operations, or equipment change out. Process-generated hazardous wastes are those wastes that are generated from the operation and maintenance of the treatment and other facilities. Examples of process-generated hazardous waste may include, but are not limited to, cleaning solvents used during maintenance, and rags. Process-generated hazardous wastes are the responsibility of BNFL Inc.

RCRA Subtitle C Waste (Hazardous Waste): Waste materials designated as hazardous only and not radioactive in accordance with Subtitle C of RCRA as referenced in 40 CFR Part 261, *Identification and Listing of Hazardous Waste*. The hazardous waste designation typically includes wastes that are hazardous either by listing (F, P, K, or U listings) or by characteristic (reactive, toxic, ignitable, or corrosive).

RCRA Subtitle D Waste (Nonhazardous Waste): Waste materials designated as nonhazardous that are neither radioactive nor hazardous by definition, including municipal solid waste, inert construction debris, sanitary waste, etc.

Secondary Waste Treatment Product: Those waste treatment products that are generated from wastes that have special properties not appropriate for inclusion into the primary waste treatment product. Secondary wastes are the products resulting from the treatment of TRU and alpha low-level mixed waste that are not the primary waste products but contain high percentages of TRU or alpha treated waste product. An example is amalgamated mercury that cannot be processed in the unit.

Transuranic (TRU): Alpha-emitting radionuclides with an atomic number greater than 92 and half-lives greater than 20 years and concentrations greater than 100 nCi/g of waste at the time of assay. TRU waste refers to waste having a TRU content greater than 100 nCi/g or TRU mixed waste that contains, in addition to the alpha-emitting radionuclide, a RCRA hazardous component.



D.15.4 Responsibilities and Authorities Specific to Waste Management

The following entities have responsibility and authority specific to AMWTP waste management, as detailed in Section C of AMWTP Contract (DOE-ID, 1996a):

- BNFL Inc. is responsible for managing wastes at AMWTP facilities. Specifically, BNFL Inc. is responsible for managing all waste from retrieval through loading of containers on approved transport carriers, and HMWA closure of facilities. BNFL Inc. is also responsible for the disposition of non-transuranic process-generated waste, including transportation of low-level mixed waste and low-level waste to disposal locations.
- The INEEL Management and Operating (M&O) Contractor provides support to the AMWTP and to DOE-ID by offering certain waste management services as specified in the memorandum of agreement (DOE-ID, 2000a).

D.15.5 Waste Minimization and Pollution Prevention Awareness

Every effort is made to minimize the volume of process-generated waste at the AMWTP facilities. The *AMWTP Waste Minimization Plan* addresses hazardous waste minimization and source reduction at the AMWTP.

D.15.6 Waste Stream Identification, Characterization, and Certification

The characteristics of the primary waste stream are described in the AMWTP contract (DOE-ID 1996a). The identification of waste streams serves as the basis for defining waste management program requirements in this Environment, Safety, and Health Program Operating Plan (ESHPOP).

The following sections identify the AMWTP waste streams for Phases II (construction and preoperational testing) and III (operations and HWMA closure). The sections also address characterization and certification of those waste streams.

D.15.6.1 Waste Streams Generated During Construction (Phase II)

A variety of waste streams are generated during construction activities. Generally these consist of wastes in the personnel and maintenance categories, and include hazardous and nonhazardous wastes.

Radioactive and mixed wastes are not expected to be generated during construction. All waste streams are characterized in accordance with 40 CFR Part 261, *Identification and Listing of Hazardous Waste*.

Project activities and potential waste streams produced during construction activities are as follows:

- Direct construction activities include developing footings and foundations, steel structure, mechanical processes, electrical wiring, and coatings. Waste streams associated with these activities are typically nonhazardous but may include some volume of hazardous waste. Waste streams primarily consist of inert construction debris, waste petroleum products, and scrap metal.



- Vehicle and equipment maintenance activities include replacing parts and fluids and refueling. Waste streams associated with these activities include petroleum products and other recyclable materials.
- Maintaining onsite offices to support construction efforts is necessary and results primarily in the generation of nonhazardous wastes.
- Standard coatings, paints, solvents, and specialty coatings are used in constructing the treatment facility. These materials are managed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.005 (40 CFR Part 261.3).

Phase II nonhazardous wastes are disposed at the INEEL Central Facilities Area (CFA) Landfill or other appropriate disposal facility. Hazardous wastes are managed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.011 (40 CFR Part 268), *Land Disposal Restrictions*.

D.15.6.2 Waste Streams Generated During Operations and HWMA Closure (Phase III)

Numerous waste streams are managed during operations and HWMA closure, including TRU, non-TRU, mixed, hazardous, and nonhazardous wastes. Waste arising from activities has been categorized into two general categories: primary waste and process generated waste. Each of these categories has one or more waste stream outputs and dispositions. The output categories are consistent with definitions in Section J of the AMWTP Contract (DOE-ID, 1996a) (see Section D.15.3). The following subsections describe these waste categories as generated during Phase III (operations and HWMA closure).

Primary waste Primary waste consists of the TRU and alpha low-level mixed waste located at the Transuranic Storage Area, plus additional waste agreed to be treated in the AMWTP Contract (DOE-ID, 1996a). This waste (most of which is mixed waste) consists of heterogeneous mixtures of various solid materials, and forms the bulk of the high volume treatment product. Treatment of primary waste gives rise to most other wastes, including process generated hazardous waste, and small amounts of secondary wastes that may be treated at the treatment facility. Process waste and secondary wastes are managed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.006 (40 CFR 262.11), *Standards Applicable to Generators of Hazardous Waste*.

Process Generated Wastes. Process operations and activities and the resulting waste streams are as follows:

- Retrieval and characterization activities generate primary waste samples that may be returned to the treatment process. The treatment processes also result in waste, such as high-efficiency particulate air filters, that are returned to the treatment process.
- Routine operations result in the generation of wastes associated with packaging materials. These wastes are typically nonhazardous radioactive wastes, but small quantities of mixed wastes may also be generated. Specific waste streams include overpack drums and lids, empty waste boxes, unsound crushed drums, and drum parts. This waste is categorized as low-level waste, as well as



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low-level mixed waste, and is shipped offsite for disposal. (Low-level waste may be disposed of onsite at the active pits at the RWMC/SDA.)

- Operations also result in the direct generation of secondary waste streams at the conclusion of processing cycles. These waste streams are radioactive, mixed, and hazardous. Specific waste streams include free liquids resulting from supercompaction and spent high-efficiency particulate air filters. Small quantities may be treated as special-case waste at the AMWTF.
- Certain activities are needed to provide indirect support to operations and include sampling, radiography, and radiological control support. Wastes from these activities are typically radioactive, mixed, or hazardous. Specific waste streams include excess sample material and decontamination debris, including used swabs or swipes.
- Spills and decontamination activities are anticipated during routine operations. Wastes from these activities may be mixed, hazardous, or nonhazardous and will be handled in accordance with IDAPA 58.01.02.851, and 40 CFR 262.1, 40 CFR 302, and 40 CFR 355. Waste streams include rags and floor sweepings in contaminated and noncontaminated areas, and hazardous chemicals. When practicable, mixed wastes are treated at the AMWTF.
- Housekeeping tasks also generate nonhazardous liquid wastes from cleaning activities. These are transferred to the Radioactive Waste Management Complex (RWMC) sanitary sewer system.
- The spent materials from painting and reapplication of specialty coatings are managed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.005 (40 CFR Part 261.3).
- Decontamination showers and sinks are used in the process areas to remove contamination. The liquids are captured in a tank that is routinely characterized for radioactivity content and, as required, for hazardous waste constituents. These wastes are absorbed and processed through the treatment facility. Contaminated protective clothing is returned to the treatment facility process.
- Equipment and vehicle maintenance is conducted to support operations and includes the replacement of worn parts and the addition of fluids and fuel. Waste streams from these activities are typically nonhazardous but can include hazardous wastes. Waste streams include contaminated and worn parts, petroleum products, and recyclable materials. Hazardous wastes are managed in accordance with applicable federal, state, and local requirements.
- Facility maintenance activities are critical to ensure that operations continue without interruption. These activities include repair and replacement of process equipment and facility structures, and may require minor construction of concrete, steel, mechanical, electrical, and chemical systems. Associated waste streams vary and include radioactive and mixed wastes, hazardous wastes, industrial wastes, and nonhazardous wastes. Specific waste streams include rags, tools, and failed items that are returned to the process, as well as inert construction debris, petroleum products,



chemical products, chemical containers, rags, and various recyclable materials that are dispositioned appropriately.

- System component maintenance activities are necessary to ensure that processing equipment functions properly. Wastes associated with these activities may be classified as mixed wastes. However, some wastes may be hazardous or nonhazardous only. Waste streams include worn tool heads from master slave manipulators, air and water filter cartridge change-outs, oil changes, and parts changes. When practicable, mixed waste items are returned to the treatment facility process. When not practical to be returned to the treatment facility the waste will be handled using other alternative treatment/disposal options in accordance with Federal State and local regulations.
- Activities associated with HWMA closure of AMWTP facilities will generate process waste and secondary waste treatment product all waste categories that exist during operations may possibly exist during HWMA closure, except the primary waste product. Radioactive only materials and components generated during decommissioning are accumulated and disposed in accordance with the requirements of the *AMWTP Decommissioning Plan* (BNFL, 1997c). HWMA/RCRA-regulated waste or waste constituents are managed in accordance with the applicable HWMA Closure Plan. PCB waste shall be stored in accordance with 40 CFR 761 while alternative treatment paths are investigated.

D.15.6.3 Receipt and Characterization of Waste

The AMWTP is designed to process INEEL waste currently stored at the Transuranic Storage Area; however, other waste (non-INEEL) may also be accepted in the future. Shipments received by BNFL Inc. at the AMWTP facilities are inspected upon receipt for damage or loss. Any evidence of leakage is reported to DOE-ID. Radioactive material shipments are also inspected for external surface contamination in accordance with Department of Transportation (DOT) standards. If the transport vehicle is contaminated, it is detained and reported to the delivering carrier and DOE-ID.

All AMWTP waste streams are characterized. Characterization of primary waste involves identifying the physical, chemical, and nuclear properties of primary waste sufficiently to allow waste to be separated into treatment campaigns, ensure that process feed rates do not exceed permitted feed rates for hazardous waste constituents into the treatment process, maintain control of the treatment processes, control emissions from the treatment facility, and maintain adequate margins of criticality safety. Characterization data are maintained in AMWTP records or files.

Characterization of primary waste includes core sampling; headspace gas analysis; visual inspection, radioassay, and radiography of containers; segregation by waste category, container type, and fissile material content for interim storage in Type II storage modules; radioassay in the Characterization Facility, and certification of the primary waste product. Characterization of primary waste is accomplished in accordance with the quality assurance requirements in the WIPP Hazardous Waste Facility Permit, Permit Number NM4890139088-TSDF (NM, 1999). Process waste and secondary waste will be characterized using either process knowledge or using the same techniques as primary waste as described above. Soil covering the waste containers in the Transuranic Storage Area-Retrieval Enclosure is removed and dispositioned on the basis of the *AMWTP Soil Sampling and Disposition Plan*.



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As defined by the *AMWTP Waste Acceptance Criteria* (DOE-ID, 1996a), all waste is characterized before management at the AMWTP as required by the INEEL RWMC RCRA Part B permit (DEQ, 2000) for storage and/or to meet the *WIPP Waste Acceptance Criteria* (DOE, 1999c) requirements or other mutually agreed upon disposal requirements. Upon identification, prohibited wastes (e.g., radioactive sources) are repacked and transferred to Type I or Type II storage modules. Prohibited wastes remain under BNFL Inc. control until all options for treatment have been explored. If it is determined that the prohibited wastes cannot be treated at the AMWTP, control of the wastes is transferred to DOE-ID. The process and timing for transferring control of prohibited wastes to DOE-ID will be specified in the memorandum of agreement.

A memorandum of agreement has been developed between DOE-ID, BNFL Inc., and the INEEL M&O Contractor (DOE-ID, 2000a) to ensure that any proposed changes to the AMWTP waste acceptance criteria contained in the AMWTP Contract (DOE-ID, 1996a) that could affect the *Idaho National Engineering Laboratory Site Treatment Plan* (DOE-ID, 1996b) are provided to DOE-ID in sufficient time for DOE-ID to modify the Site Treatment Plan on the schedule agreed to with the State of Idaho.

D.15.6.4 Certification of Waste Products

The treated waste product is certified to meet the minimum physical, chemical, and radiological requirements of the Revision 7 of the *Waste Acceptance Criteria for the Waste Isolation Pilot Plant* (DOE, 1999c). Any future updates to the WIPP Waste Acceptance Criteria will be incorporated by formal contract change and appropriate revision of the *AMWTP Project Design Criteria*. Individual waste containers in a transuranic package transporter (TRUPACT-II) shipping payload assembly may consist of a combination of TRU and non-TRU waste, provided the TRU content of the packages are greater than 100 nCi/g. Therefore, the payload assembly as a whole is certified as TRU waste. Waste disposed of at other facilities will meet the certification requirements or waste acceptance criteria for that particular disposal facility.

D.15.7 Radioactive and Mixed Waste Management

The goal of the AMWTP is to process DOE TRU waste and alpha low-level mixed waste into the primary waste product, and to generate a minimum amount of other radioactive and mixed wastes. This is accomplished through a combination of design features and process controls. Effective radioactive and mixed waste management is ensured at the treatment facility through the AMWTP radioactive and mixed waste management program.

The AMWTP radioactive and mixed waste management program includes the following elements which are implemented by procedure:

- Radioactive and mixed waste generation
- Radioactive and mixed waste segregation and storage
- Radioactive and mixed waste transport
- Facility HWMA closure
- Effluent monitoring and control.



The following sections describe how these elements are implemented at the AMWTP.

D.15.7.1 Radioactive and Mixed Waste Generation

Most of the radioactive and mixed waste generated at the AMWTP consists of empty boxes, samples, swipes, and used equipment and clothing. As much waste as possible is returned to the treatment process, such as used protective clothing, samples, and used high-efficiency particulate air filters.

The AMWTP uses work practices and design features to minimize the amount of low-level waste and mixed low-level waste generated. The AMWTP radioactive and mixed waste management program contains guidance addressing implementation of technical and administrative controls to reduce the amount of radioactive waste generated.

The AMWTP implements the following recordkeeping for all generated radioactive and mixed waste:

- A formal recordkeeping system that tracks waste generation, treatment, storage, transport, and disposal
- Records generated during the characterization, packaging, certification, and shipment of AMWTP-generated wastes destined for WIPP in accordance with the WIPP *Quality Assurance Program Document* (DOE-1999b). Records of all waste that enters and leaves the facility
- Hazardous waste manifests.

D.15.7.2 Radioactive and Mixed Waste Segregation and Storage

All waste collected for temporary accumulation that exceeds the radiological limits established in the AMWTP Radiation Protection Program (see ESHPOP Sections D.1 and D.1A) is stored in a radioactive material area or other properly posted area. All low-level waste is separated from uncontaminated waste, mixed low-level waste, and hazardous waste to facilitate cost-effective treatment and disposal. Mixed waste containers are managed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.006 (40 CFR 262.34), *Standards Applicable to Generators of Hazardous Waste*.



D.15.7.3 Radioactive and Mixed Waste Transport

Initial transfer of primary waste to the Characterization Facility, the Type II storage modules, and to the AMWTF will be conducted in a safe manner; however, it is not subject to DOT regulations. Neither is transfer of the primary waste product containers from the AMWTF to the Type I and Type II storage modules and to the Waste Aggregation Facility.

The AMWTF primary waste product is packaged in containers that can be shipped in the TRUPACT II shipping container or other DOT-approved transport containers, as specified in the *WIPP Waste Acceptance Criteria* (DOE, 1999c). Primary waste product data that are required to be reported to the WIPP are prepared to be consistent with the WIPP Hazardous Waste Facility Permit, Permit Number NM4890139088-TSDF.

All non-TRU waste is characterized to document the compliance with the waste acceptance criteria of the receiving facility. Low-level waste generated at the AMWTF facilities will be disposed at the RWMC if possible, and therefore does not involve offsite shipments. If an agreement with the INEEL regarding disposal of low-level waste at the RWMC is not possible, other arrangements will be made. In this event, the shipping process (labeling, marking, sealing, and placarding of waste shipments) complies with the requirements in 49 CFR Part 171, *General Information, Regulations, and Definitions*; 49 CFR Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements*; and 49 CFR Part 173, *Shippers-General Requirements for Shipments and Packages*.

The small quantities of mixed low-level waste generated at the AMWTF facilities are disposed in accordance with applicable federal, state, and local requirements, including IDAPA 58.01.05.011 (40 CFR Part 268), *Land Disposal Restrictions*. Any shipment of mixed low-level waste shall comply with the requirements of 49 CFR Part 172 and 49 CFR Part 173, as well as the manifest requirements applicable to hazardous waste at IDAPA 58.01.05.006 (40 CFR Part 262), *Standards Applicable to Generators of Hazardous Waste*.

D.15.7.4 Facility Hazardous Waste Management Act Closure

BNFL Inc. is responsible for operational shutdown and closure of the AMWTF. In accordance with federal, state and local requirements HWMA closure of the AMWTF facilities is completed at the conclusion of operations. Closure activities include the removal of hazardous waste and hazardous waste constituents from AMWTF HWMA/RCRA-regulated hazardous waste management units.

Waste management during D&D is described in the *AMWTF Decommissioning Plan* (BNFL, 1997c). The *AMWTF Decommissioning Plan* will be revised within two years of D&D [as required by clause H.36 in the AMWTF Contract (DOE-ID, 1996a)]. Furthermore, before revising this Plan, BNFL Inc. will submit to DOE-ID for concurrence proposed criteria against which the plan can be reviewed and approved.



D.15.7.5 Effluent Monitoring and Control

Radioactive airborne effluents are also generated at the AMWTP facilities during operations. These are minimized through process design, contamination control, and filtering. The AMWTP environmental protection and monitoring program (ESHPOP Section D.8) ensures that public dose limits are not exceeded, environmental protection is ensured, and that all releases are adequately monitored and documented.

D.15.8 Hazardous Waste Management

Effective hazardous waste management is ensured at the AMWTP through the use of the waste management procedures and programs, the HWMA/RCRA Permit for Treatment and Storage, *AMWTP Emergency Plan/RCRA Contingency Plan*, and the *AMWTP Quality Assurance Project Plan*. These documents describe how hazardous waste at the AMWTP is managed and minimized.

D.15.8.1 Hazardous Material Usage and Sources

A material safety data sheet will be available for hazardous materials used at the AMWTP. Hazardous materials are used correctly and completely consumed, as practicable, to avoid leaving partially filled containers of unwanted material. Materials with hazardous waste constituents that could lead to the generation of a hazardous waste when improperly managed are carefully controlled.

Subcontractors are required to remove hazardous materials from the site upon job completion. Onsite inventories of hazardous materials are maintained by AMWTP Environment, Safety, and Health Department in accordance with the *Emergency Planning and Community Right-to-Know Act of 1986* (EPCRA).

D.15.8.2 Hazardous Waste Generator Determination and Reporting

The AMWTP is a large-quantity hazardous waste generator (generates over 1000 kg of hazardous waste monthly) based on the identified waste streams. Pursuant to the *Idaho Hazardous Waste Management Act* (Idaho Code §§39-4411(4)), an annual report shall be completed and submitted to the INEEL M&O contractor for inclusion in the site wide INEEL annual report. The AMWTP also prepares and submits a report to the INEEL M&O contractor for inclusion in the site wide INEEL biennial report as required by IDAPA 58.01.05.008 and 58.01.05.009 (40 CFR 264.75 and 265.75). This report is combined with the annual report on even numbered years. In addition the AMWTP also submits a biennial Report to the INEEL M&O contractor for inclusion in the site wide INEEL RCRA Section 3016 Report.

D.15.8.3 Storage Area Design, Location, and Siting Justification

During AMWTF construction, waste is managed in accordance with IDAPA 58.01.05.006 (40 CFR Part 262), including using satellite and temporary accumulation areas as necessary. Satellite accumulation areas are strategically placed at locations throughout the AMWTP where hazardous wastes are generated. Ease of use and proximity to waste generation areas are considered in locating satellite and temporary accumulation areas. Upon removal from satellite accumulation areas, containers of hazardous



wastes are placed in a BNFL Inc. 90-day temporary accumulation area or otherwise managed in accordance with IDAPA 58.01.05.006 (40 CFR Part 262), *Standards Applicable to Generators of Hazardous Waste*

During operations, all storage areas within the AMWTP boundary (e.g., the Type I and II storage modules) are permitted as required. Collected waste at various points of generation is transferred to approved storage modules before offsite shipment for disposal.

D.15.8.4 Implementation of Toxic Substance Control Act Requirements

Applicable requirements of the *Toxic Substances Control Act of 1986* (TSCA) for polychlorinated biphenyls (PCBs) and asbestos management will be followed and applicable federal, state, and local requirements for mixed waste management will be addressed.

D.15.8.5 Handling Procedures and Practices

During construction, all hazardous wastes routinely generated at the AMWTP are containerized and placed in satellite or temporary accumulation areas. AMWTP personnel inspect the process of collecting, containerizing, and managing wastes in the satellite and temporary accumulation and temporary storage areas to ensure compliance with applicable federal, state, and local requirements. During operations, wastes collected at generation points are transferred to HWMA\RCRA-permitted storage areas for management.

D.15.8.6 Waste Certification Process

All hazardous wastes generated at the AMWTP are certified for disposal off the INEEL. Each waste stream receives an EPA hazardous waste number after laboratory analysis. Documentation of the waste certification process is strictly maintained by BNFL Inc.

All shipments of hazardous waste shipped directly to a treatment, storage, and disposal facility are accompanied by uniform hazardous waste manifests and approved labeling.

D.15.8.7 Spill Prevention Control and Countermeasures

The spill prevention control and countermeasures plan for hazardous waste managed at the AMWTP are contained in the *AMWTP Emergency Plan/RCRA Contingency Plan* (see ESHPOP Section D.9).

D.15.9 Nonhazardous (Municipal) Solid Waste Management

Nonhazardous, or municipal, solid wastes are considered wastes that may be disposed in municipal solid waste landfills or in construction and demolition debris sites. A memorandum of agreement has been developed with DOE-ID and the INEEL M&O Contractor (DOE-ID, 2000a) to provide waste management services during Phase II (construction and preoperational testing). The memorandum of agreement will be modified for Phase III (operations and HWMA closure).



D.15.9.1 Municipal Solid Waste Streams

Nonhazardous, or municipal, solid wastes are generated throughout the life of the project. Generation rates are greatest during construction activities and possibly during HWMA closure and decommissioning activities (if the facility is dismantled). Nonhazardous, or municipal solid waste streams are identified in Section D.15.6. The INEEL M&O Contractor provides waste dumpsters and pickup services for generated wastes. Arrangements for these services are specified in the memorandum of agreement.

D.15.9.2 Procedures, Instructions and Practices

Procedures and instructions include a discussion of disposal and storage of waste, listings of excluded wastes, and inspection criteria.

D.15.9.3 Recycling

To the greatest extent possible, wastes that can be recycled are collected in separate recycling containers and managed accordingly. Recycling of non-hazardous waste is a best management practice, however the recycling of hazardous waste is required by the HWMA/RCRA permit and is described in our *Waste Minimization Pollution Prevention Plan*.

D.15.9.4 Nonhazardous Effluent Waste

Various nonhazardous effluent waste streams are present at the AMWTP and are discharged under onsite permit authority or are managed on the site. These waste streams include emissions from heating and cooling equipment, vents from uncontaminated processing areas in the building, storage tank vents, exhaust from emergency diesel generators, and drains from liquid storage systems.

D.15.10 Waste Packaging and Shipment

The elements involved in preparing and shipping wastes safely and in compliance with requirements are discussed in the following sections.

D.15.10.1 Labeling and Packaging

All wastes prepared for offsite shipment are labeled and packaged in accordance with federal, state, and local requirements [49 CFR Part 172, IDAPA 58.01.05] and specific disposal facility waste acceptance criteria.



D.15.10.2 Handling Equipment Certification and Inspection

All equipment used to manage wastes, such as forklifts, cranes, and hand tools, are verified as safe and in good working order. Routine inspections are made to ensure that equipment remains safe and in good working order. At the end of its useful life, prior to disposal all equipment will be handled in accordance with Federal, State, and local regulations.

D.15.10.3 Waste Manifests and Shipment Authorizations

All waste shipments are accompanied by uniform hazardous waste manifests and/or shipping authorizations (Section D.15.8.6). As appropriate, TSCA and DOE requirements are added when wastes contain PCBs or asbestos and/or mixed wastes.

D.15.10.4 Radiological Surveillance

All transuranic and low-level waste shipments are surveyed before release from the AMWTP to ensure proper labeling and shipping precautions. All nonradioactive waste shipments are surveyed before release to confirm the absence of radioactive material. Surveys are conducted in accordance with the *AMWTP Radiological Control Implementation Matrix* and associated procedures (see ESHPOP Section D.8, Environmental Protection and Monitoring).

D.15.11 Implementing Documents

The following documents implement the waste management program:

AMWTP waste management procedures

AMWTP Soil Sampling and Disposition Plan

AMWTP Waste Minimization Plan

AMWTP Radiological Control Implementation Matrix and associated procedures:

MP-EC&P-01-IM HWMA/RCRA Storage Permit Requirements Implementation Matrix

MP-EC&P-02-IM TSA-RE Air Permit Requirements Implementation Matrix

MP-EC&P-03-IM Interim Status Unit Requirements Implementation Matrix

MP-EC&P-04-IM AMWTF Air Permit Requirements Implementation Matrix

D.16 Hazards Analysis and Control Process

D.16.1 Introduction

The purpose of the hazards analysis and control process is to systematically identify and assess hazards resulting from potential internal, external, and natural phenomena events that develop into accidents.

The hazard analysis and control process for Advanced Mixed Waste Treatment Project (AMWTP) (a) identifies the hazards contained in the AMWTP facilities, (b) performs hazard categorization on the basis of material quantity, energy sources, and initiating events, (c) provides an overall assessment of the importance of the various hazards, (d) identifies occupational hazards and related requirements prescribed by the Occupational Safety and Health Administration (OSHA), and (e) characterizes and analyzes the remaining nonroutine hazards that are unique and representative to be analyzed in the documented safety analysis.

The products resulting from the process are the following:

- *Preliminary Hazard Categorization* (BNFL, 1997d), which determines the hazard category and the scope of the documented safety analysis (see Section D.3, Safety Analysis Process)
- Hazard and operability (HAZOP) studies (Levels I and II)
- Final hazards assessment, documented in the AMWTP documented safety analysis (see Environment, Safety, and Health Program Operating Plan (ESHPOP) Section D.3).

During Phase III (operations and Hazardous Waste Management Act (HWMA) closure), hazard control is achieved by (a) conformance with programmatic requirements documented in this ESHPOP, (b) operating within the limits of the AMWTP Technical Safety Requirements, (c) conducting periodic reviews of the AMWTP final documented safety analysis, (d) reviewing any facility modifications according to the unreviewed safety question process, and (e) conducting operational monitoring and surveillance. ESHPOP Section D.3 describes the safety analysis process, including technical safety requirements and unreviewed safety questions, and ESHPOP Section D.8 (Environmental Protection and Monitoring) discusses monitoring and surveillance.

D.16.2 Requirements

Table 15 in Appendix A (Requirements Tables) lists environment, safety, and health for the hazards analysis and control functional area.

D.16.3 Hazards Analysis

The hazards analysis process consists of hazard categorization, hazard and operability studies, inventory of hazardous materials, and evaluation of potential releases. These steps are described in the following sections.

D.16.3.1 Hazard Categorization

A hazard categorization is required by 10 CFR 830, Subpart B *Safety Basis Requirements*, and DOE Order 5480.23, *Nuclear Safety Analysis Reports*, and constitutes the first step in developing the relevant

documented safety analysis described in ESHPOP Section D.3 (Safety Analysis Process). The three hazard categories for nuclear facilities are as follows:

- Category 1—The hazard analysis shows the potential for significant offsite consequences
- Category 2—The hazard analysis shows the potential for significant onsite consequences
- Category 3—The hazard analysis shows the potential for only significant localized consequences.

The hazard categorization provides the basis for the level of analysis required in the preliminary and final documented safety analyses. Additional guidance for hazard categorization, including radioactive material inventory thresholds for each category, is provided in DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. For nonradioactive hazardous chemicals, the level of hazard analysis is based on the guidance in DOE-EM-STD-5502-94, *Hazard Baseline Documentation*, and threshold quantities in 40 CFR Part 302, *Designation, Reportable Quantities, and Notification*, and 40 CFR Part 355, *Emergency Planning and Notification*.

Radiological hazards in the Advanced Mixed Waste Treatment Facility (AMWTF) are evaluated on the basis of the facility segmentation shown in the AMWTP process flow sheet. The *AMWTP Preliminary Hazard Categorization* (BNFL, 1997d) concludes that the AMWTP facilities should be designated Hazard Category 2. In accordance with Section 8.c.(4) of DOE Order 5480.23, the documented hazard categorization for the AMWTP is submitted to DOE-ID as part of the documented safety analysis described in ESHPOP Section D.3 (Safety Analysis Process).

D.16.3.2 Hazard and Operability Studies

The AMWTP hazard and operability studies identify hazards and operability problems by systematically reviewing each process within the facility for chemical and radiological hazards, energy sources, physical hazards, and operating conditions. An AMWTP hazard and operability study team is assembled that represents various disciplines and collectively brings experience and knowledge pertinent to the AMWTP processes. Hazard and operability study team members use a checklist to help evaluate the applicability and significance of a particular condition to a system or process in the AMWTP. The checklist contains guide words for hazards (e.g., radiation, fire, and explosion), as well as operability considerations such as reduced quality of a plant product, increased production cost, domino effects, reduced plant throughput, or increased waste generation.

The report resulting from the AMWTP hazard and operability studies highlights those hazard and operability problems that could occur. The report focuses on each AMWTP major system or process. Each section of the report contains the following information:

- A list of review team members and their expertise
- A list of drawings and other documents on which the review was based
- Hazards and operability considerations identified
- Actions
- Conclusions.

Two levels of hazard and operability analyses are performed for the AMWTP: (1) a preliminary hazard and operability study is based on the preliminary design (HAZOP I), and (2) a final hazard and operability study based on the final design (HAZOP II). The results of the hazard and operability studies help facility

designers eliminate or minimize hazards and operability problems, and provide input to the hazards assessment in the AMWTP documented safety analysis described in ESHPOP Section D.3 (Safety Analysis Process).

The outline of the hazard and operability study approach and the keywords used during the reviews are included in Attachment D.16a.

D.16.3.3 Inventory of Hazardous Materials

The magnitude of the hazard to workers, the public, and the environment resulting from an accidental release of radioactive or toxic material is directly related to the quantity of these materials at the facility. The average total activity concentration in the waste entering AMWTP is 7.61 Ci/m³ (LMITCO, 1995).

Most waste entering AMWTP is mixed waste, contaminated with Resource Conservation and Recovery Act (RCRA) listed and characteristic constituents, as well as some constituents regulated under Toxic Substances Control Act (TSCA). The hazardous material content of Transuranic Storage Area waste is given in the *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999).

An unmitigated release considers quantity, form, location, dispersibility, and interaction with available energy sources, but does not consider active safety features that prevent or mitigate a release. Any assumptions used to reduce the inventory at risk must be supported in the hazard analysis.

D.16.3.4 Evaluation of Potential Releases

The hazard evaluation process included in the AMWTP documented safety analysis thoroughly evaluates the spectrum of risks to the public, workers, and the environment from accidents involving any of the hazards identified. All modes of operation are considered, including startup, shutdown, testing, and maintenance configurations; both normal operation and accident conditions are evaluated. Exposure to both radioactive and nonradioactive releases is analyzed.

Normal operation assumes that waste processing is being performed as planned and that the AMWTP atmospheric protection systems are fully functional and operating within design specifications. Emissions over the life of the project are evaluated for annual dose to offsite members of the public. Atmospheric transport of emissions from the AMWTP to the individual at risk is determined using DOE-developed or commercial computer codes that calculate exposure at the individual's location using atmospheric conditions input by the analyst.

Potential abnormal and accident releases are determined on the basis of hazardous material inventory, form, and location within the facility. The hazard analysis identifies potential energy sources and potential initiating events that could affect the hazardous material and lead to a release. For hazardous chemicals, the requirements of 29 CFR 1910.119(e)(3)(vii) specify that the process hazard analysis include a qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace. For each postulated event or category of events, an airborne release is calculated using the source term formula in *Airborne Release Fractions/Rate and Respirable Fractions for Nonreactor Nuclear Facilities* (DOE, 1994).

Hazard analysis of the inventory of nonradioactive hazardous chemicals, toxics, and reactives is addressed in accordance with 29 CFR 1910.119, *Process Safety Management of Highly Hazardous Chemicals*. Facilities with chemical quantities exceeding those in Appendix A of 29 CFR 1910.119 are

required to perform a process hazards analysis. The inventory of nonradioactive hazardous chemicals considered in the AMWTP hazard analysis includes both chemical products used and stored at the facility, and chemicals in the waste in staging, characterization, and processing areas. The AMWTP is not expected to process or handle regulated quantities of any of the toxic, reactive, flammable, or explosive chemicals listed in Appendix A to Section 29 CFR 1910.119. Thus, a process hazards analysis is not required. If regulated quantities of any of these materials are identified at a later date, a process hazards analysis will be performed in conjunction with the hazard and operability (HAZOP) reviews discussed in Section D.16.3.2.

D.16.4 Hazards Control

The hazards involved in construction, operation, and HWMA closure of AMWTP facilities are controlled through defense-in-depth measures. Layers of defense against the release of hazardous materials are developed so that no one layer by itself is relied upon to provide total defense. For example, automatically actuated systems, alarms, or both prompt operators to manually correct the abnormal situation before an event progresses toward a more serious condition. Passive features such as double containers for waste, confinement cells for processes, atmospheric protection systems, physical controls, monitoring, and action levels provide additional control.

D.16.4.1 Technical Safety Requirements

The AMWTP Technical Safety Requirements are documented, approved requirements imposed on measurable process parameters to ensure that operating conditions are maintained within the safety envelope evaluated in the documented safety analysis. The technical safety requirements also specify administrative and design requirements that must be implemented and maintained. ESHPOP Section D.3 (Safety Analysis Process) provides a more detailed discussion of the technical safety requirements, which is maintained as a controlled document in accordance with ESHPOP Section D.11 (Records and Reports).

D.16.4.2 Work Control Conditions

Workers are the principal population at risk from potential accidents at the AMWTP. Control of worker safety at the AMWTP is governed by 29 CFR Part 1910, *Occupational Safety and Health Standards*. Nonroutine work is controlled by written procedures/instructions that describe the steps to be followed to execute the job safely. As a minimum, workers are trained and qualified for the assigned tasks and are briefed on the relevant hazards of the job.

A job hazards analysis involves the individuals performing the work, and includes the relevant elements of the radiation protection program discussed in ESHPOP Section D.3, the safety analysis process described in ESHPOP Section D.3, and the worker safety and health program discussed in ESHPOP Section D.4. During operation and before initiating potentially hazardous tasks, job hazards analyses are performed to identify existing and potential workplace hazards and to evaluate the risk of associated worker injury or illness. The job hazard analysis ensures that hazard control is integrated for all relevant elements of the ESHPOP.

D.16.4.3 Emission Controls

Where needed, process controls and treatment are used to control emissions from the AMWTP. The air emission treatment system in the AMWTF consists of high-efficiency particulate air filtration, and monitoring components; the system has sufficient capacity and redundancy to handle normal operation

and potential pulses from process cells. Emissions are discharged to the atmosphere through an elevated exhaust stack to maximize atmospheric dispersion. Stack emissions are continuously monitored, and control systems are equipped with automatic and manual controls that actuate protective actions to mitigate potential off-normal releases. The emission control system is described in Section B.4 (Description of Engineered Safety Systems) of ESHPOP Part B (Facility and Process Description).

D.16.4.4 Environmental Monitoring

Environmental monitoring allows the verification of operating permit limits and the determination of exposure at designated locations, including Experimental Breeder Reactor (EBR)-1, the project facility boundary, and the Idaho National Engineering and Environmental Laboratory (INEEL) site boundary. The effects of the project facilities alone, and the combined effects of the project facilities plus other INEEL facilities are determined. In the event of an accidental release, effects can be determined and appropriate actions taken to control access to contaminated areas and protect workers and the public. The AMWTP environmental monitoring program is described in ESHPOP Section D.8 (Environmental Protection and Monitoring).

D.16.5 Implementing Documents

The following documents implement the hazard analysis process:

- *AMWTP Preliminary Safety Analysis Report* (BNFL, 1999)
- AMWTP documented safety analysis (final safety analysis report, etc.)
- Technical safety requirements
- Hazard and operability report.



Attachment D.16a
**Advanced Mixed Waste Treatment Project Hazard
and Operability Study**

Advanced Mixed Waste Treatment Project

Hazard and Operability Study

The AMWTP hazard and operability study was conducted on the major systems installed in the facility to process radioactive mixed waste. The guide words applied to the hazard and operability study of each of the major systems follow.

Typical HAZOP I Guide Words

- External Dose/Shielding
- Internal Dose
- Criticality
- Loss of Confinement
- Ventilation
- Fire
- Explosion/Overpressure
- Maintainability
- Remote Handling
- Loss of Services/Power
- Effluents/Washings
- Corrosion/Erosion
- Domino
- Extreme Weather
- Seismic
- Dropped Load/Impact
- Industrial Safety
- Commissioning/Decommissioning
- Instrumentation/Interlocks
- Construction
- Other.

Typical HAZOP II Property/Guide Word List for a Process Plant.

Property Words	Guide Words
<u>Basic Property Words</u>	<u>Basic Guide Words</u>
Flow	None
Temperature	More of
Pressure	Less of
Level	Part of
Concentration	As well as
Radiation	Other
Other	Reverse
<u>Additional Property Words</u>	<u>Additional Guide Words</u>
Oxygen	Early
Viscosity	Late
Density	
Acidity	
Settle	
Dissolve	

Application. For example, consider the effect of flow—none. What are the consequences of no flow on a particular vessel or pipeline. If there is the potential for a significant safety or operability hazard, then the causes of this condition should be recorded. Where a particular combination has no hazards, this should be recorded.

Typical HAZOP II Property/Guide Word List for Mechanical Handling Operations.

Property Words	Guide Words
<u>Basic Property Words</u>	<u>Basic Guide Words</u>
Movement	Do not
	More
<u>Additional Property Words</u>	Less or part only
	As well
Speed	Reverse
Distance	Early
Acceleration	Late
Direction	Other
Loss of coordination	
Unexpected signals	
Spurious/faulty operation	

Application. For example, consider the effect of movement—none. What are the consequences of no movement on a particular operation. If there is the potential for a significant safety or operability hazard, then the causes of this condition should be recorded. Where a particular combination has no hazards, this should be recorded.

PART E REFERENCES

The purpose of this part of the ESHPOP is to list references from Parts A (General), B (Facility and Process Description), C (Interface with Other Permits, Authorizations and Agreements), and D (Specific DOE ES&H Authorization Conditions). The references are organized into three parts: Section E.1 gives full citations for the references cited in each part by specific date, as well as references that are continually updated and cited by title and designated as current version. Section E.2 lists the regulations, laws, directives, and standards referred to in each part, and the last section (E.3) lists the documents referred to in Part D as implementing documents.

Requirements identified as applicable and mandatory are identified and summarized in Appendix A (Requirements Matrices). When applicable, dates associated with these requirements are included in the references here.

E.1 References

This section lists references cited in the document and references cited by title and designated as current version.

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E.2 Regulations

This section lists the Code of Federal Regulations, federal and state laws, and U.S. Department of Energy directives and standards, and various other standards cited in the Environment, Safety, and Health Program Operating Plan (ESHPOP).

E.2.1 Code of Federal Regulations

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E.2.2 Congressional Acts and U.S. Code

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Clean Air Act of 1977, Title V Amendments 1990, Public Law 101-549, 42 USC §§ 7401-7671.

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E.2.3 Idaho Statutes

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IDAPA 58.01.01, Rules for the Control of Air Pollution in Idaho.

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IDAPA 58.01.05.010, *Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities.*

IDAPA 58.01.05.011, *Land Disposal Restrictions.*

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IDAPA 58.01.05.013, *Procedures for Decisionmaking.*

IDAPA 58.01.05.015, *Standards for the Management of Used Oil.*

IDAPA 58.01.05.500, *Routing of Hazardous Waste Shipments.*

IDAPA 58.01.05.800, *Inspection Plan—Frequency Levels.*

IDAPA 58.01.05.850, *Illegal Actions.*

IDAPA 58.01.06.005, *General Solid Waste Management Site Operation Standards.*

IDAPA 58.01.08, *Idaho Rules for Public Drinking Water Systems.*

E.2.4 U. S. Department of Energy Directives and Standards

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E.2.5 Other Standards

ACGIH, *Industrial Ventilation, A Manual of Recommended Practice*, 17th Edition, American Conference of Governmental Industrial Hygienists.

ANSI/ANS 8.1-1983, *Nuclear Criticality Safety Controls in Operations with Fissionable Materials Outside Reactors (Shielding and Confinement)*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1988.

ANSI/ANS 8.3-1997, *Nuclear Criticality Alarm System*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS 8.5-1986, *Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS 8.6-1983, *Safety in Conducting Sub-critical Neutron-Multiplication Measurements in Situ*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1988.

ANSI/ANS 8.7-1998, *Guide for Nuclear Criticality Safety in Storage of Fissile Materials*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS 8.9-1987, *Nuclear Criticality Safety Criteria for Steel-Pipe Intersections Containing Aqueous Solutions of Fissile Materials*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS 8.10-1983, *Criteria for Nuclear Criticality Safety Controls in Operations with Shielding and Confinement*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1988.

ANSI/ANS 8.12-1987, *Nuclear Criticality Control and Safety of Plutonium-Uranium Fuel Mixtures Outside Reactors*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1993.

ANSI/ANS 8.15-1981, *Nuclear Criticality Control of Special Actinide Elements*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1987.

ANSI/ANS 8.17-1984, *Criticality Safety Criteria for the Handling, Storage, and Transportation of LWR Fuel Outside Reactors*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois, reaffirmed 1989.

ANSI/ANS 8.19-1996, *Administrative Practices for Nuclear Criticality Safety*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS-8.20-1991, *Nuclear Criticality Safety Training*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI/ANS-8.21-1995, *Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors*, American National Standards Institute/American Nuclear Society, La Grange Park, Illinois.

ANSI D6.1-1988, *Manual on Uniform Traffic Control Devices for Streets and Highways*, American National Standards Institute.

ANSI Z41.1-1967, *Men's Safety-Toe Footwear*, American National Standards Institute.

ANSI Z87.1-1989, *Practice for Occupational and Educational Eye and Face Protection*, American National Standards Institute.

ANSI Z88.2-1992, *Respiratory Protection*, American National Standards Institute.

ANSI Z88.6-1986, *Physical Qualifications for Respirator Use*, American National Standards Institute.

ANSI Z89.1-1981, *Requirements for Protective Headgear for Industrial Workers*, American National Standards Institute.

ANSI Z89.2, *Standard for Respiratory Protection*, American National Standards Institute.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 70, *National Electric Code*, National Fire Protection Association, Quincy, Massachusetts.

NFPA 72, *National Fire Alarm Code*, National Fire Protection Association, Quincy, Massachusetts..

NFPA 101, *Life Safety Code*, National Fire Protection Association, Quincy, Massachusetts.

Uniform Building Code, International Conference of Building Officials, 1994.

Uniform Fire Code, International Association of Plumbing and Mechanical Officials, 1994.

E.3 Implementing Documents

AMWTP As Low as Reasonably Achievable Plan

AMWTP Authorization Agreement

AMWTP Conduct of Operations Implementation Matrix

AMWTP Construction Services Manual Number 3: Safety and Health Program

AMWTP criticality safety procedures

AMWTP "Document Control," *Program Quality Procedure 4.1*

AMWTP documented safety analyses

AMWTP Emergency Plan/Resource Conservation and Recovery Act (RCRA) Contingency Plan

AMWTP Employee Concerns Program (BNFL, 2000a)

AMWTP Environmental programs, such as those for National Emissions Standards for Hazardous Air Pollutants, the *Clean Water Act of 1977*, and the *Safe Drinking Water Act of 1996*

AMWTP Exceptions, Exemptions and Extensions Procedure

AMWTP Fire Prevention Plan and procedures

AMWTP Occupational Medical Program Plan

AMWTP Occurrence Reporting Procedure

AMWTP Operational Readiness Review Plan of Action and implementation plans

AMWTP operations safety and health procedures

AMWTP Permitting Matrix

AMWTP Preliminary Safety Analysis Report (BNFL, 1999)

AMWTP Procedure for Startup and Restart

AMWTP program quality procedures, as required by the existing and approved *AMWTP Quality Assurance Program Plan*

AMWTP Quality Assurance Program Plan and project implementing procedures

AMWTP Radiological Control Implementation Matrix and associated implementing procedures

AMWTP Radiological Control Manual

AMWTP “Records Management” Program Quality Procedure 4.2

AMWTP security procedures

AMWTP Maintenance Implementation Plan

AMWTP Soil Sampling and Disposition Plan

AMWTP Storm Water Pollution Prevention Plan for Construction Activities

AMWTP Storm Water Pollution Prevention Plan for Industrial Activities

AMWP supporting management procedures

AMWTP System Operability Testing Plans

AMWTP Technical Safety Requirements

AMWTP Training Implementation Matrix

AMWTP Unreviewed Safety Question determination procedure (BNFL, 2001b)

AMWTP waste management procedures

AMWTP Waste Minimization Plan

DOE-approved Unreviewed Safety Question resolutions

DOE Safety Evaluation Reports

Hazard and operability report

Memorandum of agreement between DOE-ID, BNFL Inc., and the INEEL Management and Operating (M&O) Contractor (DOE-ID, 2000a)



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APPENDIX A

REQUIREMENTS TABLES



APPENDIX A: REQUIREMENTS TABLES

This appendix presents a series of tables organized by the functional area addressed in Part D (Specific DOE ES&H Authorization Conditions) of the Environment, Safety, and Health Program Operating Plan (ESHPOP). A separate table is presented for each functional area, except D.12 (Supporting Environment, Safety, and Health Documents, Manuals, and Agreements), which has no mandatory requirements identified. The tables identify each applicable and mandatory requirement the effective date of the requirement, and the title of the requirement. Requirements include only those portions of the regulation(s) cited that are applicable to the AMWTP and that were applicable on or before the August 1, 1996 contract date (unless otherwise noted).



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Table 1. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.1 (Radiation Protection Program).

Requirement (Date)	Title
10 CFR 835, Subpart A (01/01/99)	General Provisions
10 CFR 835, Subpart B (01/01/99)	Management and Administrative Requirements
10 CFR 835, Subpart C (01/01/99)	Standards for Internal and External Exposure
10 CFR 835, Subpart E (01/01/99)	Monitoring of Individuals and Areas
10 CFR 835, Subpart F (01/01/99)	Entry Control Program
10 CFR 835, Subpart G (01/01/99)	Posting and Labeling
10 CFR 835, Subpart H (01/01/99)	Records
10 CFR 835, Subpart I (01/01/99)	Reports to Individuals
10 CFR 835, Subpart J (01/01/99)	Radiation Safety Training
10 CFR 835, Subpart K (01/01/99)	Design and Control
10 CFR 835, Subpart L (01/01/99)	Radioactive Contamination Control
10 CFR 835, Subpart M (01/01/99)	Sealed Radioactive Source Control
10 CFR 835, Subpart N (01/01/99)	Emergency Exposure Situations
29 CFR 1910.134 (08/01/96)	General Industry Standards-Respiratory Protection
DOE P 441.1	DOE Radiological Health and Safety Policy



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Table 1A. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.1A [Radiation Protection Program (Operations Phase)].

Requirement (Date)	Title
10 CFR 835, Subpart A (01/01/99)	General Provisions
10 CFR 835, Subpart B (01/01/99)	Management and Administrative Requirements
10 CFR 835, Subpart C (01/01/99)	Standards for Internal and External Exposure
10 CFR 835, Subpart E (01/01/99)	Monitoring of Individuals and Areas
10 CFR 835, Subpart F (01/01/99)	Entry Control Program
10 CFR 835, Subpart G (01/01/99)	Posting and Labeling
10 CFR 835, Subpart H (01/01/99)	Records
10 CFR 835, Subpart I (01/01/99)	Reports to Individuals
10 CFR 835, Subpart J (01/01/99)	Radiation Safety Training
10 CFR 835, Subpart K (01/01/99)	Design and Control
10 CFR 835, Subpart L (01/01/99)	Radioactive Contamination Control
10 CFR 835, Subpart M (01/01/99)	Sealed Radioactive Source Control
10 CFR 835, Subpart N (01/01/99)	Emergency Exposure Situations
29 CFR 1910.134 (08/01/96)	General Industry Standards-Respiratory Protection
DOE P 441.1	DOE Radiological Health and Safety Policy



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Table 2. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.2 (Nuclear Criticality Controls).

Requirement (Date)	Title
10 CFR 835.1304 (12/14/93)	Nuclear Accident Dosimetry
10 CFR 830, Subpart B (04/10/01)	Safety Basis Requirements
10 CFR 830, Appendix A Section G.2 (04/10/01)	Hazard Controls
DOE O 420.1 4.3.1 (11/16/95)	Nuclear Criticality Safety
DOE O 420.1 4.3.1 (11/16/95)	Objectives
DOE O 420.1 4.3.2 (11/16/95)	General Requirements
DOE O 420.1 4.3.3 (11/16/95)	Specific Requirements



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Table 3. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.3 (Safety Analysis Process).

Requirement (Date)	Title
DOE Order 5480.23.a (04/30/92)	Graded approach for the level of analysis
DOE Order 5480.23.b (04/30/92)	Scope and content of safety analysis reports
DOE Order 5480.23.c (04/30/92)	Hazard classification for nuclear facilities and operations
DOE Order 5480.23.d (04/30/92)	Document control
DOE Order 5480.23.9.a (04/30/92)	Approval of safety analysis reports for new DOE nuclear facilities
DOE Order 5480.23.9.b (04/30/92)	Preparation and submittal of upgraded safety analysis reports for existing nuclear facilities
DOE Order 5480.23.9.c (04/30/92)	Periodic updates of safety analysis reports
DOE Order 5480.21.10 (12/24/91)	Program Requirements
DOE Order 5480.22.9 09/15/92	Technical Safety Requirements
10 CFR 830 Subpart B (as of April 10, 2001)	Safety Basis Requirements
10 CFR 835 Subpart C (As of 01/01/99)	Standards for Internal and External Exposure
29 CFR 1910.119 (As of 08/01/96)	Process Safety Management of Highly Hazardous Chemicals
29 CFR 1926.64 (As of 08/01/96)	Process Safety Management of Highly Hazardous Chemicals
40 CFR 302, Appendix B (As of 08/01/96)	Designation, Reportable Quantities, and Notification
40 CFR 355, Appendix A (As of 08/01/96)	Emergency Planning and Notification
DOE O 420.1, Section 4.4 Change 1 (11/16/95)	Natural Phenomena Hazards Mitigation
DOE-ID O 420.D, Attachment II (07/17/00)	Hazard Categorization Process
DOE-ID O 420.D, Attachment III (07/17/00)	Evaluation Guidelines for Nonreactor Nuclear Facilities



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Table 4. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.4 (Worker Safety and Health).

Requirement (Date)	Title
29 CFR 1926, Subpart B (07/01/97)	Safety and Health Regulations for the Construction Industry—General Interpretations
29 CFR 1926, Subpart C (07/01/97)	Safety and Health Regulations for the Construction Industry—General Safety and Health Provisions
29 CFR 1926, Subpart D (07/01/97)	Safety and Health Regulations for the Construction Industry—Occupational Health and Environmental Controls
29 CFR 1926, Subpart E (07/01/97)	Safety and Health Regulations for the Construction Industry—Personal Protective and Life Saving Equipment
29 CFR 1926, Subpart F (07/01/97)	Safety and Health Regulations for the Construction Industry—Fire Protection and Prevention
29 CFR 1926, Subpart G (07/01/97)	Safety and Health Regulations for the Construction Industry—Signs, Signals, and Barricades
29 CFR 1926, Subpart H (07/01/97)	Safety and Health Regulations for the Construction Industry—Materials Handling, Storage, Use, and Disposal
29 CFR 1926, Subpart I (07/01/97)	Safety and Health Regulations for the Construction Industry—Tools—Hand and Power
29 CFR 1926, Subpart J (07/01/97)	Safety and Health Regulations for the Construction Industry—Welding and Cutting
29 CFR 1926, Subpart K (07/01/97)	Safety and Health Regulations for the Construction Industry—Electrical
29 CFR 1926, Subpart L (07/01/97)	Safety and Health Regulations for the Construction Industry—Scaffolds
29 CFR 1926, Subpart M (07/01/97)	Safety and Health Regulations for the Construction Industry—Fall Protection
29 CFR 1926, Subpart N (07/01/97)	Safety and Health Regulations for the Construction Industry—Fall Protection
29 CFR 1926, Subpart O (07/01/97)	Safety and Health Regulations for the Construction Industry—Motor Vehicles and Mechanized Equipment
29 CFR 1926, Subpart P (07/01/97)	Safety and Health Regulations for the Construction Industry—Excavation



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Requirement (Date)	Title
29 CFR 1926, Subpart Q (07/01/97)	Safety and Health Regulations for the Construction Industry–Concrete and Masonry Construction
29 CFR 1926, Subpart R (07/01/97)	Safety and Health Regulations for the Construction Industry–Steel Erection
29 CFR 1926, Subpart T (07/01/97)	Safety and Health Regulations for the Construction Industry–Demolition
29 CFR 1926, Subpart U (07/01/97)	Safety and Health Regulations for the Construction Industry–Blasting and Use of Explosives
29 CFR 1926, Subpart V (07/01/97)	Safety and Health Regulations for the Construction Industry–Power Transmission and Distribution
29 CFR 1926, Subpart W (07/01/97)	Safety and Health Regulations for the Construction Industry–Rollover Protective Structures; Overhead Protection
29 CFR 1926, Subpart X (07/01/97)	Safety and Health Regulations for the Construction Industry–Stairways and Ladders
29 CFR 1926, Subpart Z (07/01/97)	Safety and Health Regulations for the Construction Industry–Toxic and Hazardous Substances
29 CFR 1910, Subpart D (07/01/97)	Occupational Safety and Health Standards–Walking–Working Surfaces
29 CFR 1910, Subpart E (07/01/97)	Occupational Safety and Health Standards–Means of Egress
29 CFR 1910, Subpart F (07/01/97)	Occupational Safety and Health Standards–Powered Platforms, Manlifts, and Vehicles–Mounted Work Platforms
29 CFR 1910, Subpart G (07/01/97)	Occupational Safety and Health Standards–Occupational Health and Environmental Controls
29 CFR 1910, Subpart H (07/01/97)	Occupational Safety and Health Standards–Hazardous Materials
29 CFR 1910, Subpart I (07/01/97)	Occupational Safety and Health Standards–Personal Protective Equipment
29 CFR 1910, Subpart J (07/01/97)	Occupational Safety and Health Standards–General Environmental Controls
29 CFR 1910, Subpart K (07/01/97)	Occupational Safety and Health Standards–Medical and First Aid
29 CFR 1910, Subpart L (07/01/97)	Occupational Safety and Health Standards–Fire Protection



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Requirement (Date)	Title
29 CFR 1910, Subpart M (07/01/97)	Occupational Safety and Health Standards–Compressed Gas and Compressed Air Equipment
29 CFR 1910, Subpart N (07/01/97)	Occupational Safety and Health Standards–Materials Handling and Storage
29 CFR 1910, Subpart O (07/01/97)	Occupational Safety and Health Standards–Machinery and Machine Guarding
29 CFR 1910, Subpart P (07/01/97)	Occupational Safety and Health Standards–Hand and Portable Powered Tools and Other
29 CFR 1910, Subpart Q (07/01/97)	Occupational Safety and Health Standards–Welding, Cutting, and Brazing
29 CFR 1910, Subpart S (07/01/97)	Occupational Safety and Health Standards–Electrical
29 CFR 1910, Subpart Z (07/01/97)	Occupational Safety and Health Standards–Toxic and Hazardous Substances



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Table 5. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.5 (Permission to Commence Operations, Stop Work Authority, and Restart).

Requirement (Date)	Title
DOE O 425.1, Change 1 (10/26/95)	Startup and Restart of Nuclear Facilities
Contract Clause H.15 Contract DE-AC07-97ID13481 (12/20/96)	Stop-Work and Shutdown Authority–Environment, Safety, and Health



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Table 6. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.6 (Facility, Construction, and Fire Safety).

Requirement (Date)	Title
DOE Order 4330.4B, Change 1, Chapter II (02/10/94)	Guidelines for the Conduct of Maintenance at DOE Nuclear Facilities
DOE O 420.1, Subpart 4.2 (11/16/95)	Fire Protection
Uniform Building Code	Fire Protection
Uniform Fire Code	Fire Protection
National Fire Protection Association Codes and Standards	Fire Protection
29 CFR 1910, Subpart L	Fire Protection



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Table 7. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.7 (Training and Qualification Program).

Requirement (Date)	Title
10 CFR 830.120, (c)(1)(ii) (04/05/94)	Quality Assurance Requirements Personnel Training and Qualification
10 CFR 830.120, (c)(1)(ii) (04/05/94)	Quality Assurance Requirements Personnel Training and Qualification
DOE Order 5480.20A, Change 1, Attachment 1 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Contractor Requirements Document
DOE Order 5480.20A, Chapter 1, Section 2 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Training Organization Requirements
DOE Order 5480.20A, Chapter 1, Section 3 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Subcontractor Personnel Qualification Requirements
DOE Order 5480.20A, Chapter 1, Section 4 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Personnel Selection Requirements
DOE Order 5480.20A, Chapter 1, Section 5 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Qualification Process Requirements
DOE Order 5480.20A, Chapter 1, Section 6 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Certification Requirements
DOE Order 5480.20A, Chapter 1, Section 7 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Training Requirements
DOE Order 5480.20A, Chapter 1, Section 8 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Operator and Supervisor Examination Requirements
DOE Order 5480.20A, Chapter 1, Section 9 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Operator and Supervisor Reexamination Requirements
DOE Order 5480.20A,	Personnel Selection, Qualification, and



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Requirement (Date)	Title
Chapter 1, Section 10 (04/05/94)	Training Requirements for DOE Nuclear Facilities, Requalification Requirements
DOE Order 5480.20A, Chapter 1, Section 11 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Exceptions to Training Requirements
DOE Order 5480.20A, Chapter 1, Section 12 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Extension Requirements
DOE Order 5480.20A, Chapter 1, Section 13 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Alternatives to Education and Experience Requirements
DOE Order 5480.20A, Chapter 1, Section 14 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, DOE Standards
DOE Order 5480.20A, Chapter 1, Section 15 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Record Requirements
DOE Order 5480.20A, Chapter 4, Section 2 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Entry-Level Requirements
DOE Order 5480.20A, Chapter 4, Section 3 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Medical Examination Requirements
DOE Order 5480.20A, Chapter 4, Section 4 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Specific Training Requirements
DOE Order 5480.20A, Chapter 4, Section 5 (04/05/94)	Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities, Operator, Fissionable Materials Handler, and Supervisor Proficiency Requirements
DOE Order 5480.19, Change 1 Chapter I, Section C, 5 Chapter V Chapter IX, Section C, 10 (05/18/92)	Conduct of Operations Requirements for DOE Facilities Management Training Control of On-Shift Training Training and Communication
DOE Order 5480.19, Change 1 Chapter V, Section B Chapter V, Section C, 5	Conduct of Operations Requirements for DOE Facilities Control of On-Shift Training–Discussion



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Requirement (Date)	Title
(05/18/92)	Training Documentation
10 CFR Part 835, Subpart J (01/01/99)	Radiation Safety Training
29 CFR Part 1910 .120(p)(7) .120(p)(8)(iii)	Occupational Safety and Health Standards Hazardous Waste Operations and Emergency Response–Training Program Hazardous Waste Operations and Emergency Response–Emergency Response Training
29 CFR Part 1926 .65(b)(1)(ii)(A) .65(b)(2) (04/06/79)	Safety and Health Regulations for Construction Safety and health program–General, Organization Structure Safety and health program–Organizational structure part of the site program
29 CFR Part 1926 .65(e) (04/06/79)	Safety and Health Regulations for Construction Hazardous Waste Operations and Emergency Response–Training
29 CFR Part 1926 .65(e)(6) (04/06/79)	Safety and Health Regulations for Construction Hazardous Waste Operations and Emergency Response–Training, Training Certification
29 CFR Part 1926 .65(e) .65(p)(7) .65(p)(8)(iii) .65(q)(6) .65(q)(7) .65(q)(8) (04/06/79)	Occupational Safety and Health Standards Hazardous Waste Operations and Emergency Response–Training Hazardous Waste Operations and Emergency Response–Training Program Hazardous Waste Operations and Emergency Response–Emergency Response Training Hazardous Waste Operations and Emergency Response–Training Hazardous Waste Operations and Emergency Response–Trainers Hazardous Waste Operations and Emergency Response–Refresher Training
29 CFR Part 1926 .20 .21 .32	Safety and Health Regulations for Construction General Safety and Health Provisions and Applicability of Standards–Accident prevention responsibility Safety Training and Education Definitions



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Requirement (Date)	Title
.65(e) (04/06/79)	Hazardous Waste Operations and Emergency Response–Training
IDAPA 58.01.05.008	Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities–References 40 CFR 264.16 Personnel Training
IDAPA 58.01.05.009	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities



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Table 8. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.8 (Environmental Protection and Monitoring).

Requirement (Date)	Title
40 CFR Part 61 (08/01/96)	National Emission Standards for Hazardous Air Pollutants
40 CFR Part 112 (3/26/76)	Oil Pollution Prevention
IDAPA 58.01.05.015 (08/01/96)	Standards For The Management Of Used Oil
IDAPA 58.01.08 (40 CFR 141,142, 143) (As of 08/01/96)	Public Drinking Water Systems
IDAPA 58.01.02 (As of 08/01/96)	Water Quality Standards and Wastewater Treatment
IDAPA 58.01.08 40 CFR Part 141 (As of 08/01/96)	National Primary Drinking Water Regulations
IDAPA 58.01.08 40 CFR Part 143 (As of 08/01/96)	National Secondary Drinking Water Regulations
40 CFR Part 122 (As of 08/01/96)	EPA Administered Permit Programs The National Pollution Discharge Elimination System (NPDES)
40 CFR Parts 152-186 (As of 08/01/96)	Pesticide Programs
40 CFR Part 761 (01/01/97)	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
IDAPA 58.01.05.004 [40 CFR Part 260] (As of 08/01/96)	Hazardous Waste Management System
IDAPA 58.01.05.005 [40 CFR Part 261] (As of 08/01/96)	Identification and Listing of Hazardous Waste
IDAPA 58.01.05.006 [40 CFR Part 262] (As of 08/01/96)	Standards Applicable to Generators of Hazardous Waste
IDAPA 58.01.05.007 [40 CFR Part 263] (As of 08/01/96)	Standards Applicable to Transporters of Hazardous Waste



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Requirement (Date)	Title
IDAPA 58.01.05.008 [40 CFR Part 264] (As of 08/01/96)	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
IDAPA 58.01.05.009 [40 CFR Part 265] (As of 08/01/96)	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
IDAPA 58.01.05.011 [40 CFR Part 268] (11/17/97)	Land Disposal Restrictions
IDAPA 58.01.05.012 [40 CFR Part 270] (As of 08/01/96)	Hazardous Waste Permit Program
IDAPA 58.01.05.013 [40 CFR Part 124] (As of 08/01/96)	Procedures For Decision-Making (State Procedures for RCRA or HWMA Permit Applications)
IDAPA 58.01.05.500 (As of 08/01/96)	Routing of Hazardous Waste Shipments
IDAPA 58.01.05.800 (As of 08/01/96)	Inspection Plan –Frequency Levels
IDAPA 58.01.05.850 (As of 08/01/96)	Illegal Actions
IDAPA 58.01.01 (As of 08/01/96)	Control of Air Pollution in Idaho
DOE Order 5400.5, Change 2, Chapter I (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–General
DOE Order 5400.5, Change 2, Chapter II (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)– Requirements For Radiation Protection Of The Public and The Environment
DOE Order 5400.5, Change 2 Chapter III (01/7/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–Derived Concentration Guides For Air And Water



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Requirement (Date)	Title
DOE Order 5400.5, Change 2, Chapter IV (01/7/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–Residual Radioactive Material
DOE 5400.1 (06/21/90)	General Environmental Protection Program



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Table 9. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.9 (Contingency/Emergency Planning and Response).

Requirement (Date)	Title
29 CFR Part 1910.120 (As of 08/01/96)	Hazardous Waste Operations and Emergency Response
29 CFR Part 1910.165 (As of 08/01/96)	Employee Alarm Systems
29 CFR Part 1910.1000 (As of 08/01/96)	Air Contaminants
29 CFR Part 1926.65 (As of 08/01/96)	Hazardous Waste Operations and Emergency Response
40 CFR Part 300 (As of 08/01/96)	National Oil And Hazardous Substances Pollution Contingency Plan
40 CFR Part 355 (As of 08/01/96)	Emergency Planning and Notification
49 CFR Part 172 (As of 08/01/96)	Emergency Response Information
IDAPA 58.01.05.008 (40 CFR Part 264) (07/01/97 Edition)	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
IDAPA 58.01.05.009 (40 CFR Part 265) (07/01/97 Edition)	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities



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Table 10. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.10 (Continuous Improvement Process and Response to Internal and External Audits).

Requirement (Date)	Title
10 CFR Part 830 Subpart A (01/10/01)	Nuclear Safety Management, Quality Assurance Requirements
10 CFR 820, Appendix A (01/01/96)	Procedural Rules for DOE Nuclear Activities (compliance with DOE nuclear safety requirements), General Statement of Enforcement Policy
CAO-94-1012 (11/99)	U.S. Department of Energy, Carlsbad Area Office Quality Assurance Program Document
DOE Order 232.1A (07/21/97)	Occurrence Reporting and Processing of Operations Information



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Table 11. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.11 (Records and Reports).

Requirement (Date)	Title
10 CFR Part 71 (01/01/97)	Packaging and Transportation of Radioactive Material
10 CFR 71.91	Records
10 CFR 71.113	Document Control
10 CFR 830.122 (d)	Management/Documents and Records
10 CFR Part 835 (01/01/99)	Occupational Radiation Protection
10 CFR 835.702	Individual Monitoring Records
10 CFR 835.703	Monitoring and Workplace Records
10 CFR 835.704	Administrative Records
10 CFR 835.801	Reports to Individuals
CAO-94-1012 (11/99)	U.S. Department of Energy, Carlsbad Area Office Quality Assurance Program Document
29 CFR Part 1904 (07/01/96)	Recording and Reporting Occupational Injuries and Illnesses
29 CFR 1904.2	Log and Summary of Occupational Injuries
29 CFR 1904.3	Period Covered
29 CFR 1904.4	Supplementary Record
29 CFR 1904.5	Annual Summary
29 CFR 1904.6	Retention of Records
29 CFR 1904.7	Access to Records
29 CFR 1904.8	Reporting of Fatality of Multiple Hospitalization Incidents
29 CFR 1910.120 (7-1-96)	Hazardous Waste Operations and Emergency Response
29 CFR 1910.120(f)(8)	Recordkeeping
29 CFR 1910.1020	Access to Employee Exposure and Medical Records
29 CFR 1910.1020(d)(1)(i)	Preservation of Records: Employee Medical Records
29 CFR 1910.1020(d)(1)(ii)	Employee Exposure Records
29 CFR 1910.1020(d)(1)(iii)	Analysis Using Exposure or Medical Records
29 CFR 1910.1020(e)(1)(i)	Access to Records
29 CFR 1910.1020(f)	Trade Secrets
29 CFR Part 1926 (07/01/97)	Safety and Health Regulations for Construction
29 CFR 1926.33	Access to Employee Exposure and Medical Records
29 CFR 1926.33	Employee Emergency Action Plans



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Requirement (Date)	Title
40 CFR Part 61 (07/01/97)	National Emissions Standards for Hazardous Air Pollutants, Subpart H
40 CFR 61.94	Compliance and Reporting
40 CFR 61.95	Recordkeeping Requirements
40 CFR Part 141 (07/01/96)	National Primary Drinking Water Regulations
40 CFR 141.31	Reporting Requirements
40 CFR 141.33	Record Maintenance
40 CFR 141.75	Reporting and Recordkeeping Requirements
40 CFR 141.90	Reporting Requirements
40 CFR 141.91	Recordkeeping Requirements
40 CFR Part 355 (07/01/96)	Emergency Planning and Notification
40 CFR 355.30	Emergency Planning
40 CFR 355.40	Emergency Release Notification
40 CFR Part 370 (07/01/96)	Hazardous Chemical Reporting: Community Right-to-Know Subpart B Reporting requirements
40 CFR 370.20	Applicability
40 CFR 370.21	Material Safety Data Sheet Reporting
40 CFR 370.25	Inventory Reporting
40 CFR 370.28	Mixtures
40 CFR 370.30	Requests for Information
40 CFR 370.40	Tier I Emergency and Hazardous Chemical Inventory Form
40 CFR 370.41	Tier II Emergency and Hazardous Chemical Inventory Form
40 CFR Part 372 (07/01/96)	Toxic Chemical Release Reporting: Community Right-to-Know Subpart B Reporting Requirements
40 CFR 372.10	Recordkeeping
40 CFR 372.30	Reporting Requirements and Schedule for Reporting
40 CFR Part 761 (07/01/96)	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions
IDAPA 58.01.05.006 (40 CFR Part 262) (07/01/96)	Standards Applicable to Generators of Hazardous Waste (Subpart D only)
40 CFR 262.40	Recordkeeping
40 CFR 262.41	Biennial Report
40 CFR 262.42	Exception Reporting



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Requirement (Date)	Title
IDAPA 58.01.05.008 (40 CFR Part 264) (07/01/96)	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (Subpart E only)
40 CFR 264.71	Use of Manifest System
40 CFR 264.73	Operating Record
40 CFR 264.74	Availability, Retention, and Disposition of Records
40 CFR 264.75	Biennial Report
40 CFR 264.76	Unmanifested Waste Report
40 CFR 264.77	Additional Reports
DOE O 425.1, Change 1 (10-26-95)	Startup and Restart of Nuclear Facilities
DOE Order 232.1A (7/21/97)	Occurrence Reporting and Processing of Operations Information
DOE Order 5400.5 (1-7-93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)
DOE Order 5400.5 Chapter II.7	Reporting Requirements
DOE Order 5400.5 Chapter II.8.a	Records: Content
DOE Order 5400.5 Chapter II.8.b	Records: Retention
10 CFR 830 Subpart B (01/10/01)	Nuclear Safety Management Safety Basis Requirements
10 CFR 830.204	Documented Safety Analysis
10 CFR 830.203	Unreviewed Safety Questions
10 CFR 830.202	Safety Basis
DOE Order 5480.19 (5-18-92)	Conduct of Operations at DOE Nuclear Facilities
DOE Order 5480.19 Chapter XI	Logkeeping
DOE Order 5480.19 Chapter XI.c	Guidelines
10 CFR 830.205	Technical Safety Requirements
10 CFR 830 Subpart B, Appendix A, Table 4	Surveillance Requirements
10 CFR 830 Subpart B, Appendix A, Table 4	Administrative Controls



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Table 12. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.13 (Security).

Requirement (Date)	Title
IDAPA 58.01.05.008 (Invokes requirements of 40 CFR 264.14, Security) (11/17/97)	Security
IDAPA 58.01.05.009 (Invokes requirements of 40 CFR 265.14, Security) (11/17/97)	Security



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Table 13. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.14 (Conduct of Operations).

Requirement (Date)	Title
DOE Order 5480.19, Change 1, Guidelines for the Conduct of Operations Requirements at DOE Facilities, Chapters I through XVIII (05/18/92)	Conduct of Operations
DOE O 210.1, Change 2, Section 4: Requirements (05/01/96)	Performance Indicators and Analysis of Operations Information
DOE O 232.1A, Section 4: Requirements (07/21/97)	Occurrence Reporting and Processing of Operations Information



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Table 14. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.15 (Waste Management Program)

Requirement (Date)	Title
40 CFR Part 194 (As of 08/01/96)	Criteria For The Certification And Re-Certification Of The Waste Isolation Pilot Plant's Compliance With The 40 CFR Part 191 Disposal Regulations
40 CFR Part 761 (07/01/97)	Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use
49 CFR Part 171 (10/01/97)	General Information, Regulations, and Definitions
49 CFR Part 172 (10/01/97)	Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements
49 CFR Part 173 (10/01/97)	Shippers—General Requirements for Shipments and Packagings
49 CFR Part 178 (10/01/97)	Specifications for Packagings
IDAPA 58.01.05.004 [40 CFR Part 260] (07/01/97)	Hazardous Waste Management System
IDAPA 58.01.05.005 [40 CFR Part 261] (07/01/97)	Identification and Listing of Hazardous Waste
IDAPA 58.01.05.006 [40 CFR Part 262] (07/01/97)	Standards Applicable to Generators of Hazardous Waste
IDAPA 58.01.05.008 [40 CFR Part 264] (07/01/97)	Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities—General
IDAPA 58.01.05.009 [40 CFR Part 265] (07/01/97)	Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
IDAPA 58.01.05.010 [40 CFR Part 266] (07/01/97)	Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
IDAPA 58.01.05.011 [40 CFR Part 268] (07/01/97)	Land Disposal Restrictions



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Requirement (Date)	Title
IDAPA 58.01.05.012 [40 CFR Part 270] (07/01/97)	The Hazardous Waste Permit Program
IDAPA 58.01.01 (12/01/97)	Rules for the Control of Air Pollution in Idaho
IDAPA 58.01.05.015	Standards For The Management Of Used Oil
DOE Order 5400.5, Change 2 (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)
DOE Order 5400.5, Change 2, Chapter I (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–General
DOE Order 5400.5, Change 2, Chapter II (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–Requirements for Radiation Protection of the Public and the Environment
DOE Order 5400.5, Change 2, Chapter III (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–Derived Concentrations for Air and Water
DOE Order 5400.5, Change 2, Chapter IV (01/07/93)	Radiation Protection of the Public and the Environment (pending final codification of 10 CFR Part 834)–Residual Radioactive Material
DOE/WIPP-069, Rev. 7 (11/99)	Waste Acceptance Criteria for the Waste Isolation Pilot Plant
CAO-94-1012, Rev. 3 (11/99)	U.S. Department of Energy, Carlsbad Area Office Quality Assurance Program Document



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Table 15. Requirements Table for Environment, Safety, and Health Program Operating Plan Section D.16 (Hazards Analysis and Control Program).

Requirement (Date)	Title
DOE Order 5480.23.8.c (04/30/92)	Hazard Classification for Nuclear Facilities and Operations
10 CFR 830, Subpart B (As of April 10, 2001)	Safety Basis Requirements
29 CFR 1910.119 (As of 08/01/96)	Process Safety Management of Highly Hazardous Chemicals
29 CFR 1926.64 (As of 08/01/96)	Process Safety Management of Highly Hazardous Chemicals
40 CFR Part 116 (As of 08/01/96)	Designation Of Hazardous Substances
40 CFR Part 117 (As of 08/01/96)	Determination Of Reportable Quantities For Hazardous Substances
40 CFR Part 302 (As of 08/01/96)	Designation, Reportable Quantities, and Notification,
40 CFR Part 355 (As of 08/01/96)	Emergency Planning and Notification