ISFSI-003

License Application for the INEL TMI-2 Independent Spent Fuel Storage Installation

- License Application
- Conceptual Plan for Decommissioning
- Environmental Report
- Quality Assurance Requirements and Description

Idaho National Engineering Laboratory

U.S. Department of Energy • Idaho Operations Office

License Application Summary

DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

LICENSE APPLICATION FOR THE IDAHO NATIONAL ENGINEERING LABORATORY THREE MILE ISLAND UNIT TWO INDEPENDENT SPENT FUEL STORAGE INSTALLATION

DOCKET NO. 72-20

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Prepared by:

The US Department of Energy
Idaho Operations Office
Idaho Falls, Idaho

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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
CFR	Code of Federal Regulations
D&D	Decontamination and Decommissioning
DOE	United States Department of Energy
DOE-ID	DOE Idaho Operations Office
DOE/RW-0333P	DOE OCRWM Quality Assurance Requirements and Description
DSC	Dry Shielded Canister
EA	Environmental Assessment
EIS	Environmental Impact Statement
FEIS	Final Environmental Impact Statement
HEPA	High Efficiency Particulate Air
HSM	Horizontal Storage Module
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
ISFSI	Independent Spent Fuel Storage Installation
LITCO	Lockheed Idaho Technologies Company
M&O	Management and Operations
NEPA	National Environmental Policy Act
NNS	Newport News Shipbuilding
NRC	Nuclear Regulatory Commission
OCRWM	DOE Office of Civilian Radioactive Waste Management
SAR	Safety Analysis Report
TAN	Test Area North
TMI-2	Three Mile Island Unit 2

CHAPTER 1
GENERAL AND FINANCIAL INFORMATION

1.0 Application For License

In accordance with the requirements of Title 10 of the Code of Federal Regulations Part 72 (10 CFR Part 72), the United States (US) Department of Energy through its Idaho Operations Office (DOE-ID), as authorized by the Secretary of Energy, hereby applies for a specific license to receive, handle, possess, store and transfer spent nuclear fuel and other core debris originating from the de-fueling of the Three Mile Island Unit 2 reactor (TMI-2 Core Debris) in an Independent Spent Fuel Storage Installation designed and constructed for this purpose and located at the Idaho Chemical Processing Plant (ICPP) on the Idaho National Engineering Laboratory (INEL) site. This ISFSI will be designated as the INEL TMI-2 ISFSI. The TMI-2 Core Debris is currently stored in NRC approved canisters (TMI-2 Canisters-Docket No. 71-9200) in a water pool at the Test Area North (TAN) on the INEL site.

DOE-ID requests a license term of 20 years. If a Federal facility that can receive the TMI-2 core debris is not available at the end of this term, an extension of the initial term will be required and DOE-ID may apply for renewal of this license in accordance with the applicable provisions of 10 CFR 72.42.

The activities to be licensed pursuant to this application and 10 CFR Part 72, are the design, construction, operation (including, receipt, handling, transfer, storage, retrieval, surveillance and maintenance) and decommissioning of the INEL TMI-2 ISFSI. Although the location for this facility is within the perimeter of the ICPP, no unlicensed activities will be conducted on the INEL TMI-2 ISFSI facility.

This application for the proposed INEL TMI-2 ISFSI contains the information required by 10 CFR Part 72, and was prepared in accordance with the Nuclear Regulatory Commission (NRC) Regulatory Guide 3.50 "Standard Format and Content for a License Application to Store Spent Fuel and High-Level Radioactive Waste," Revision 1, September 1989. The complete application consists of the following documents, each of which are incorporated by reference:

a. The License Application,
b. The Safety Analysis Report for the INEL TMI-2 ISFSI ,
c. The U.S. Department of Energy's Environmental Report for the INEL TMI-2 ISFSI,
d. The INEL Emergency Plan/ RCRA Contingency Plan and Addendum #10 thereto, the INEL TMI-2 ISFSI Emergency Plan,
e. The Conceptual Plan for Decommissioning the INEL TMI-2 ISFSI,
f. The DOE Office of Civilian Radioactive Waste Management (OCRWM) Quality Assurance Requirements and Description (DOE/RW-0333P), Revision 5,
g. The INEL TMI-2 ISFSI Physical Security Plan (to be submitted under separate cover),
h. The INEL TMI-2 ISFSI draft Technical Specifications (to be submitted later), and
i. The INEL TMI-2 ISFSI Personnel Training and Certification Plan (to be submitted later).

1.1 Full Name And Address Of Applicant

United States Department of Energy, Idaho Operations Office
850 Energy Drive
Idaho Falls, ID 83401-1562

The Manager of the DOE Idaho Operations Office is John M. Wilcynski, (208) 526-5665, and the TMI/FSV Licensing Project Manager is Jan Hagers, (208) 526-0758. DOE-ID requests that all correspondence relating to this application be addressed to John M. Wilcynski, DOE Idaho Operations Office Manager, at the address above with copies to Jan Hagers, TMI/FSV Licensing Project Manager at 785 DOE Place, MS 1145, Idaho Falls, ID 83402.

1.2 Scope Of License - Activities & Materials To Be Licensed

DOE-ID currently owns, possesses and stores the TMI-2 Core Debris, in NRC approved canisters (TMI-2 Canisters-Docket No. 71-9200) located in a water pool within the Test Area North facility on the INEL site, in accordance with DOE Orders and INEL procedures. DOE-ID will transfer the TMI-2 Canisters containing the TMI-2 Core Debris to an ISFSI to be constructed at the ICPP also located on the INEL site. DOE-ID proposes that the NRC regulated activities will commence with the transportation of the TMI-2 Core Debris in an approved transportation cask pursuant to a route specific license to be obtained pursuant to the requirements of 10 CFR Part 71 and cover the INEL TMI-2 ISFSI. The activities falling within the scope of this 10 CFR Part 72 application will commence with the receipt of TMI-2 Canisters in the MP-187 transportation cask at the INEL TMI-2 ISFSI facility and will include all subsequent fuel handling, operational and maintenance activities thru and including decommissioning of the INEL TMI-2 ISFSI. The design, construction and pre-operational testing of the INEL TMI-2 ISFSI will also be included within the scope of the license.

Activities that take place in the TAN facility such as the drying of the TMI-2 Canisters and loading of the Dry Shielded Canisters will be performed in accordance with TAN facility procedures and will be regulated by DOE Orders and Directives.

1.3 Description Of Applicant's Business

The Department of Energy is a cabinet level department of the Federal Government authorized by the Atomic Energy Act of 1954, as amended. The Department of Energy is recognized as a qualified applicant for an ISFSI license (10 CFR 72.22(d)(5)). The DOE organization responsible for the construction and operation of the INEL TMI-2 ISFSI is the DOE Idaho Operations Office (DOE-ID). The Secretary of Energy by Delegation Order No. 10CFR72.512.1 signed ______________, has delegated the authority to submit this application for license and the responsibility to construct and operate the INEL TMI-2 ISFSI to the Manager, DOE Idaho Operations Office.

DOE-ID directs the activities of the INEL, an operation with approximately 7,700 employees. Almost 5,000 employees work at the nine operating areas on the INEL, while the remainder work at facilities in Idaho Falls. DOE-ID's mission is to provide the vision, leadership, and management to effectively execute technology programs while promoting regional economic growth, industrial and government partnerships, and safe, environmentally-sound operations. The INEL has primary missions of nuclear reactor research and development; environmental restoration, including waste management remediation and technology development; spent nuclear fuel management; nuclear process operations; and a broad suite of technological research and development programs.

The INEL site covers nearly 570,000 acres, or 890 square miles, of typical western sagebrush flats almost a mile above sea level. The land is bordered on the north and west by three mountain ranges and on the south by three towering buttes. The INEL is 39 miles long from north to south and 36 miles wide at its broadest point.

The INEL contains the following nine primary operating areas:

- Argonne National Laboratory-West, which conducts nuclear research and development;

- Central Facilities Area, which provides many services for the entire INEL including environmental monitoring and calibration laboratories, security, fire protection, medical, communication systems, warehouses, cafeteria, vehicle and equipment pools, bus system, and laundry;

- Experimental Breeder Reactor I, which was the first reactor in the world to generate usable amounts of electricity and is today a Registered National Historic Landmark;

- Idaho Chemical Processing Plant, which houses one-of-a-kind reprocessing facilities (not currently in operation) for government-owned defense and research spent fuels and has spent fuel storage and reprocessing areas, a waste solidification facility and related waste storage bins, remote analytical laboratories, and a coal-fired steam generating plant;

- Naval Reactor Facility, which is operated under the direction of the Office of Naval Reactors by Bettis Atomic Power Laboratory and continues to carry out research on Naval spent fuel and irradiated materials used in Naval reactors;

- Power Burst Facility, which consists of facilities constructed for the Special Power Excursion Reactor Tests, facilities used to conduct light water reactor fuel behavior studies; the Waste Experimental Reduction Facility, an operating mixed low level waste incinerator; and facilities leased to the Idaho Brain Tumor Center for studying boron neutron capture therapy for potential use in brain cancer treatments;

- Radioactive Waste Management Complex, which studies various high-tech strategies for waste storage, processing and disposal;

- Test Area North, which consists of facilities for handling, storage, examination, and research and development of spent nuclear fuel; and

- Test Reactor Area, which houses extensive facilities for studying the effects of radiation on materials, fuels, and equipment for the nuclear Navy.

As previously stated, the INEL TMI-2 ISFSI will be located at the ICPP on the INEL site. The location and layout of the INEL TMI-2 ISFSI and the ICPP are further discussed in Chapter 2 of the INEL TMI-2 ISFSI Safety Analysis Report (SAR). The operation of the INEL TMI-2 ISFSI will be performed by certified personnel from the ICPP fuel storage facilities. The INEL TMI-2 ISFSI will share utilities such as electricity with the ICPP. Postulated accident and exposure interactions with the INEL, ICPP, and the INEL TMI-2 ISFSI are discussed in the INEL TMI-2 ISFSI SAR. Due to the size and remoteness of the INEL, "external" support for fire protection, security, and radiation control services are furnished by DOE-ID and its INEL contractors.

Although the INEL TMI-2 ISFSI is not located at the site of a facility licensed under the requirements of 10 CFR Part 50, it will be constructed and operated on a nuclear processing facility and the INEL site which have a significant facility, organizational and response infrastructure. DOE-ID operates the INEL under the authority and requirements of the Atomic Energy Act of 1954, as amended and provides written direction to its M&O Contractor through DOE Orders and Directives. The INEL therefore has qualified plans and programs in place for the Emergency Plan, Hazardous Materials Response, Security Plans, Radiation Protection and Training that accomplish the functions similar to those of a civilian nuclear power plant but in compliance with DOE Orders. The INEL TMI-2 ISFSI specific plans, programs and procedures will be written to meet NRC Regulations as well as the requirements and conditions of the license. These specific plans will specify any interfaces with the ICPP or INEL plans, programs or procedures. DOE-ID will integrate the TMI-2 ISFSI specific plans, programs and procedures with the related ICPP or INEL plans, programs and procedures to ensure appropriate support and responses are available.

1.4 Need For The INEL TMI-2 ISFSI

DOE-ID has determined that the TAN Pool, in which the TMI-2 Canisters and Core Debris are presently stored, does not meet SNF storage requirements delineated in DOE Order 420.1 "Facility Safety"(DOE 1995c). The principal deficiencies of the TAN Pool include lack of redundant containment of pool water (i.e., stainless steel pool liner), no provisions for detection subsurface leaks for the pool and inadequate control of the air space over the pool. In order to eliminate these deficiencies and as part of its NEPA review, DOE evaluated a number of alternatives that included (a) constructing an Independent Spent Fuel Storage Installation at the ICPP, (b) removing the TMI fuels from the pool and transporting them to ICPP, and (c) draining and stabilizing the TAN Pool. Based on this evaluation DOE determined that the TMI-2 Core Debris should be transported to and stored in, the TMI-2 ISFSI to be constructed at the ICPP.

The schedule for construction of the INEL TMI-2 ISFSI and removal of TMI-2 Core Debris from the TAN Pool has been established by a Settlement Agreement entered into by the State of Idaho, the Department of Energy and the Department of Navy. The Settlement Agreement was signed in October 1995 and fully resolves all issues in the actions Public Service Co. of Colorado v. Batt, No. CV 91-0035-S-EJL(D.Id.) and United States v. Batt, No. CV91-0065-S-EJL (D.Id.). Within the Settlement Agreement paragraph E7 states:

"DOE shall complete construction of the Three Mile Island dry storage facility by December 31, 1998. DOE shall commence moving fuel into the facility by March 31, 1999, and shall complete moving fuel in to the facility by June 1, 2001."

1.5 Applicant's Working And Contractual Arrangements

The Secretary of Energy has designated the Manager, DOE Idaho Operations Office as the Secretary's authorized representative for filing the INEL TMI-2 ISFSI license application and as the license holder when the license is granted. As the owner and licensee of the INEL TMI-2 ISFSI, DOE-ID will retain overall responsibility for all INEL TMI-2 ISFSI activities, including engineering, design, licensing, construction, operation, and decommissioning, and will be responsible for meeting applicable regulatory requirements. DOE-ID will manage and oversee INEL TMI-2 ISFSI activities as necessary to verify compliance to regulatory requirements and license conditions, and to ensure the overall protection of the health and safety of the public, the workers, and the environment. DOE-ID has contractually delegated the responsibility for the management and operation of the INEL TMI-2 ISFSI to its INEL management and operations (M&O) contractor, Lockheed Idaho Technologies Company (LITCO). (LITCO's address is P.O. Box 1625, Idaho Falls, ID 83415; LITCO has recently changed its name to Lockheed Martin Idaho Technologies Company.)

To exercise its overall responsibility, DOE-ID will retain responsibility for and perform independent audits of the M&O contractor's INEL TMI-2 ISFSI quality assurance program (both the achievement of quality by M&O contractor management and the verification of quality by M&O contractor quality assurance personnel), ensure the requirements to comply with the license conditions for the INEL TMI-2 ISFSI are included in the M&O contract, assess the performance of the M&O contractor against the terms of the contract, retain the responsibility to budget funds necessary and sufficient to safely operate the INEL TMI-2 ISFSI, and retain the authority to revise the M&O contract in the event contract deficiencies are found relative to proper implementation of license conditions.

Pursuant to its contract with DOE-ID, LITCO is required to manage and operate the TMI-2 ISFSI in compliance with all applicable NRC requirements and license conditions. The INEL TMI-2 ISFSI is exempt from compliance with DOE Orders that duplicate or overlap NRC regulations. These requirements and responsibilities will be passed to any succeeding M&O contractor as a contract condition throughout the term of the license.

LITCO has contracted the design, safety analysis, and construction of the INEL TMI-2 ISFSI to Newport News Shipbuilding (NNS) of Newport News, Virginia. NNS has contracted with VECTRA Technologies, Inc. (VECTRA) of San Jose, California, and SCIENTECH, Inc., of Idaho Falls, Idaho, for design, safety analysis, and licensing support. VECTRA is the subcontractor responsible for design and safety analysis of the dry spent fuel cask storage system components. SCIENTECH is the subcontractor responsible for licensing and safety review support. NNS plans to subcontract the fabrication and on-site construction of INEL TMI-2 ISFSI structures, systems, and components to qualified firms during the construction phase of the project.

For more information on DOE-ID's working and contractual arrangements and the INEL TMI-2 ISFSI organizational structure, see Sections 1.4 and 9.1 of the INEL TMI-2 ISFSI SAR.

1.6 Financial Qualification

As set forth in 10 CFR 72.22(e), the Department of Energy is not required to provide detailed financial information to demonstrate its financial qualifications. DOE-ID has obtained funding to construct and load fuel into the INEL TMI-2 ISFSI under a line item project authorization. DOE-ID will request the necessary funding from Congress for the operation, maintenance and decommissioning of the facility in future years.

CHAPTER 2
TECHNICAL QUALIFICATIONS

Chapter 9 of the INEL TMI-2 ISFSI SAR provides the information required by 10 CFR 72.28, "Contents of Application: Applicant's Technical Qualifications." Section 9.1 of the INEL TMI-2 ISFSI SAR discusses the organization and technical qualifications of the DOE-ID and its M&O contractor staff to design, construct, and operate the ISFSI. Section 9.3 of the INEL TMI-2 ISFSI SAR discusses the DOE-ID and M&O contractor training program and states that the objective of the training program is to develop and maintain a qualified work force for safe and efficient ISFSI operations. DOE-ID commits to provide an adequate complement of trained and certified personnel possessing the required skills throughout all phases of the project. This commitment includes providing the resources necessary for the M&O contractor to maintain an adequate complement of certified operations personnel.

DOE-ID and its contractors are fully qualified to manage, design, construct, operate, maintain, and decommission the INEL TMI-2 ISFSI. Through years of managing and operating the INEL, DOE-ID and its M&O contractor have acquired numerous technical capabilities that can be applied to operating the INEL TMI-2 ISFSI. This experience includes:

- performing safety analyses for nuclear activities, environmental activities and waste management operations;
- conducting environmental assessments and remediation of hazardous waste, mixed waste, and radioactively contaminated waste;
- performing environmental risk assessments and evaluating safety and risk for complex technical systems;
- implementing radiological control programs;
- designing, fabricating, and testing specialized facilities, prototype systems, components, software, hardware, instruments, and test equipment;
- handling heavy loads and developing remote handling and process automation capabilities through an extensive robotics program directed toward waste handling, accessing confined and hazardous areas, and performing repetitive skills;
- developing a decontamination and decommissioning (D&D) program that is recognized as a national leader; and
- characterizing and treating waste generated by the INEL and other sites, including disposing of INEL low-level waste, processing high-level waste, and storing and certifying transuranic waste.

In addition to these technical capabilities, the experience gained by DOE-ID during the construction and operation of numerous nuclear facilities at INEL, including spent fuel storage installations, will be available to support the construction and operation of the INEL TMI-2 ISFSI. Additionally, the training program, along with other management systems, will ensure that qualified and certified individuals will be available to perform planned and unplanned tasks. This experience and training will ensure that the ISFSI is constructed and operated in a manner which

provides adequate protection to the health and safety of the worker, the public, and the environment.

CHAPTER 3
TECHNICAL INFORMATION -- SAFETY ANALYSIS REPORT

The INEL TMI-2 ISFSI SAR filed with this application provides the information required by 10 CFR 72.24, "Contents of Application: Technical Information," and was prepared in accordance with NRC Regulatory Guide 3.48, "Standard Format and Content for the Safety Analysis Report for an Independent Spent Fuel Storage Installation or Monitored Retrievable Storage Installation (Dry Storage)," Revision 1, August 1989. The SAR describes the proposed ISFSI design, assesses the safety of the ISFSI design bases, and discusses ISFSI operations including the receipt, handling, packaging, and storage of the TMI-2 core debris. A summary of the INEL TMI-2 ISFSI is provided below.

3.1 Type Of Installation

The INEL TMI-2 ISFSI will be a dry-type ISFSI using the NUHOMS®-12T system. The NUHOMS®-12T system is a modification of the standardized NUHOMS® horizontal modular storage system for irradiated nuclear fuel (Docket Number 72-1004). The NUHOMS®-12T system provides for the horizontal, dry storage of containerized TMI-2 core debris in dry shielded canisters (DSCs) which are placed in concrete horizontal storage modules (HSMs). The HSMs will be placed on a concrete basemat at the INEL TMI-2 ISFSI site.

3.2 Design Capacity

The INEL TMI-2 ISFSI is designed to store up to 348 TMI-2 canisters. The INEL TMI-2 ISFSI layout is based on the use of a maximum of 30 HSMs. Each HSM holds a DSC containing up to 12 TMI-2 canisters. Therefore, 29 DSCs and 29 HSMs will be used to store the TMI-2 canisters. An extra HSM will serve as a backup in case a challenged canister needs additional confinement. This spare HSM will include a cylindrical overpack that can be used as an additional barrier. The INEL TMI-2 ISFSI will have the capacity to store all of the TMI-2 Core Debris received at the INEL.

3.3 Unique Design Features

One unique design feature of the NUHOMS®-12T system in comparison to the standardized NUHOMS® horizontal modular storage system is that the TMI-2 canisters will be vented to the DSCs and the DSCs will normally be vented to the atmosphere, through high efficiency particulate air (HEPA) filters, to prevent hydrogen gas buildup caused by radiolysis of residual water in the TMI-2 core debris.

Another unique design feature of the NUHOMS®-12T system, in comparison to the standardized NUHOMS® horizontal modular storage system, is that, due to the low heat load of the TMI-2 canisters in comparison to commercial spent fuel assemblies, the INEL TMI-2 ISFSI HSMs have no air vents for cooling.

3.4 Mode Of Operation

Once the loaded DSCs have been secured in the HSMs, the INEL TMI-2 ISFSI is a passive storage installation.

In order to move the TMI-2 core debris from the TAN facility to the INEL TMI-2 ISFSI, the following procedure will be repeated until all of the TMI-2 canisters have been moved to the INEL TMI-2 ISFSI. Each TMI-2 canister will be removed from the TAN facility spent fuel pool, drained, and then vacuum dried to ensure that no free water is contained in the canisters. The TMI-2 canisters will be loaded into a DSC (already inside a transport cask) in the Hot Cell of the TAN facility. The contents of each DSC (TMI-2 canister seriel numbers, drying results and moisture levels) will be recorded on a transfer form and independently verified. The DSC will be sealed, the vent system filter assemblies will be installed (with vent system transportation covers already installed on the filter assemblies), and the DSC cavity will be dried and backfilled with helium. The cask will be placed on a transport trailer at the TAN facility, ready for transport to the INEL TMI-2 ISFSI located at the ICPP site. After towing the transport trailer to the ISFSI location, the loaded cask on the trailer is aligned with the HSM and the DSC is pushed out of the cask into the HSM using a hydraulic ram. The DSC vent system transportation covers are then removed from the DSC and dust covers are installed. Once inside the HSM with the DSC vent system open to the atmosphere, the DSC is in safe, passive dry storage.

CHAPTER 4
CONFORMITY TO GENERAL DESIGN CRITERIA

As summarized in this chapter, the INEL TMI-2 ISFSI complies with all the applicable design criteria contained in Subpart F, "General Design Criteria," of 10 CFR Part 72. The ISFSI's specific conformance to the general design criteria is discussed in more detail in the INEL TMI-2 ISFSI SAR.

4.1 Quality Standards [10 CFR 72.122(a)]

As discussed in Section 3.4 of the INEL TMI-2 ISFSI SAR, the DSCs (shield plugs, DSC shells, cover plates, weld filler metal, and vent systems), the HSMs (reinforced concrete, DSC support structure), and the transport cask are the only components at the INEL TMI-2 ISFSI that are important to safety. These components are assigned the highest quality classification under the DOE-ID, LITCO, and VECTRA Quality Assurance Programs, and will be designed, fabricated, sealed, and tested in accordance with the vendor's quality assurance program. License Application Chapter 6 and Chapter 11 of the INEL TMI-2 ISFSI SAR provide more information on the quality standards applied to the INEL TMI-2 ISFSI.

4.2 Protection Against Environmental Conditions And Natural Phenomena [10 CFR 72.122(b)]

Chapter 2 of the INEL TMI-2 ISFSI SAR describes the characteristics of the INEL TMI-2 ISFSI site and defines credible environmental conditions and natural phenomena as well as monitoring capabilities at the INEL. As discussed in Section 3.2 of the INEL TMI-2 ISFSI SAR, the INEL TMI-2 ISFSI is designed to accomodate the environmental conditions and withstand the effects of natural phenomena without impairing its safety function. Chapter 8 of the INEL TMI-2 ISFSI SAR contains the analyses which demonstrate that the ISFSI will maintain its structural integrity and ability to perform safety functions during a range of credible accident occurrences (from minor accidents to design basis accidents). Chapter 4 of the SAR describes the design features that provide containment of the TMI-2 core dedris and preclude it from entering the Snake River Plan Acquifer.

4.3 Protection Against Fire And Explosions [10 CFR 72.122(c)]

As discussed in Section 3.3.6 of the INEL TMI-2 ISFSI SAR, the NUHOMS® DSCs and HSMs contain no permanent flammable material and the concrete and steel used for their fabrication can withstand any credible fire hazard. There is no fixed fire suppression system within the boundaries of the INEL TMI-2 ISFSI; however, portable fire suppression equipment is available for use by the fire brigade.

INEL TMI-2 ISFSI initiated explosions are not considered credible since no explosive materials are present in the DSCs other than low concentrations of hydrogen generated by radiolysis. Additionally, the INEL TMI-2 ISFSI is designed without any known ignition sources present, thus minimizing the potential for hydrogen deflagration. The hydrogen deflagration analysis in Appendix C of the SAR shows that the TMI-2 canisters and DSC maintain structural integrity. Externally initiated explosions are discussed in Chapter 8 and are considered to be bounded by the design basis tornado generated missile load analysis discussed in Section 8.2.2 of the INEL TMI-2 ISFSI SAR.

4.4 Sharing Of Structures, Systems, And Components [10 CFR 72.122(d)]

No INEL TMI-2 ISFSI structures, systems, or components important to safety are shared with other facilities. Also, none of the activities at the ICPP will result in challenges to the safety of the INEL TMI-2 ISFSI. Conversely, the operations associated with the INEL TMI-2 ISFSI will not impair the capability to maintain the safety of ICPP activities.

4.5 Proximity Of Sites [10 CFR 72.122(e)]

The INEL TMI-2 ISFSI is located on a two-acre dedicated area within the ICPP boundaries. The INEL TMI-2 ISFSI is designed to be completely independent of any other facilities at the ICPP, other than electrical service for security lighting. The operation of the INEL TMI-2 ISFSI is described in Chapter 5 of the INEL TMI-2 ISFSI SAR, and radiological impacts are addressed in Chapters 6 and 7 of the INEL TMI-2 ISFSI SAR. Chapter 7 demonstrates that the off-site radiological doses are small and there is no unreasonable risk to the health and safety of the public due to the presence of the INEL TMI-2 ISFSI.

The cumulative environmental impact of spent fuel management on the INEL, including the consolidation of SNF at the ICPP were analyzed in the DOE's Programmatic SNF and INEL ER&WM Programmatic Final EIS (FEIS: DOE/EIS-0203-F) and shown to be very small. The data presented in the Environmental Report submitted with this application are consistent with the FEIS and show there is no significant effect on the human environment due to the INEL TMI-2 ISFSI.

4.6 Testing And Maintenance Of Systems And Components [10 CFR 72.122(f)]

The INEL TMI-2 ISFSI structures, systems, and components important to safety are designed to permit inspection, maintenance, and testing. As discussed in Sections 4.3.11, 10.3 and 10.4 of the INEL TMI-2 ISFSI SAR, the only surveillance and maintenance required during long-term storage are a semi-annual check of the DSC internal gases, a monthly radiation survey of the DSC vent system HEPA filters, and a leak test of the DSC vent connections at five year intervals. The maintenance program will also involve the inspection of the vent access doors to ensure that they remain operational and that no build up of debris or snow occurs in the vent areas. The surveillance and maintenance required during loading and unloading operations are discussed in Section 10.3 of the INEL TMI-2 ISFSI SAR. The proposed pre-operational testing is discussed in Section 9.2 of the INEL TMI-2 ISFSI SAR.

As discussed in Section 4.5 of the INEL TMI-2 ISFSI SAR, the transport cask is designed to require only minimal maintenance. Cask maintenance is limited to periodic inspection and testing of critical components, and replacement of damaged or non-functioning components.

4.7 Emergency Capability [10 CFR 72.122(g)]

The INEL TMI-2 ISFSI is designed to accommodate emergency response activities and provides for accessibility to the equipment of emergency facilities and services. An INEL TMI-2 ISFSI Emergency Plan filed with this application describes how the INEL TMI-2 ISFSI will handle emergencies. Additional information on this plan is provided in License Application Chapter 11 and Section 9.5 of the INEL TMI-2 ISFSI SAR.

4.8 Confinement Barriers And Systems [10 CFR 72.122(h)]

The INEL TMI-2 ISFSI storage system is designed to withstand all operating and credible accident conditions without significant degradation or damage to the DSCs or the TMI-2 canisters. As discussed in Section 3.3.2 of the INEL TMI-2 ISFSI SAR, the multiple barrier design of the system is designed to ensure adequate confinement of the radioactive material contained in the TMI-2 core debris. The DSC vents used to mitigate the effects of hydrogen gas generation due to radiolysis are provided with HEPA filters to ensure the confinement of airborne radioactive particulate materials during normal or off-normal conditions. Chapter 10 describes the surveillance and monitoring requirements for the vent system.

4.9 Instrumentation And Control Systems [10 CFR 72.122(i)]

As discussed in Section 3.3.3 of the INEL TMI-2 ISFSI SAR, because the NUHOMS®-12T system is passive, no permanent instrumentation or control systems are necessary for the safe operation of the INEL TMI-2 ISFSI. Instrumentation and control systems not important to safety will be used to perform the surveillances described in Chapter 10 of the INEL TMI-2 ISFSI SAR.

4.10 Control Room Or Control Area [10 CFR 72.122(j)]

As discussed in Section 5.5 of the INEL TMI-2 ISFSI SAR, because the NUHOMS®-12T system is passive, there is no control room or control area for the INEL TMI-2 ISFSI. Security monitoring instruments are described in the Physical Security Plan, submitted as part of this application. Readouts related to security are provided in an ICPP control room.

4.11 Utility Or Other Services [10 CFR 72.122(k)]

No utility services are needed for the safe operation of the INEL TMI-2 ISFSI. As discussed in Section 4.3 of the TMI-2 SAR, non-essential electrical power will be provided for DSC loading and unloading operations, lighting, and security systems. Additionally, non-essential communication systems will be provided as necessary. More information on security system power and communications is provided in the INEL TMI-2 ISFSI Physical Security Plan.

4.12 Retrievability [10 CFR 72.122(l)]

As discussed in Section 5.1 of the INEL TMI-2 ISFSI SAR, the NUHOMS®-12T storage system is designed to allow ready retrieval of spent fuel for further processing. The DSCs can be removed from the HSMs, and the TMI-2 canisters can either be shipped inside the DSCs to an appropriate INEL facility for further dispositioning, or dry transferred from the DSCs to an approved shipping container and shipped to another federal facility.

4.13 Nuclear Criticality Safety (10 CFR 72.124)

As discussed in Section 3.3.4 of the INEL TMI-2 ISFSI SAR, the NUHOMS®-12T system is designed to remain subcritical during all credible conditions without the addition of fixed neutron absorbing materials to the DSC basket. Control methods for the prevention of criticality consist of drying the TMI-2 canisters before loading into the DSC, material properties of the fuel, design features of the installation, administrative procedures to prevent intrusion of water into the DSC cavity, the geometric confinement of the fuel within the TMI-2 canisters, boron rich neutron poisons in the TMI-2 canisters, and the inherent neutron absorption in the steel components of the DSC and TMI-2 canister structures.

4.14 Radiological Protection (10 CFR 72.126)

As discussed in Section 3.3.5 of the INEL TMI-2 ISFSI SAR, the INEL TMI-2 ISFSI is designed to maintain on-site and off-site doses as low as reasonably achievable (ALARA) during transfer operations and long-term storage conditions. The on-site and off-site dose assessments are presented in Sections 7.4 and 7.6 of the INEL TMI-2 ISFSI SAR and in Section 5.2 of the INEL TMI-2 ISFSI Environment Report. The radiological consequences which occur during off-normal and accident conditions are addressed in Chapter 8 of the TMI-2 SAR. All exposures from normal operations and anticipated occurrences will be within the limits of 10 CFR 72.104, and all exposures from design basis accidents are within the limits of 10 CFR 72.106. The site dose rates will be well below the applicable dose limits for individual members of the public specified in 10 CFR 20.1301. Chapter 7 of the INEL TMI-2 ISFSI SAR provides further information on the INEL TMI-2 ISFSI Radiation Protection Program.

4.15 Spent Fuel, High-Level Radioactive Waste, And Other Radioactive Waste Storage And Handling (10 CFR 72.128)

As discussed in Sections 3.3.7 and 6.1 of the INEL TMI-2 ISFSI SAR, the radioactive waste expected to be generated during long-term storage is low level waste, specifically the spent HEPA filters on the DSC vents, when replaced, and other items, such as bags, tape, or anti-contamination clothing, that may be used in the filter replacement process. This low level waste will be removed from the INEL TMI-2 ISFSI site, packaged, treated, and disposed in accordance with the INEL procedures. Any radioactive waste generated during loading or unloading operations also will be transferred to an appropriate ICPP waste storage facility. Chapter 6 of the INEL TMI-2 ISFSI SAR provides further information on waste management.

4.16 Decommissioning (10 CFR 72.130)

As discussed in Sections 3.5 and 9.6 of the INEL TMI-2 ISFSI SAR, the INEL TMI-2 ISFSI is designed for decommissioning. The NUHOMS®-12T system is designed to confine all contamination within the DSC and the DSC vent system. License Application Chapter 10 and the INEL TMI-2 ISFSI Decommissioning Plan provide more information on the decontamination, dismantlement, and decommissioning of the INEL TMI-2 ISFSI.

CHAPTER 5
OPERATING PROCEDURES -- ADMINISTRATIVE AND MANAGEMENT CONTROLS

General operating procedures for the INEL TMI-2 ISFSI are described in Chapter 5 of the INEL TMI-2 ISFSI SAR. These procedures will be developed to minimize the amount of time required to complete the subject operations, to minimize personnel exposure, and to ensure that all operations required for DSC transfer and storage are performed safely and in accordance with applicable regulations. DOE-ID and its M&O contractor have performed similar operations at the INEL including handling spent fuel transfer casks, moving spent fuel storage containers, performing radiation control and monitoring, conducting emergency response activities (including drills), and conducting general maintenance, necessary to ensure operability, environmental protection, and nuclear safety.

Administrative and management controls for the INEL TMI-2 ISFSI will be developed to ensure that the operation of the ISFSI is conducted in a safe manner. A description of the INEL TMI-2 ISFSI organizational structure, including delegation of administrative and managerial functions, are contained in Chapter 9 of the INEL TMI-2 ISFSI SAR. A description of the INEL TMI-2 ISFSI quality assurance program, including delegation of responsibilities, are provided in Chapter 11 of the INEL TMI-2 ISFSI SAR.

In summary, DOE-ID retains ultimate responsibility for the safe operation of the ISFSI and for compliance with all license conditions. To exercise its overall responsibility, DOE-ID will retain responsibility for and perform independent audits of the M&O contractor's INEL TMI-2 ISFSI quality assurance program (both the achievement of quality by M&O contractor management and the verification of quality by M&O contractor quality assurance personnel), ensure the license conditions for the INEL TMI-2 ISFSI are included in the M&O contract, assess the performance of the M&O contractor against the terms of the contract, retain the responsibility to budget funds necessary and sufficient to safely operate the INEL TMI-2 ISFSI, and revise the M&O contract in the event contract deficiencies are found relative to proper implementation of license conditions. Pursuant to its contract with DOE-ID, the INEL M&O contractor will be required to manage and operate the TMI-2 ISFSI in compliance with all of the NRC requirements and license conditions. These requirements and conditions will be passed to any succeeding M&O contractor as a contract condition throughout the term of the license.

An INEL TMI-2 ISFSI safety review committee will be used to ensure ISFSI operations are performed safely. The safety review committee will review the following: changes to INEL TMI-2 ISFSI operations and maintenance procedures, performance indicators (such as gas samples from the DSC vents and contamination and radiation surveys), 10 CFR 72.48 evaluations, and other records generated during the operation of the ISFSI. This committee will be comprised of senior technical personnel and management personnel with extensive nuclear experience in various areas of expertise. Three core members of the committee will provide the needed management oversight and technical expertise in radiological controls, criticality safety, and quality assurance. Further details on the safety review committee are provided in Section 9.1 of the INEL TMI-2 ISFSI SAR.

Essential to the administrative and management control of INEL TMI-2 ISFSI operations is the availability of qualified technical personnel in areas such as criticality safety, health physics, radiation protection, and quality assurance. The requirements for qualified personnel for DOE-ID and the M&O contractor are provided in Section 9.1.3 of the INEL TMI-2 ISFSI SAR.

CHAPTER 6
QUALITY ASSURANCE PROGRAM

The INEL TMI-2 ISFSI Quality Assurance Program is described in Chapter 11 of the INEL TMI-2 ISFSI SAR. This quality assurance program provides the information required by 10 CFR Part 72, Subpart G, Quality Assurance, and covers the engineering aspects of the site investigation, design, procurement, shop fabrication, onsite construction, pre-operational testing, conduct of operations, maintenance, and ultimate decommissioning. DOE-ID will ensure that this quality assurance program is understood by all involved in its execution and that the program will be implemented, as applicable, for all phases of the project.

The INEL TMI-2 ISFSI Quality Assurance Program applies the applicable portions of DOE/RW-0333P, "Quality Assurance Requirements and Description," Revision 5. DOE/RW-0333P is filed with this application as DOE's quality assurance program description for spent fuel storage and transportation activities. DOE/RW-0333P was written to meet the NRC QA requirements for storage and transport of spent nuclear fuel and high-level radioactive waste, including the requirements contained in 10 CFR Part 72, Subpart G, "Quality Assurance." Chapter 11 of the INEL TMI-2 ISFSI SAR describes how DOE/RW-0333P will be applied for INEL TMI-2 ISFSI activities. The INEL TMI-2 ISFSI Quality Assurance Program is structured to assure that the planned quality assurance effort is commensurate with the importance to safety of the identified activities and items.

CHAPTER 7
OPERATOR TRAINING

The training program to be used at the INEL TMI-2 ISFSI is described in Section 9.3 of the INEL TMI-2 ISFSI SAR. The training program provides the information required by 10 CFR 72.28(b) and 10 CFR 72, Subpart I, "Training and Certification of Personnel." DOE-ID commits to maintain an appropriate complement of qualified and certified personnel to conduct ISFSI operations throughout the term of the license. DOE-ID will prepare and submit to the NRC a Training and Certification Plan for ISFSI operation with associated procedures, prior to initiating operations. DOE-ID has delegated the responsibility for developing and implementing this training and certification plan to its M&O contractor. The existing INEL training program will be used to provide general employee training and indoctrination. Additional sections to this program will be added, as described below, to include training specific to the ISFSI.

The sections required to be added to the INEL training program include the following:

- ISFSI General Systems Overview (including nuclear engineering principles)
- ISFSI Technical Specifications and Procedures
- Applicable ISFSI Regulations and Standards
- NUHOMS®-12T Loading and Retrieval Operations
- ISFSI-Related Equipment Training
- Transfer cask operations and maintenance
- Transfer trailer operation and maintenance
- Hydraulic ram operation and maintenance
- Automatic welding equipment operation and maintenance
- Vacuum drying system operation and maintenance
- Vent system monitoring, operation and maintenance
- Purging system operation and maintenance

All individuals working in the fuel storage area will receive radiation and safety training. Specialized training will be provided, as appropriate, to operations, maintenance, and health physics personnel. Additionally, operators performing cask and fuel handling operations and DSC vent system surveillance and monitoring will be certified. Supervisory personnel who personally direct the operation of equipment and controls that are important to safety also will be certified in such operations. Retraining, proficiency testing, and recertification of INEL TMI-2 ISFSI personnel will be performed as required. Documentation of training activities and certifications of proficiency will be retained by the M&O contractor.

The training program, in concert with other management systems, ensures that qualified individuals will be available to perform planned and unplanned tasks while protecting the health and safety of plant personnel and the public. DOE-ID and its M&O contractor will provide additional training to support the emergency plan, physical security plan, quality assurance program, and administrative and safety requirements, as required.

CHAPTER 8
INVENTORY AND RECORDS REQUIREMENTS

Material balances and inventories of the TMI-2 core debris to be stored in the INEL TMI-2 ISFSI will be performed, and records of the spent fuel will be maintained, in accordance with 10 CFR 72.72, "Material balance, inventory, and records requirements for stored materials." Section 9.4.2 of the INEL TMI-2 ISFSI SAR describes the records management system, including the provision to maintain records on the identity of the spent fuel stored at the TMI-2 ISFSI. A description of the material inventory and records system to be used at the INEL TMI-2 ISFSI is provided below.

Records, in the form of electronic media and paper copies, will be kept to show the receipt, inventory, location, and transfer of all TMI-2 core debris at or from the INEL TMI-2 ISFSI. The records will include the estimated quantity of material contents of each canister containing TMI-2 core debris (TMI-2 canister), including the estimated special nuclear material in each TMI-2 canister (based on original loading quality assurance documentation), TMI-2 canister identification, initial moisture content, and storage location within a specific DSC. The records will also include the movements of each DSC to or within the INEL TMI-2 ISFSI, and movements away from the INEL TMI-2 ISFSI to a treatment or interim storage facility. These records will be kept for as long as the spent fuel is stored at the INEL TMI-2 ISFSI and will be transferred along with the TMI-2 canisters to another federal facility. A duplicate set of these records will be kept at a separate location away from the location of the principal records, sufficiently remote that a single event will not destroy both sets of records. This duplicate set of records will be kept for a period of five years after the TMI-2 canisters have been removed from the ISFSI.

Administrative controls and labeling of the TMI-2 canisters and the DSCs will be utilized to keep accurate records of material location. Each TMI-2 canister is labeled with a unique designator, and each DSC will be labeled with a unique designator. Information, including location, on all TMI-2 canisters and DSCs will be documented and kept with other INEL TMI-2 ISFSI facility records. Prior to any movement of a DSC to, within, or from the INEL TMI-2 ISFSI facility, facility procedures will require a review of the documentation to help assure that the proper DSC is being moved.

A physical inventory of the DSCs at the INEL TMI-2 ISFSI will be performed annually. Records will be kept of the results of the current inventory and retained until termination of the NRC license. Inventories will be performed in accordance with written procedures, and will consist, primarily, of confirmation that all the DSCs are in their assigned locations by showing there is no evidence of tampering with the door seals of the HSMs. In addition to the inventory procedures, other written material control and accounting procedures will be prepared and implemented, as necessary, to account for the radioactive material in storage. Copies of current material control and accounting procedures will be retained until termination of the NRC license.

CHAPTER 9
PHYSICAL PROTECTION

The INEL TMI-2 ISFSI Physical Security Plan, which includes the Operator Security Training and Qualification Plan, the Design for Physical Protection, and the Safeguards Contingency Plan, provides the information required by 10 CFR Part 72, Subpart H, "Physical Protection." This security plan is controlled as Safeguards Information and will be submitted under separate cover.

As required by 10 CFR 72.24(o), DOE-ID certifies that it will provide such safeguards at the INEL TMI-2 ISFSI as DOE requires at comparable surface DOE facilities to promote the common defense and security.

CHAPTER 10
DECOMMISSIONING PLAN

The Conceptual Plan for Decommissioning the INEL TMI-2 ISFSI, filed with this application, provides the information required by 10 CFR 72.30, "Financial Assurance and Recordkeeping for Decommissioning." A description of this plan is provided in Section 9.6 of the INEL TMI-2 ISFSI SAR. DOE-ID will provide a final decommissioning plan prior to the start of decommissioning work. DOE-ID expects to develop decommissioning and decontamination technologies during the license period and will select and define the appropriate approach in its final decommissioning plan.

The conceptual plan for decommissioning discusses two potential scenarios for decommissioning the INEL TMI-2 ISFSI based on using the DECON (prompt removal/dismantling) decommissioning alternative. The first scenario involves the transport of the TMI-2 canisters, the DSCs, and the HSMs to an off-site facility where the TMI-2 canisters will be stored similar to the INEL TMI-2 ISFSI. The second scenario involves removing the TMI-2 canisters from the DSCs to a licensed 10 CFR Part 71 transportable cask, shipping the TMI-2 canisters to an off-site facility, and disposing all storage and transfer components at the INEL TMI-2 ISFSI.

To facilitate decommissioning, all components of the NUHOMS® -12T are manufactured of materials similar to those found at other INEL facilities (e.g., reinforced concrete, carbon steel, and stainless steel). Therefore these components can be decommissioned using the same methods developed to handle similar materials at INEL. Any of the components that may be contaminated can be cleaned or disposed of using the decommissioning technologies available at the time of decommissioning. DOE-ID will decontaminate any contaminated components in accordance with the NRC requirements in effect at the time of decommissioning.

DOE-ID intends to request the necessary funding from Congress to complete decommissioning of the INEL TMI-2 ISFSI. DOE-ID will request these funds sufficiently in advance of decommissioning to prevent delay of required activities. To support this statement of intent, DOE-ID has prepared a cost estimate for decommissioning and included this estimate in the Conceptual Plan for Decommissioning the INEL TMI-2 ISFSI. DOE-ID will update this cost estimate as required.

Recordkeeping in support of decommissioning will be comprised of radiological records (e.g., records of spills or other unusual occurrences leaving fixed contamination and records of all areas designated and formerly designated as restricted areas); as-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used or stored, and of locations of possible inaccessible contamination; and records of the cost estimate for decommissioning. These records will be maintained in a secure storage area until license termination. Additionally, a list of all areas inside the ISFSI site boundaries designated and formerly designated as restricted areas or where spills or other unusual occurrences involving the spread of contamination occurred will be maintained and updated every two years.

CHAPTER 11
EMERGENCY PLAN

The INEL Emergency Plan/RCRA Contingency Plan (referred to as the INEL base plan) and the Addendum #10, TMI-2 ISFSI, to the INEL Base Plan, both filed with this application, provide the information required by 10 CFR 72.32, "Emergency Plan." Because the INEL base plan provides the overall process to respond to and mitigate the consequences of emergencies that may arise at the INEL, and is written to meet DOE emergency planning requirements, ISFSI-specific and NRC-specific requirements are incorporated into the Addendum #10. Furthermore, an appendix to Addendum #10 has been prepared to indicate where the requirements of 10 CFR 72.32(a) are implemented in the INEL base plan and in Addendum #10.

The INEL base plan and Addendum #10 describe the overall process developed to respond to and mitigate any consequences of emergencies that might arise at the INEL TMI-2 ISFSI. The plan and addendum incorporate a number of emergency elements, including: (a) demonstrating hazards and credible events that could result in emergency situations; (b) preparing for those situations with a trained emergency response organization; (c) maintaining emergency equipment and facilities; (d) determining protective actions; (e) maintaining standards and techniques for notifications, classification, consequence assessment, reentry, medical support, and program administration; (f) providing timely and accurate public information; and (g) identifying the diverse elements involved in recovery and reentry.

All primary INEL TMI-2 ISFSI offsite emergency response will be provided by DOE-ID and its M&O contractor personnel located at the INEL. Secondary assistance may be requested by the primary responders from public/private agencies per negotiated agreements if necessary per the INEL base plan, which has undergone public review and comment.

Given the fact that the INEL base plan is established and has been reviewed by and coordinated with participating offsite agencies, DOE-ID considers the requirements for outside review of Addendum #10 per 10 CFR 72.32(a)(14) have been satisfied and no additional review will be conducted. Because credible postulated accidents at the INEL TMI-2 ISFSI will not result in significant offsite consequences, the INEL TMI-2 ISFSI will not present any unique emergency response requirements that are not already covered by the overall INEL base plan.

CHAPTER 12
ENVIRONMENTAL REPORT

The INEL TMI-2 ISFSI Environmental Report filed with this application provides the information required by 10 CFR 72.34, "Environmental Report"; 10 CFR 72, Subpart E, "Siting Evaluation Factors"; and 10 CFR Part 51, Subpart A, "National Environmental Policy Act - Regulations Implementing Section 102(2)." Reporting requirements specified in 10 CFR Part 72 are described in Section 3.5 and Section 6.2 of the Environmental Report. The Environmental Report describes the environmental effects associated with all aspects of the construction, operation, and decommissioning of the TMI-2 ISFSI and the transportation of the TMI-2 core debris from the TAN facility to the INEL TMI-2 ISFSI. The INEL TMI-2 ISFSI Environmental Report is based on previous NEPA documentation prepared by DOE-ID.

Licensing of the TMI-2 ISFSI activities starts with acceptance of a loaded DSC contained within a shipping cask, mounted on a transport trailer at the TAN facility perimeter. Although the activities at the TAN site (including handling, dewatering, drying, and loading the DSCs) are not subject to NRC regulation, they are covered by DOE National Environmental Policy Act (NEPA) documentation and SARs. The INEL TMI-2 ISFSI Environmental Report covers NRC licensed activities as well as related preparations in the TAN Pool and transportation to ICPP. The environmental impact of the fuel handling activities at the TAN facility are discussed in the Environmental Assessment of the Test Area North Pool Stabilization Project, DOE/EA-1050.

CHAPTER 13
PROPOSED LICENSE CONDITIONS

Chapter 10 of the INEL TMI-2 ISFSI SAR provides the information required by 10 CFR 72.26, "Contents of Application: Technical Specifications," and reflect the requirements of 10 CFR 72.44(c). SAR Chapter 10 discusses the preoperational and general license conditions, including administrative controls; functional and operating limits; limiting conditions; surveillance requirements; and the design features requiring design controls and limits. SAR Chapter 10 identifies the limits and controls required to provide confinement of the stored TMI-2 core debris, to prevent criticality of the core debris, and to prevent radioactive releases resulting in an exposure at the controlled area boundary in excess of 5 rem (pursuant to 10 CFR 72.106) for any design basis accident.

13.1 Preoperational And General License Conditions

Proposed preoperational license conditions are provided to ensure that appropriate procedures are prepared and personnel are trained and certified prior to the receipt of spent nuclear fuel at the INEL TMI-2 ISFSI. General license conditions include quality assurance requirements, administrative controls, actions to be taken if a technical specification is not met, records to be maintained, and reports to be made to the NRC. A pre-operational test program will be developed to demonstrate all functional and design requirements have been met and verified.

13.2 Functional And Operating Limits

Functional and operating limits are provided for the fuel to be stored at the INEL TMI-2 ISFSI, DSC surface examination of closure welds, leak testing of DSC vent connections, HSM dose rates, cask/DSC handling height, and cask/DSC handling as a function of low temperature conditions.

13.3 Limiting Conditions

A limiting condition is provided if hydrogen concentrations in the DSC exceeds specified levels. This condition requires purging of the DSC and replacement of the DSC vent system HEPA filters. No other limiting conditions regarding minimum available equipment or operating characteristics apply to the INEL TMI-2 ISFSI.

13.4 Surveillance Requirements

Surveillance requirements are provided for semi-annual sampling of the DSC internal gases, conducting monthly radiation surveys of the DSC vent system HEPA filters, and leak testing the DSC vent connections at five year intervals.

13.5 Design Features

Design features that are important to safe operations of the INEL TMI-2 ISFSI and that require design controls and limits are provided. These design features involve the structural integrity and confinement of the DSC, the HSM, and the transport cask; venting of the DSC through HEPA filters; and decay heat removal from the HSM and the transport cask .

13.6 Effluent Monitoring

No effluent monitoring is required for the INEL TMI-2 ISFSI.

13.7 Administrative Controls

Administrative controls are described in Chapters 9 and 10 of the SAR. DOE's and its M&O contractor's organizational structures and controls are described in Chapter 9 of the SAR.

CHAPTER 14
CONCLUSION

DOE Idaho Operations Office (DOE-ID) on behalf of the US Department of Energy respectfully requests that the Nuclear Regulatory Commission issue a specific license under 10 CFR Part 72 to authorize the activities described in this application and the referenced documents for DOE-ID to construct and operate an INEL TMI-2 ISFSI for the receipt and storage of the TMI-2 Core Debris. DOE-ID commits to conduct activities associated with the INEL TMI-2 ISFSI in accordance with the requirements of 10 CFR Part 72.

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Approved and submitted in compliance with the requirements of 10 CFR Part 72, on behalf of the United States Department of Energy by the authority delegated to me in Delegation Order No. 10CFR72.512.1 signed by the Secretary of Energy,

Original signed by John Wilcynski

John M. Wilcynski, Manager
DOE Idaho Operations Office

Date: ____________

Conceptual Plan for Decommissioning

CONCEPTUAL PLAN

FOR DECOMMISSIONING

INEL TMI-2 Independent Spent Fuel Storage Installation

U. S. Department of Energy

Idaho National Engineering Laboratory

Revision 0

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1. INTRODUCTION

Decommissioning of an ISFSI consists of removing all fuel assemblies and source material from the site, including all radioactive fission and corrosion products and all other radioactive materials having activities above release limits. The facility operator may then have unrestricted use of the site with no requirement for a license. The balance of systems and structures may also be removed. The site is then restored and made available for alternative use.

This decommissioning plan describes the program for the decommissioning of the INEL TMI-2 ISFSI, which provides for the dry storage of the INEL TMI-2 fuel core debris. The DOE expects to develop decommissioning and decontamination technologies during the license period and will select and define the appropriate approach in its final decommissioning plan. It is preferred to ship the DSC intact to a conditioning facility, an interim above ground storage facility, or a permanent underground geologic repository in a compatible shipping cask licensed under 10 CFR Part 71. At this time, however, the waste acceptance criteria, NEPA documentation, regulatory requirements, and disposal characteristics of spent fuel have not been determined for the final disposition of DOE-owned spent fuel. Resolution of technical, regulatory, safety, legal, and institutional matters would be necessary before the fuel is moved from the INEL. DOE plans to characterize the existing inventory of spent nuclear fuel as required to assess compliance with the repository's disposal criteria and determine what processing, if any, is required to meet these criteria. When this is complete, TMI fuel debris would be shipped to an off-site Federal storage facility or permanent repository.

Three decommissioning alternatives acceptable to the NRC are DECON (prompt removal/ dismantling), SAFSTOR (mothball), and ENTOMB (entombment). Given the low levels of contamination and the relatively small physical plant size associated with a dry storage ISFSI, DECON of the installation is the most reasonable alternative.

It appears at this point that the DECON alternative is the most appropriate for the INEL TMI-2 ISFSI, therefore, this conceptual plan will discuss this alternative. This plan describes the approaches, elements, and cost estimates associated with the proposed decommissioning program.

The decommissioning plan addresses two potential scenarios for decommissioning the INEL TMI-2 ISFSI. Scenario 1 involves the transport of the INEL TMI-2 canisters, the DSCs and the HSMs to an off-site facility where the INEL TMI-2 canisters will be stored similar to the INEL TMI-2 ISFSI. This scenario includes the following key assumptions and elements:

- The INEL TMI-2 canisters will be loaded into a licensed 10 CFR Part 71 transportation cask from the DSCs by using a dry cask to cask transfer system or other suitable method.

- The INEL TMI-2 canisters will be transported to an off-site Federal facility along with the DSC and HSM. At this facility, the INEL TMI-2 canisters will be transferred back to the DSCs and stored in the HSMs. This feature allows for the simple decontamination of the DSC and HSM at ICPP to allow for transport to an off-site facility and for reuse at that facility.

- The INEL TMI-2 ISFSI equipment requiring decontamination will be the DSCs and HSMs to allow their transport to an off-site facility; and the vacuum drying system and welding equipment to be used at that facility.

- Material for disposal will be waste material (such as steel DSC lids, HEPA filters, and vent seals and connections).

- The remaining transfer and transport equipment would be relocated to an off-site facility for use.

- The only element remaining at the INEL TMI-2 ISFSI will be the concrete basemat.

This scenario represents a "best" case relative to decommissioning at the INEL TMI-2 ISFSI; however, it also represents a realistic and viable approach given technology advances being pursued in the industry (both DOE and commercial).

Scenario 2 is based on the removal of the INEL TMI-2 canisters from the DSC to a licensed 10 CFR Part 71 transportable cask and the disposal of all storage and transfer components at the INEL TMI-2 ISFSI. The key assumptions and elements of this scenario are:

- The INEL TMI-2 canisters will be loaded into a licensed 10 CFR Part 71 transportation cask from the DSCs by using a dry cask to cask transfer system or other suitable method.

- The INEL TMI-2 canisters will be transported to an off-site facility.

- The INEL TMI-2 ISFSI equipment requiring decontamination will be the DSCs and HSMs to allow for their disposal; and the vacuum drying system and welding equipment prior to free release for reuse with other applications.

- Material for disposal will be waste material (such as steel from the DSC, concrete from the HSMs, HEPA filters, and vent seals and connections).

- It is assumed that the transfer and auxiliary equipment will be available for reuse with other applications or facilities.

- The only element remaining at the INEL TMI-2 ISFSI will be the concrete basemat.

This scenario results in the most material for decontamination and disposal and will represent the highest cost option. For purposes of this plan, Scenario 2 will be selected since it contains all fuel transport features of Scenario 1 and also results in the maximum disposal requirements. However, both scenarios will be reviewed relative to decommissioning cost estimates in order to provide lower and upper bound estimates.

2. DESCRIPTION OF ACTIVITIES TO SHIP INEL TMI-2 CANISTERS TO OFF-SITE FEDERAL FACILITY

Prior to commencement of the decommissioning of the INEL TMI-2 ISFSI, the INEL TMI-2 canisters must be prepared for shipment to an off-site facility. Since the preparation of the INEL TMI-2 canisters for shipment may result in facilities and materials for disposal during decommissioning, it is appropriate to describe the activities required to ship the canisters.

The INEL TMI-2 canisters will be shipped in a 10 CFR Part 71 licensed transport cask. Since the DSCs for the INEL TMI-2 ISFSI are not designed or licensed for transportation, the INEL TMI-2 canisters must be removed from the DSCs and transferred to the cask. It is anticipated that the following actions will be performed to provide for shipment of the INEL TMI-2 canisters:

- The DSCs will be removed from the HSMs by use of an approved on-site transfer cask in accordance with specified NUHOMS®-12 T procedures, and the transfer cask and DSC will be moved to an existing ICPP facility.

- A dry cask to cask transfer system set up at this ICPP facility can be used for the INEL TMI-2 canister transfer. The dry cask to cask transfer system may be the refurbished INEL TMI-2 equipment or new generation equipment.

- The DSC lid and shield plug will be removed from the DSC in accordance with specified NUHOMS®-12T procedures. The INEL TMI-2 canisters will be removed from the DSC and loaded into the transportation cask.

- The transport cask will be closed and the INEL TMI-2 canisters will be shipped to an off-site Federal facility.

- For Scenario 1, the DSC and HSM will be decontaminated to allow for shipment of these components to an off-site Federal facility for reuse in the storage of the INEL TMI-2 canisters. A reverse dry cask to cask transfer process will be performed at an off-site Federal facility and the NUHOMS®-12T system would reconfigured.

For Scenario 2, the DSC and HSM will require disposal and will be included in the decommissioning plan. The remainder of this decommissioning plan will address this scenario since it results in the maximum effort. Scenario 1 decommissioning activities will be enveloped by Scenario 2.

3. DESCRIPTION OF DECOMMISSIONING ALTERNATIVE

This section describes the basic activities necessary for the DECON decommissioning alternative specific to the INEL TMI-2 ISFSI. Although detailed procedures for each activity required are not provided, and actual sequences of work may vary, the activity descriptions discussed here provide a basis for detailed engineering planning and scheduling at the time of decommissioning. The DECON mode of decommissioning deals with the immediate removal of all radioactivity from the site upon cessation of operations for the fuel storage period. In addition to the removal of radioactivity, this alternative also assumes the removal of the remaining structures from the site; thereby permitting return of the ISFSI for other use. For this decommissioning plan, the final state is based on providing decontamination and removal of radioactivity from the site to meet applicable NRC standards and leaving the basemat intact.

3.1 Phase 0: Preparations

Prior to the commencement of decommissioning operations, detailed preparations will be undertaken to provide a smooth transition from fuel storage and shipping operations to site decommissioning activities. These preparations include engineering planning, surveys of the site areas to determine contamination levels, activation analyses of the horizontal storage modules (HSMs), activation analyses of dry shielded canisters (DSCs) and other site equipment, as well as the assembly of a decommissioning management organization. Final planning for activities and writing of activity specifications and detailed procedures will also begin at this time. Preparations for decommissioning will begin at least three years prior to the projected end of ISFSI operations (final shipment of spent fuel from the ISFSI). At the beginning of this period, submittal of a preliminary decommissioning plan will be sent to the NRC. The activities delineated within this alternative description addresses final preparation work during ISFSI operations, and all post-shutdown activities.

3.1.1 Engineering and Planning

DOE-ID will file a Decommissioning Plan (DP) with the NRC describing how it will remove all radioactive components and essentially all radioactivity from the ISFSI site to meet applicable NRC standards. This document is initiated by the DOE three years prior to the final removal of spent fuel from the ISFSI when facility operation ceases. The DP will accompany or precede an application for termination of the facility license. This application must be made within two years following permanent cessation of operations, and in no case later than one year prior to the expiration of the operating license.

The DP will address the decontamination of the site and termination of the facility's license and will include a detailed plan describing the organization and program that will be used during the decommissioning of the facility. The plan will accomplish the required tasks within the As Low

As Reasonably Achievable (ALARA as defined in 10 CFR Part 20) guidelines for protection of personnel from exposure to radiation and radioactive contaminants. It will also clearly describe how the DOE-ID will continue to protect the public and the environment during dismantling activities.

The development of a decommissioning staff within the DOE-ID organization is essential to the successful planning and execution of the decontamination and dismantling of the nuclear facility. This activity not only includes identifying the staff requirements, but also securing the commitment of key personnel.

In preparation for a change in license, NRC regulatory criteria applicable to decommissioning will be reviewed. The existing technical specifications will be reviewed and modified to reflect decommissioning requirements and to delete non-applicable operating specifications.

In addition to the DP, an environmental survey will be provided to the NRC to evaluate the impact of the decommissioning operations on the environment. All applicable records, i.e., as-built or revised drawings and specifications, operating records, and site-specific background data, will be needed to support the development of these submittals to the NRC.

For Scenario 2, it is expected that the DSC steel material will contain significant neutron activation. The other components of the storage and transfer system are not expected to have significant neutron activation. However, until final site characterization verifies this to be a fact, it will be assumed that there is some activation of the HSM concrete and steel. Therefore, the preparation activities must include the possibility for addressing neutron activation, as well as the possibility of no detectable activation products. Much of the work in the development of the DP will also be relevant to the development of the detailed engineering plans and procedures. This work includes:

- Site preparation plans for decommissioning activities;
- Detailed procedures and sequences for removal of systems and components;
- Decontamination procedures for the DSCs;
- Procedures for decontaminating the inner surfaces of the HSMs to remove contamination if plans for decontamination of other system, (such as the vacuum drying system), as needed;
- Design / procurement and testing of special equipment;
- Identification / selection of specialty contractors;

- Procedures for removal and disposal of radioactive materials; and

- Sequential planning of activities to minimize conflicts with simultaneous activities.

3.1.2 Site Preparation

Following the final spent fuel shipment and in preparation for actual decommissioning activities, the following activities will be initiated.

- Prepare site support and storage as required;

- Clean all ISFSI areas of loose contamination and process any wastes;

- Conduct radiation surveys of work area contamination and general dose levels; piping and structure dose levels; and activation profiles from HSM shield core samples;

- Calculate residual byproduct material inventory for components and structures, and normalize neutron flux profiles from storage operations to survey data for development of packaging and shipping requirements and decommissioning safety requirements;

- Determine shipping container requirements for activated materials and fabricate such containers if neutron activation is believed to be present, and

- Develop procedures for occupational exposure control, control and release of liquid and gaseous effluents, control of solid radwaste, site security and emergency programs, and industrial safety. These activities will be coordinated with comparable INEL site programs. This alternative presumes that the decommissioning of the ISFSI is performed in accordance with current regulations.

Following approval of the DP by the NRC, the NRC will issue an order authorizing implementation. The DP will then be implemented by the ISFSI operator.

3.2 Phase 1: Decommissioning Operations and License Termination

Decommissioning operations, Phase 1, will begin upon receipt of the NRCs approval of the decommissioning plan, which for this alternative description is assumed to coincide with the final fuel shipment, when all spent fuel is gone from the ISFSI. This allows decontamination and dismantling activities, once started, to proceed unimpeded. Implementation of dismantling procedures may begin upon receipt of the dismantling order from the NRC. For components or structures at the ISFSI that are determined to be activated above site release levels, the following activities will be performed for the DECON alternative approach for the ISFSI.

General

- Construct temporary enclosures in existing facilities and arrange existing storage facilities to support the dismantling activities. These may include: changing rooms and "hot" laundry for the increased work force, protected and open lay down areas to facilitate equipment removal and shipping operations, and modifications of the existing protected perimeter to control movement to and from the contaminated area.

HSMs

- Design and fabricate special contamination control envelopes to cover the ends of the HSM openings during decontamination activities.

- Procure required waste shipping containers from suppliers.

- Remove, package, and dispose of the activated rails, supports, and door steel. If not activated above site release levels, scrap steel may be removed by an off-site waste handler at no cost to the project.

- Remove activated concrete from within the HSMs by decontaminating the inner surfaces exposed to the neutron flux from the DSCs. The concrete debris will be stacked into high-capacity LSA containers for shipment and burial.

- Perform a radiation survey to assure that the remaining portions of the HSM structure are free of surface contamination.

DSCs

- Remove basket from DSC.

- Decontaminate DSC steel shell, basket internals, and shield plugs.

- Remove, package, and dispose of the activated steel. If not activated above site release levels, scrap steel may be removed by off-site waste handler at no cost to the project.

- Ship and dispose of all remaining radioactive materials (liquid and solids).

Site

- Conduct full radiation survey to assure that all radioactive materials have been removed. This may be performed by NRC-approved vendors for final check survey. This survey may coincide with final NRC site inspection.

- Following notification by DOE-ID of completion of the decontamination and disposal of components and materials from the facility, the NRC regional staff conducts an on-site survey to verify that the acceptable activity and contamination levels are satisfied. When the requirements are satisfied, the NRC can terminate the 10 CFR Part 72 license for the facility.

3.3 Phase 2: Site Restoration

Following completion of the decommissioning operations, site restoration activities may begin. These activities will be consistent with the overall use of the site at the ICPP. The activities performed for the ISFSI will be consistent with other ISFSIs and include the following:

- Using conventional demolition techniques, remove the remaining portions of the HSMs. Concrete rubble will be disposed of off-site.

- Remove the perimeter security fence.

- Prepare the final dismantling program report.

These activities will ensure that no contamination remains at the site from the ISFSI. The only remaining structure at the site will be the ISFSI basemat.

4. COST OF DECOMMISSIONING

The DOE Office of Environmental Management has included the INEL TMI-2 ISFSI decommissioning program in its overall cost estimate for Environmental Management Program at the INEL. DOE will request appropriate funding from Congress at the time of decommissioning.

This section will provide the cost estimates for the decommissioning program for both Scenario 1 and Scenario 2. These options will provide relative upper and lower bounds for the decommissioning costs for the INEL TMI-2 ISFSI. The total decommissioning costs (in 1996 dollars) for the ISFSI are:

- Scenario 1: $ 2,175,000
- Scenario 2: $ 2,875,000

A breakdown of the decommissioning costs for each scenario are provided in Table 1.

5. DECOMMISSIONING FACILITATION

Decommissioning of a NUHOMS® ISFSI can be performed in a manner consistent with that for decommissioning of other INEL facilities. The NUHOMS® system allows the DSCs to be brought to a fuel handling facility for repackaging prior to transport to an off-site facility.

All components of the NUHOMS® system are manufactured of materials similar to those found at existing plants (e.g. reinforced concrete and steel). These components can therefore be decommissioned by the same methods in place to handle those materials within INEL. Any of the components that may be contaminated can be cleaned and/or disposed of using the decommissioning technology available at the time of decommissioning.

The NUHOMS® system is a dry containment system that effectively confines all contamination within the DSC. When the DSC is removed from the HSM, the free-standing HSM can be manually decontaminated for any trace activity, dismantled and removed from the site. It is possible that a thin layer of material comprising the inner wall of the HSM could become activated by the neutron flux from the fuel after an extended period of service. The specific activity of the HSM inner wall surfaces may be measured at the time of decommissioning and compared with the existing guidelines to determine whether the values allow free release. Disposal procedures can then be developed which comply with existing guidelines at the time of decommissioning.

6. RECORDKEEPING FOR DECOMMISSIONING

Records that support decommissioning will be treated as quality assurance records. They will be obtained and archived in accordance with the records management plans and controls as described in the Quality Assurance Plan for the INEL TMI-2 ISFSI. The recordkeeping requirements are included in 10 CFR 72.30(d) and require that the DOE keep records important to the safe and effective decommissioning of the facility in an identified location until the license is terminated by the Commission. The records important to decommissioning include the following:

- Records of spills or other unusual occurrences involving the spread of contamination in and around the facility, equipment or site. These records may be limited to instances when contamination remains after any cleanup procedures or when there is reasonable likelihood that contaminants may have spread to inaccessible areas. These records must include any known information on identification of involved nuclides, quantities, forms, and concentrations.

- As-built drawings and modifications of structures and equipment in restricted areas where radioactive materials are used and/or stored, and of locations of possible inaccessible contamination.

- A list contained in a single document and updated no less than every 2 years of the following:
  - All areas designated and formerly designated as restricted areas as defined under 10 CFR 20.1003
  - All areas outside of restricted areas that require documentation under 10 CFR 72.30(d)

- Records of the cost estimate performed for the decommissioning funding plan or of the amount certified for decommissioning, and records of the funding method used for assuring funds.

These records are kept from the initiation of ISFSI activities until the site is decommissioned and the license expires.

Table 1

Decommissioning Cost Estimate

ITEM	Scenario 1 Cost Estimate	Scenario 2 Cost Estimate
1. Decommissioning plan development	$ 150,000	$ 150,000
2. Site preparation	$ 100,000	$ 100,000
3. Decommissioning operations:		
a. HSMs	$ 150,000	$ 600,000
b. DSCs	$ 1,300,000	$ 1,500,000
c. Other	$ 50,000	$ 100,000
d. Total	$ 1,500,000	$2,200,000
4. Site restoration	$ 150,000	$ 150,000
5. Recordkeeping	$ 200,000	$ 200,000
6. Licensing	$ 75,000	$ 75,000
TOTAL COST	$ 2,175,000	$ 2,875,000

Environmental Report

U. S. DEPARTMENT OF ENERGY'S ENVIRONMENTAL REPORT - INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) LICENSE FOR THE THREE MILE ISLAND UNIT TWO (TMI-2) FUEL

TABLE OF CONTENTS

1. PURPOSE OF THE PROPOSED ISFSI

1.1 PURPOSE

This Environmental Report provides information for the Nuclear Regulatory Commission (NRC) to use in the analysis of licensing the INEL TMI-2 independent spent fuel storage installation (ISFSI). This report identifies environmental impacts associated with (a) constructing an ISFSI at the Idaho Chemical Processing Plant (ICPP) for receipt of the TMI-2 debris; (b) transporting the debris from TAN to ICPP for placement in the ISFSI, and (c) operation and subsequent decommissioning of the ISFSI. This report describes in a summary fashion the reasonably foreseeable environmental impacts that the Department of Energy (DOE) analyzed previously in NEPA documents and provides information required by NRC for the environmental analysis associated with licensing. This report has been prepared to meet the requirements of 10 CFR 51.45 and 10 CFR 51.61 using Regulatory Guide 4.2 (NRC 1976) to the extent they are applicable to a facility of this type based on the NEPA analysis prepared and decisions previously made by DOE.

The ISFSI would be an aboveground dry storage system that would be constructed to store the 344 canisters[1] of spent nuclear fuel (SNF) core debris from the March, 1979, Three Mile Island Unit 2 (TMI-2) reactor accident. These canisters would be removed from wet storage at the Test Area North (TAN) pool and placed in dry shielded canisters (DSCs). The DSCs are transported to ICPP in transport casks and placed in storage at the ISFSI. DOE is conducting this action since the TAN Pool, constructed in 1954, has vulnerabilities that include inadequate corrosion monitoring, and lack of a leak detection system or double containment for the pool water (Vol. 2, Part A, Section 2.2.5.2, DOE 1995). The TMI-2 ISFSI would (a) receive the transport cask, (b) transfer the DSC containing the SNF from the transport cask into storage, (c) store the SNF, (d) allow inspection and monitoring of key safety parameters during storage, and (e) provide for retrievability of the SNF (10 CFR 72.122). The system is designed to enable the TMI-2 canisters to move through the process in an unopened container during shipment from TAN and storage at ICPP. Following storage at ICPP, the TMI-2 canisters would be shipped to an offsite facility.

1.2 DECISIONS ALREADY MADE BY DOE

DOE has made a decision to construct and operate an ISFSI within the boundaries of an existing facility, ICPP (Figure 1-1), located at the Idaho National Engineering Laboratory (INEL), a DOE facility. DOE has prepared extensive NEPA documentation analyzing the environmental impacts of this project, a decision to proceed with the

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1 A canister is a thin-walled, unshielded metal container used to hold fuel assemblies or debris. Canisters are used in combination with specialized "overpacks" (or casks) that provide shielding and structural support for transportation or storage purposes.

project has been made, and the public has been notified of this decision. The following summarizes this NEPA process and accompanying decisions.

FEIS Analysis (April, 1995)--- DOE completed a Final Environmental Impact Statement (FEIS) (DOE 1995) in April 1995 that analyzed two different, but related questions. The Volume 1 portion of that EIS evaluated reasonable programmatic alternatives to the management of DOE's inventory of spent nuclear fuel. Volume 2 of the EIS analyzed reasonable alternatives to the waste management and environmental restoration programs at the INEL over the next ten years of the EIS. Impacts associated with the TAN Pool fuel transfer were analyzed in the FEIS at Volume 2, in both Part A, regarding the potential environmental impacts associated with this project and the site-wide cumulative impacts perspective, and Part B, at C-2.1, a project-specific analysis as one of the INEL's ongoing projects. The project's potential environmental impacts from removal from the pool, transportation, facility construction, and facility operation are analyzed in the FEIS.

ROD (May 30, 1995)--- The FEIS Record of Decision (ROD) (DOE 1995a) was issued on May 30, 1995. The first decision made by the Department was to "Regionalize" the management of DOE's SNF, such that the production reactor fuel at the Hanford Site would remain at Hanford; the aluminum clad fuel would be moved to, and managed at the Savannah River Site; and all non-aluminum clad fuel would be moved to, and managed at the INEL. By virtue of this decision, DOE decided that the SNF at TAN would be managed at the INEL, rather than managed at some other site. As a result of the analysis in Volume 2, DOE decided to conduct its environmental restoration and waste management activities at the INEL using one approach analyzed in the EIS known as the "Ten Year Plan." The Ten Year Plan decision involves completing certain identified actions and initiate new projects to enhance cleanup, manage laboratory wastes, and spent nuclear fuel. The Appendix to the ROD states more specifically the decisions made by the Department. DOE decided, as part of the management of this SNF, to construct a new dry storage system for the storage of the Three Mile Island fuel upon receipt of any required approvals of the Nuclear Regulatory Commission.

Litigation/Settlement Agreement (October 16, 1995)---The federal court case filed by the State of Idaho against DOE challenging the adequacy of the analyses in the FEIS was settled on October 16, 1995. The settlement agreement (DOE 1995b) among the Department of Energy, the Department of the Navy, and the State of Idaho was approved by the court on October 17, 1995 and incorporated into a consent order. In that Agreement, the parties agreed that all of the TMI fuel would be removed from the state of Idaho by January 1, 2035. In paragraph E.7 of the Settlement Agreement/Consent Order, the parties agreed that DOE would complete construction of the Three Mile Island dry storage facility by December 31, 1998, commence moving fuel into the facility by March 31, 1999, and complete moving fuel into the facility by June 1, 2001.

Amended ROD (February 28, 1996)---On February 28, 1996, DOE published an amended ROD in the Federal Register reflecting the terms of the Settlement Agreement/Consent Order. No changes were made in DOE's decision to proceed with the TAN Pool Fuel Transfer Project or the construction of a dry storage facility for the TMI-2 fuels.

Test Area North Pool Stabilization Project Environmental Assessment and FONSI (May 6, 1996) An Environmental Assessment (EA) (DOE 1996b) was prepared to analyze the potential impacts associated with stabilizing the pool at TAN. The scope of that impact analysis included an analysis of the potential environmental impacts associated with the proposed action of dewatering and removing the canisters of the TMI fuels from the TAN pool, draining and treating the water, construction of a dry storage facility at ICPP, transporting the fuels from TAN to ICPP, storage at ICPP, and stabilizing the TAN pool. Because no significant environmental impacts were identified, DOE issued a Finding of No Significant Impact (FONSI) (DOE 1996c) and announced its decision to proceed with implementing this alternative.

1.3 DESCRIPTION OF THE TMI-2 DEBRIS

The TMI-2 core debris was shipped to the INEL from Pennsylvania between 1986 and 1990 and placed in the TAN Pool for examination as part of the TMI Core Offsite Examination Program. The objectives of this program were to: (a) provide the analytical data necessary to understand the accident sequence that occurred in the TMI-2 reactor, and (b) provide a data base for predicting nuclear fuel behavior during a degraded core cooling situation.

The damaged TMI-2 core material contained in the canisters does not consist of intact fuel assemblies or fuel rods typical of normal commercial fuels. The core material is an agglomerate of the various items that existed within the reactor vessel after the accident. Because of this, the TMI-2 core debris differs from normal commercial SNF and was placed in canisters in order to be shipped from the TMI-2 reactor to Idaho for examination. The debris was placed in three types of cylindrical stainless-steel canisters: fuel, knockout, and filter. The fuel canisters are receptacles for large pieces of core debris, the knockout canisters were designed to contain smaller debris, and the filter canisters contain stainless-steel filters and fines that were collected in the filters during defueling operations. Neutron absorbing materials (boron carbide poison in the form of plates or rods) were designed into each type of canister to prevent criticality events.

Due to the characteristics of the damaged fuel, the TMI-2 canisters are designed to vent radiolytic generated hydrogen and oxygen. Venting is accomplished through a vent orifice located in the top of each canister. Orifices were sealed using protective caps for canister shipment from TMI in Pennsylvania to the INEL. The canisters were received at TAN and placed in the TAN Pool, the protective caps removed, and the canisters flooded with demineralized water. To allow radiolytic gases generated within the canisters to escape, the vent port on each canister was connected to a water-filled vent tube that extends upwards above the pool water surface.

Transfer of the TMI-2 debris from TAN to ICPP would require the TMI-2 canisters to be loaded into a NUHOMS® DSC. The DSC would then be loaded into the transport cask.

The transport cask would be placed on a special use trailer, inspected, and transported by truck to the TMI-2 ISFSI at ICPP. Transportation from TAN to ICPP would be conducted in accordance with a route specific license that would be obtained from the Nuclear Regulatory Commission (NRC). The fenced ISFSI site would have a series of modular storage units called Horizontal Storage Modules (HSM) located on a concrete pad. The HSMs are a passive storage module designed to provide shielding and safe confinement of spent nuclear fuel. Upon arrival of the transport cask at the ISFSI, the trailer would be positioned at the HSM for cask transfer. The transport cask lid and ram-port cover would be removed, whereby the ram would push the DSC into a vacant position in a HSM. The HSM storage door would then be installed, the DSC vent system connected, and the transport cask prepared for return to TAN to repeat the operation. It is anticipated that twenty-nine trips would be required to transport all the TMI-2 canisters from TAN to ICPP.

1.4 FIGURES AND REFERENCES

1.4.1 FIGURES

1.1 Aerial Photo of ICPP and the TMI-2 ISFSI Site

1.4.2 REFERENCES

DOE 1993, *Report on Interim Storage of Spent Nuclear Fuel,* The Midwestern Office of The Council of State Governments, DOE/CH/10402-22, April

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* April

DOE 1995a, *Record of Decision for the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* May 30

DOE 1995b, *"Settlement Agreement"* between the State of Idaho, Department of the Navy, and the Department of Energy." Oct. 16

DOE 1996a *Amendment to Record of Decision on the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement.* February 28

DOE 1996b, *Environmental Assessment of the Test Area North Pool Stabilization Project,* DOE/EA-1050, May.

DOE 1996c, *Finding of No Significant Impact for the Test Area North Pool Stabilization Project at the Idaho National Engineering Laboratory*, May 6

NRC 1976, U.S. Nuclear Regulatory Commission, Regulatory Guide 4.2, Revision 2, *Preparation of Environmental Reports for Nuclear Power Stations*, NUREG-0099, July

Aerial photo of ICPP with TMI - 2 ISFSI Site

2. THE SITE AND ENVIRONMENTAL INTERFACES

2.1 GEOGRAPHY AND DEMOGRAPHY

2.1.1 SITE LOCATION AND DESCRIPTION

The ISFSI is to be located at the INEL, one of nine multiprogram laboratories within the DOE complex. The INEL area measures about 37.5 mi (60.3 km) north to south and about 34.8 mi (56.0 km) east to west. Figure 2-1 depicts the location of the INEL in relation to Idaho and adjacent states, Figure 2-2 shows the location of the INEL relative to surrounding cities. Most of the INEL is located within Butte County, but portions are also within Bingham, Bonneville, Jefferson, and Clark counties. The ICPP is located totally within Butte County.

The INEL has nine primary facility areas situated on an expanse of otherwise undeveloped, high-desert terrain. The ISFSI would be sited at the ICPP, a facility with the mission to receive and store spent nuclear fuels and radioactive wastes. Other INEL facilities include Test Area North (TAN), Naval Reactors Facility (NRF), Test Reactor Area (TRA), Central Facilities Area (CFA), Power Burst Facility (PBF), Auxiliary Reactor Area (ARA), Argonne National Laboratory-West (ANL-W), and the Radioactive Waste Management Complex (RWMC). The INEL is the current wet storage site for the TMI-2 core debris.

The geographic center of the ICPP is easting 43° 34' 13" latitude, northing 112° 55' 56" longitude. The Universal Transverse Mercator (UTM) coordinates of the proposed ISFSI location within ICPP are 213.665 mi (343.867 km) east by 2998.424 mi (4825.583 km) north, Zone 12.

The ISFSI site is located in a flat-lying area near the Big Lost River in the south central part of the INEL. The area is underlain by about 30 to 60 ft (9-18 m) of Big Lost River alluvial silts, sands, and gravels, which lie on an alternating sequence of basalt lava flows and interbedded sediments extending to a depth of about 2,000 to 2,300 ft (600 to 700 m). Landforms in the vicinity of ISFSI consist of braided channels (some abandoned) of the Big Lost River to the west and north of the site, and irregular flow lobes of basalt lavas to the east of the site.

2.1.1.1 Site Area

The INEL site, controlled by the DOE, occupies about 890 square miles (2,300 km^2). The ISFSI would occupy approximately 2 acres (.8 ha) within the ICPP complex such that a 100 meter radius includes current areas of the ICPP (Figure 2-3). As depicted in Figure 2-4, the shortest distance from the ICPP to the INEL site boundary is to the south, a distance of 8.5 mi (13.7 km). The next closest INEL boundary to ICPP is 8.6 mi (13.8 km) to the northwest. The INEL is remote from major population centers, waterways, and interstate transportation routes. The INEL has no permanent residents, and ingress and egress of site personnel for performance of their duties and visiting personnel on official business are strictly controlled by the DOE. Visitor access to the INEL is restricted, except for persons driving through the INEL on one of four public highways and visitors to the Experimental Breeder Reactor-1 (EBR–1), National Historical Monument, which is open to the public during the summer months.

Limited recreational activities and grazing are allowed within the INEL under special requirements (see Section 2.1.3.1). There are eight nuclear facilities within a 50 mi (80 km) radius of the ICPP (Table 2-1).

2.1.1.2 Boundaries for Establishing Effluent Release Limits

The INEL boundary (site boundary lines), shown in Figure 2-2, establishes the exclusion area, defined in 10 CFR Part 100, for protection from exposure to airborne radioactivity. The relative position of the ICPP within the INEL and distances to the property boundary is depicted in Figure 2-4.

2.1.2 POPULATION DISTRIBUTION[2] (Refer to Section 4.3.2.1, Vol. 2, Part A, DOE 1995):

From 1960 to 1990, population growth in the region of influence mirrored State-wide growth. During this period, the region's population increased at an average annual rate of approximately 1.3 percent, while the growth rate for the State was 1.4 percent. Between 1980 and 1990, population growth in the region of influence approximately equaled that of the State, with an average growth rate of 0.6 percent per year. The region of influence had a 1990 population of 219,713, which comprised 22 percent of the State's total population of 1,006,749. The most populous counties were Bannock and Bonneville, which together contained over 60 percent of the seven county total. Butte and Clark were the least populous of the counties in the region of influence.

The population within a 50-mile (80-kilometer) circle centered at Argonne National Laboratory-West (on the INEL site) has been characterized for the purposes of identifying whether any disproportionately high and adverse impacts might exist to minority or low-income populations. The population within this circle surrounding the INEL site is shown to be 7 percent minority and 14 percent low-income, based on U.S. Bureau of Census information and the definitions and approach presented in Section 8.1 on Environmental Justice.

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2 Populations in this section are discussed from three viewpoints: (1) "region of influence" as identified in Appendix F, Section F-1, Socioeconomics of the FEIS (DOE 1995) was determined to be a seven-county area comprised of Bingham, Bonneville, Butte, Clark, Jefferson, Bannock, and Madison counties where over 97 percent of the INEL employees reside. The region of influence includes the Fort Hall Indian Reservation and Trust Lands (home of the Shoshone-Bannock Tribes), located in Bannock, Bingham, Caribou, and Power counties; (2) a 50-mile circle centered at Argonne National Laboratory- West for the purposes of identifying whether disproportionately high and adverse impacts might exist to minority or low-income populations; and (3) a 50-mile circle centered at the ICPP to show population densities from the proposed site.

Population in the region of influence is projected to reach 276,395 persons by 2004 based on population and employment trends. Over the period 1990 to 2004, the average annual growth rate is projected to be 1.6 percent compared to a projected State-wide annual growth rate of 1.7 percent.

Figures 2-5, 2-6, 2-7, and 2-8 show population densities, based on the 1990 Census, for the years 1990 through 2020 at 10-year intervals for the 50 mile (80 km) radius around ICPP. Also shown are the relative locations of the major towns. The nearest populated area to the INEL is Atomic City, population about 30, located approximately 1 mile (1.6 km) from the southern INEL boundary and about 11 miles (18 km) from the ICPP.

2.1.2.1 Population Within 10 Miles

There are no permanent residents or cities or towns within a 10-mile (16-km) circle centered at the ICPP (Figure 2-5). However, several INEL facilities, such as the CFA, TRA, and the RWMC are within 10 miles of the ICPP. Also, the Experimental Breeder Reactor I (EBR-I), a National Historic Landmark, is located southwest and within 10 miles of the ICPP. Institutional control would continue to restrict access to INEL lands for the next 100 years (DOE 1996), thus population within 10 miles (16 km) of the ICPP is unlikely to change through 2035.

2.1.2.2 Population Within 10 and 50 Miles

The population between 10 and 50 miles of the ICPP is about 118,644 (Figure 2-5). The two largest cities within the region of influence are Pocatello and Idaho Falls, with 1990 populations of approximately 46,000 and 44,000, respectively. In 1990, the Fort Hall Indian Reservation and Trust Lands contained 5,113 residents. The age distribution within the region of influence, over a seven county area is shown in Table 2-2. Expected population growth through 2020 is depicted in Figures 2-6, 2-7, and 2-8.

2.1.2.3 Transient Population

Year round variations in populations are caused by the daily influx of the INEL workforce. About 4,110 workers are employed within 10 miles (16 km) of the ICPP (Table 2-3). U. S. Highways 20 and 26 pass through the site and are within 10 miles (16 km) of ICPP. Traffic on these highways, other than the daily site traffic, is related to travel between cities surrounding the site and the many recreational opportunities in the area (see Section 2.1.3.2). The projected INEL workforce for the year 2004 is 7,250 (DOE 1995).

2.1.3 USES OF ADJACENT LANDS AND WATERS

The INEL site encompasses 571,000 acres (230,000 ha) within Butte, Bingham, Bonneville, Jefferson, and Clark counties. This section includes a brief description of existing land uses on and immediately surrounding the INEL, and applicable land use plans and policies.

2.1.3.1 Existing and Planned Land Uses at the INEL (Refer to Section 4.2.1, Vol. 2, Part A, DOE 1995)

Categories of land use at the INEL site include facility operations, grazing, general open space, and infrastructure, such as roads. Facility operations include industrial and support operations associated with energy research and waste management activities. Land is also used for recreation and environmental research associated with the designation of the INEL as a National Environmental Research Park. Much of the INEL site is open space that has not been designated for specific uses. Some of this space serves as a buffer zone between INEL facilities and other land uses. About 2 percent of the total INEL site area (11,400 ac or 4,600 ha) is used for facilities and operations. Public access to most facility areas is restricted. Approximately 6 percent of the INEL site, or 34,260 acres (13,870 ha), is devoted to public roads and utility rights-of-way that cross the site. Recreational uses include public tours of general facility areas and EBR-I and controlled hunting, that is generally restricted to half a mile (0.8 km) within the INEL boundary. Between 300,000 and 350,000 acres (121,000 and 142,000 ha) are used for cattle and sheep grazing. A 900-acre (400-ha) portion of this land, located at the junction of Idaho State Highways 28 and 33, is used by the U.S. Sheep Experiment Station as a winter feed lot for approximately 6,500 sheep. Grazing is not allowed within 2 miles (3 km) of any nuclear facility, and, to avoid the possibility of milk contamination by long-lived radionuclides, dairy cattle are not permitted. Rights-of-way and grazing permits are granted and administered by the U. S. Department of the Interior's Bureau of Land Management. Selected land uses at the INEL and in the surrounding region are presented in Figure 2-9.

2.1.3.2 Existing and Planned Land Use in Surrounding Areas (Refer to Section 4.2.2, Vol. 2, Part A, DOE 1995)

Lands surrounding the INEL site are owned by the Federal government, the State of Idaho, and private parties. Land uses on federally owned land consist of grazing, wildlife management, range land, mineral and energy production, and recreation. State-owned lands are used for grazing, wildlife management, and recreation. Privately owned lands are used primarily for grazing, crop production, and range land.

Small communities and towns located near the INEL boundaries include Mud Lake to the east; Arco, Butte City, and Howe to the west; and Atomic City to the south. The larger communities of Idaho Falls/Ammon, Rexburg, Blackfoot, and Pocatello/Chubbuck are located to the east and southeast of the INEL site. The Fort Hall Indian Reservation is located southeast of the INEL site. Recreation and tourist attractions in the region surrounding the INEL site include Craters of the Moon National Monument, Hell's Half Acre Wilderness Study Area, Black Canyon Wilderness Study Area, Camas National Wildlife Refuge, Market Lake State Wildlife Management Area, North Lake State

Wildlife Management Area, Yellowstone National Park, Targhee and Challis National Forests, Sawtooth National Recreation Area, Sawtooth Wilderness Area, Sawtooth National Forest, Grand Teton National Park, Jackson Hole recreation complex, and the Snake River (see Figure 2-10).

All county plans and policies encourage development adjacent to previously developed areas in order to minimize the need to extend infrastructure improvements and to avoid urban sprawl (DOE-ID 1993d). Because the INEL is remotely located from most developed areas, INEL lands and adjacent areas are not likely to experience residential and commercial development, and no new development is planned near the INEL site (DOE-ID 1993d). However, recreational and agricultural uses are expected to increase in the surrounding area in response to greater demand for recreational areas and the conversion of range land to crop land (DOE-ID 1993d).

2.2 ECOLOGY

This section describes the biotic resources on the INEL site, which are typical of the Great Basin and Columbia Plateau. Threatened and endangered species, wetlands, and the extent of human-caused radionuclides in plants and animals are discussed. Only those biotic resources in the immediate vicinity of the ICPP are expected to be affected by this action. However, because other resources such as more mobile species like pronghorn could be affected, biotic resources for the entire INEL site also are briefly described.

2.2.1 FLORA (Refer to Section 4.9.1, Vol. 2, Part A, DOE 1995)

Vegetation on the INEL site is primarily of shrub-steppe vegetation and is a small fraction of the 111.2 million acres (45 million ha) of this vegetation type found in the Intermountain West. The 15 vegetation associations identified on the INEL site range from primarily shadscale-steppe vegetation at lower altitudes through sagebrush- and grass-dominated communities to juniper woodlands along the foothills of the nearby mountains and buttes (Rope et al. 1993, Kramber et al. 1992, Anderson 1991). These associations can be grouped into six types: juniper woodland, native grassland, shrub-steppe, lava, modified, and wetland vegetation types (Figure 2-11). Over 90 percent of the INEL is covered by shrub-steppe vegetation, which is dominated by big sagebrush (Artemisia tridentata), saltbush (Atriplex spp.), and rabbitbrush (Chrysothamnus spp.). Grasses include cheatgrass (Bromus tectorum), Indian ricegrass (Oryzopsis hymenoides), wheatgrasses, (Agropyron spp.), and squirreltail (Sitanion hysterix). Herbaceous plants include phlox (Phlox spp.), wild onion (Allium), milkvetch (Astragalus spp.), Russian thistle (Salsola kali), and various mustards. Additional detailed information on plant communities is described in Rope et al. (1993).

Disturbed areas (grazing not included) cover only 1.3 percent of the INEL site. Disturbed areas frequently are dominated by introduced annuals, including Russian thistle and cheatgrass. These species usually provide less food and cover for wildlife compared to perennial native species and are competitive with perennial native species. Therefore, these disturbed areas serve as a source of seeds that may increase the potential for the increased establishment of Russian thistle and cheatgrass into the surrounding undisturbed areas. Vegetation adjacent to each facility is generally similar to the vegetation types mapped in Figure 2-11. Vegetation within each facility area is primarily disturbed or landscaped. Species diversity on the INEL is similar to diversity on like-sized areas and physiognomy in the Intermountain west. The diversity on the INEL is heavily influenced by the shrub-steppe vegetation covering over 90 percent of the INEL. Diversity is lower on disturbed and modified areas and higher on areas of greater moisture content.

However, site-specific information indicates that the area immediately surrounding the ICPP is dominated by crested wheatgrass (Agropyron cristatum), a European perennial grass seeded in disturbed areas to provide cover and hold soil.

2.2.2 FAUNA (Refer to Section 4.9.2, Vol. 2, Part A, DOE 1995)

The INEL site supports animal communities typical of shrub-steppe vegetation and habitats. Over 270 vertebrate species have been observed, including 46 mammal, 204 bird, 10 reptile, 2 amphibian, and 9 fish species (Arthur et al. 1984, Reynolds et al. 1986). Common species include small mammals (mice, ground squirrels, rabbits, and hares), elk, songbirds (sage sparrow, western meadowlark), sage grouse, lizards, and snakes. Migratory species, including pronghorn, waterfowl, and raptors, use the INEL site for part of the year. Some pronghorn remain on the site year round. Predators observed on the INEL site include bobcats, mountain lions, and coyotes. Trout and salmon species have been observed in the Big Lost River when it has flowed on to the INEL site.

2.2.3 THREATENED AND ENDANGERED SPECIES (Refer to Section 4.9.3, Vol. 2, Part A, DOE 1995)

Two Federally listed endangered and threatened species, the bald eagle (Haliaeetus leucocephalus) and the gray wolf (Canis lupus) have been identified by the U.S. Fish and Wildlife Service as potentially occurring on the INEL site (Martin 1996). Bald eagles listed as threatened are observed each winter near or on the INEL, but only in the remote areas of the INEL about 20 miles (32 km) north of the TAN and on the INEL site near Howe. The gray wolf has been listed as an experimental/non-essential population and may range on or near the INEL (Martin, 1996). The USFWS also identified 16 species of plants and animals that are not designated as endangered, threatened, or candidate species under the Endangered Species Act but are of concern to the agency concerning their population status and threats to their long-term viability. These species include those identified by the Idaho Native Plant Society and the State of Idaho as protected and sensitive species.

None of the Federal- or State-listed animal species have been observed near any of the facilities where proposed actions would occur (Rope et al. 1993, Reynolds 1993). No

Federal- or State-listed plant species were identified as potentially occurring on the INEL site. Eight plant species identified by other Federal agencies and the Idaho Native Plant Society as sensitive, rare, or unique are known to occur on the INEL site (Lobdell 1995).

2.2.4 WETLANDS (Refer to Section 4.9.4, Vol. 2, Part A, DOE 1995)

Aquatic habitats on the INEL site are limited to scattered wet areas, artificial ponds, and intermittent waters. The U.S. Fish and Wildlife Service National Wetlands Inventory maps show over 130 potential wetlands; these maps and a subsequent survey (Hampton et al. 1995) indicate these potential wetlands cover more than 2,900 acres (1,180 ha) of the INEL site. Over 70 percent of the potential wetlands are found near the Big Lost River and its spreading areas and playas, the Birch Creek Playa, and in an area north of and in the general vicinity of Argonne National Laboratory-West. The rest are scattered throughout the INEL site.

Approximately 20 potential wetlands listed by the U.S. Fish and Wildlife Service are near facilities and are mostly man-made (for example, industrial waste and sewage treatment ponds, borrow pits, and gravel pits) and, therefore, may not be considered regulated jurisdictional wetlands (Figure 2-11). There is one area north of the TRA under evaluation as a jurisdictional wetland. Other potential wetlands include portions of the Big Lost River channel near the ICPP and the Birch Creek Playa containing TAN facilities. Limited riparian (riverbank) communities with mature trees are found along the Big Lost River (Reynolds 1993), reflecting the intermittent flow in the river. The scattered artificial ponds, potential wetlands, and intermittent waters serve as water sources to many wildlife species including bats, song birds, and mammals. Some artificial ponds are not fenced and are used by pronghorn.

2.2.5 RADIOECOLOGY (Refer to Section 4.9.5, Vol. 2, Part A, DOE 1995)

Potential radiological effects on plants and animals are measured at the population, community, or ecosystem level. However, for threatened and endangered species, harm to individuals is important. Radionuclides are found above background levels in individuals belonging to some plant and animal species on and surrounding the INEL site (Morris 1993a). Measurable effects of radionuclides on plants and animals, however, have only been observed in individuals on areas adjacent to INEL facilities, and not at the population, community, or ecosystem levels. The following is information on doses, concentrations, and effects reported for animals on the INEL site.

Halford and Markham (1984) and Arthur et al. (1986) studied maximally exposed small mammals at the TRA radioactive waste percolation pond and at the RWMC SDA (Subsurface Disposal Area). These studies concluded that the small mammals received doses similar to those shown to reduce life expectancies in other small mammals at other locations. Statistically significant differences in several physiological parameters were found between deer mice inhabiting the TRA radioactive waste percolation pond, the

SDA, and control areas (Evenson 1981). However, radiation exposures were too small to cause cellular changes in the mice. A comparison between barn swallow nestlings exposed to sediments from the TRA pond and control birds revealed a statistically significant difference in growth rates (Millard et al. 1990). However, this difference could not definitely be attributed to exposure. All studies reported that doses to individual organisms were too low to cause any effects at the population level. Doses and exposures to animals from 1992 at both the SDA and TRA are probably lower than the doses reported in the above studies because 2 feet (0.6 meter) of additional soil cover the contaminated pits and trenches (Wilhelmsen and Wright 1992), and the percolation pond is now less attractive to animals (Morris 1993b).

Elevated radionuclide concentrations have been observed in some individual animals and plants outside the boundaries of INEL facilities and off the INEL site. Iodine-129 concentrations in vegetation and in rabbit thyroids have been reported in excess of background up to 18.6 miles (30 km) from the ICPP fence (Markham 1974). Iodine-129 has also been detected above background in pronghorn tissue collected on the INEL site (Markham 1974) and from pronghorn collected as far away as Craters of the Moon National Monument and Monida Pass (Markham et al. 1982). In a study of raptor nesting, Craig et al. (1979) concluded that detectable radionuclide levels would only be observed within 2.2 miles (3.5 km) from the RWMC. In these examples, the dose from internal consumption of radionuclides was less than is thought to be required for observable effects to occur to individual animals (IAEA 1992). Also, on the basis of limited data and the infrequent and few bald eagles and Ferruginous hawks observed near contaminated areas, these species probably are not consuming harmful concentrations of radioactive contaminants in their prey (Morris 1993b). A similar conclusion can be made for peregrine falcons because they have rarely been seen on or near the INEL site, and have never been seen near contaminated INEL ponds.

2.3 CLIMATOLOGY AND METEOROLOGY (Refer to Section 4.7.1, Vol. 2, Part A, DOE 1995)

The Eastern Snake River Plain climate exhibits low relative humidity, wide daily temperature swings, and large variations in annual precipitation. Table 2-4 lists the meteorological variables observed and the period of record of observations of past stations and the larger present stations. Average seasonal temperatures measured onsite range from 18.8°F (Fahrenheit) [-7.3°C (Celsius)] in winter to 64.8°F (18.2°C) in summer, with an annual average temperature of about 42°F (5.6°C). Temperature extremes range from a summertime maximum of 103°F (39.4°C) to a wintertime minimum of -49°F (-45°C). Large year-to-year variations in average monthly and seasonal temperatures are common, as are large variations in temperature in different locations. Annual precipitation is light, averaging 8.71 inches (22.1 centimeters), with monthly extremes of zero to 5 inches (12.8 centimeters). The maximum 24-hour precipitation rate is 1.8 inches (4.6 centimeters). The greatest short-term precipitation rates are primarily attributable to thunderstorms, which occur approximately two or three days per month during the summer. The average annual snowfall is 27.6 inches (70.1

centimeters), with extremes of 59.7 inches (151.6 centimeters) and 6.8 inches (17.3 centimeters). Relative humidity ranges from an average minimum of 27 percent to a maximum of 79 percent on an annual basis.

The INEL site is in the belt of prevailing westerlies; however, these winds are normally channeled by the mountain ranges bordering the Eastern Snake River Plain into a southwest wind. Most offsite locations experience the predominant southwest/northeast wind flow of the Eastern Snake River Plain, although subtle terrain features near some locations cause considerable variations from this flow regime. The highest hourly average near-ground wind speed measured onsite is 51 miles per hour (22.8 meters per second) from the west-southwest, with a maximum instantaneous gust of 78 miles per hour (34.9 meters per second) (Clawson et al. 1989). Other than thunderstorms, severe weather is uncommon. Five funnel clouds (tornadoes not touching the ground) and no tornadoes have been reported onsite from 1950 to 1988 (Table 2-5). Visibility in the region is good because of the low moisture content of the air and minimal sources of visibility-reducing pollutants. At Craters of the Moon Wilderness Area [approximately 12.4 miles (20 km) southwest of the INEL site], the seasonal visual range is from 81 to 97 miles (130 to 156 km) (Notar 1993).

Air pollutant dispersion is a result of the processes of transport and diffusion of airborne contaminants in the atmosphere. Transport is the movement of a pollutant in the wind field, while diffusion refers to the process whereby a pollutant plume is diluted by turbulent eddies. Vertical diffusion of pollutants may be restricted or enhanced by the temperature gradient of the atmosphere (that is, the change in temperature with altitude). Lapse conditions, which tend to enhance vertical diffusion, occur slightly less than 50 percent of the time. Conversely, thermal stratification or inversion conditions, which inhibit vertical diffusion, occur slightly more than 50 percent of the time. The height to which the pollutants can freely diffuse is known as the mixing depth, while the layer of air from the ground up to the mixing depth is known as the mixed layer. Estimates of the monthly average depth of the mixed layer range from 400 feet (120 meters) in December to 3,000 feet (900 meters) in July. Nocturnal (nighttime) inversions form at approximately sunset and dissipate about one to two hours after sunrise. These inversions are often ground-based, meaning that the temperature increases with height from the ground (Clawson et al. 1989).

The U.S. Weather Bureau, subsequently the Environmental Sciences Service Administration, and presently the NOAA, has maintained a meteorological observation program at the INEL since 1949. The Environmental Research Laboratories (the NOAA facility at the INEL) is a permanent installation and continues to update all meteorological data. Figure 2-12 shows the locations of the present INEL stations.

The weather monitoring instruments at CFA are located about 3 miles (4.8 km) from ICPP and, with the exception of wind roses, the information collected is representative of conditions at ICPP. Tables 2-6 through 2-15 provide a summary of INEL climatological records. Wind roses (Figures 2-13 and 2-14) have been provided from the NOAA Grid III (GRD 3) station to reflect the topographic influences on wind in the immediate area of ICPP. Tower measurements at GRD 3 have shown a 180 degree direction shear between levels 20 and 50 feet (6.10 and 15.24 meters) above the ground in the early morning hours. This is attributed to the fact that the slope of the terrain in this area is opposite the general slope of the terrain over the Eastern Snake River Plain. The general down slope drainage is, therefore, opposed by this local anomaly in the topography (Page 106 of Clawson et.al., 1989).

2.4 HYDROLOGY

This section describes existing regional and INEL site hydrologic conditions and discusses existing water quality for surface and subsurface water, water use, and water rights. The subsurface water section also describes the saturated zone below the water table and the vadose zone (or unsaturated zone and perched water bodies) located between the land surface and the water table.

2.4.1 SURFACE WATER

Intermittent streams and ephemeral surface water bodies and manmade percolation, infiltration, and evaporation ponds are the only surface water features on the INEL site.

2.4.1.1 Regional Drainage (Refer to Section 4.8.1.1, Vol. 2, Part A, DOE 1995)

The INEL site is located in the Mud Lake-Lost River Basin, a closed drainage basin that includes three main tributaries: the Big and Little Lost Rivers and Birch Creek (Figure 2-15). These surface water features drain mountain watersheds located directly west and north of the INEL site. However, most of the surface water flow is diverted for irrigation before it reaches site boundaries (Barraclough et al. 1981), resulting in little or no surface water flow for periods of up to several years in duration within the boundaries of the INEL site (Pittman et al. 1988).

The Big Lost River drains approximately 1,450 square miles (376,000 ha) of land before reaching the INEL site (Figure 2-16). Approximately 30 miles (48 km) upstream of Arco, Idaho, Mackay Dam controls and regulates river flow, which continues southeast past the towns of Moore and Arco and onto the Eastern Snake River Plain. The river channel then crosses the southwestern boundary of the INEL site, where surface water flow can be controlled by the INEL Diversion Dam. During heavy runoff events, surface water is diverted to a series of natural depressions, designated as spreading areas. The purpose of the diversion system is to prevent flooding of downstream facilities and ice jams from developing in the channel. The Big Lost River continues northeasterly across the INEL site to an area of natural infiltration basins (playas or sinks) near TAN. Surface water from the Big Lost River does not usually reach the western boundary of the INEL site; however, during an unusually wet year, flow can continue as far north as the Birch Creek Playa (Playa 4). Because most of the INEL is located in a closed basin, surface water rarely, if ever, flows off the site.

Birch Creek drains an area of approximately 750 square miles (194,000 ha). In the summer, upstream of the INEL site, surface water from Birch Creek is diverted for irrigation and hydropower production. In the winter, water flow crosses the northwest corner of the INEL site, entering a manmade channel constructed 4 miles (6.4 km) north of TAN, where it then infiltrates into channel gravels, recharging the aquifer (Bishop 1993).

The Little Lost River drains an area of approximately 705 square miles (183,000 ha). Streamflow is diverted for irrigation use north of Howe. Surface water from the Little Lost River has not reached the INEL site in recent times; however, during high stream flow years, water from the Little Lost River has reached the INEL site, where it then infiltrated into the subsurface (EG&G Idaho 1984).

2.4.1.2 Local Runoff (Refer to Section 4.8.1.2, Vol. 2, Part A, DOE 1995)

Surface water generated from local precipitation will flow into topographic depressions (lower elevations than the surrounding terrain) on the INEL site. This surface water either evaporates or infiltrates into the ground[3]. Ponding of the runoff in a few low areas may increase subsurface moisture content, enhancing migration of localized contaminants in the unsaturated zone (Wilhelmson et al. 1993).

Localized flooding can occur at the INEL site when the ground is frozen and runoff from melting snow is combined with heavy spring rains. The RWMC was flooded in 1962, 1969, and 1982 by local runoff from rapid spring thaws; and TAN was flooded in 1969 due to rapid snowmelt (Koslow and Van Haaften 1986). After the flooding events, the addition of dikes, diversion channels, settling basins, and sump pumps at the RWMC SDA and TAN have alleviated snowmelt flooding at these facilities (Dames & Moore 1992, Koslow and Van Haaften 1986).

2.4.1.3 Flood Plains (Refer to Section 4.8.1.3, Vol. 2, Part A, DOE 1995)

Intermittent surface water flow and the INEL Diversion Dam (constructed in 1958 and enlarged in 1984) have effectively prevented flooding from the Big Lost River onto the INEL site. However, flooding from the Big Lost River might occur on the INEL if high water in the Mackay Dam or the Big Lost River were coupled with a dam failure. Koslow and Van Haaften (1986) examined the potential consequences of a Mackay Dam failure during a hypothetical seismic event, structural failure coincident with the 100- and 500-year recurrence interval floods, and during a probable maximum flood (hypothetical flood that is considered to be the most severe event possible)[4]. The results from all dam failures studied indicate flooding would occur outside the banks of the Big Lost River from Mackay Dam to TAN, except within Box Canyon (Figure 2-17). The water velocity

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3 The intermittently flowing waters from the Big Lost and the Little Lost Rivers flow to the Lost River Sinks in the northwest portion of the INEL, where the water evaporates and infiltrates into the Snake River Plain Aquifer. Birch Creek also flows intermittently onto the INEL to a depression north of Test Area North.

4 The estimated probability of an occurrence for this combined event is one chance in one million.

on the INEL site would range 0.6 to 3.0 feet per second (from 0.18 to 0.91 m/s), with water depths outside the banks of the Big Lost River ranging from 2 to 4 feet (0.61 to 1.22 m) (Koslow and Van Haaften 1986). Because of the low velocity and shallow depth of the water, flooding would not pose a threat of structural damage to facilities.

An updated 100-year floodplain map for the Big Lost River is currently being developed and is expected to be completed in 1996.[5] The projects identified in Appendix C, Information Supporting the Alternatives, of Volume 2 of the FEIS would be located using the most currently available floodplain information. Pending completion of this floodplain map, it is assumed that the area encompassed by the probable maximum flood is greater than that for the 100-year flood.

The ICPP is located on an alluvial plain approximately 200 feet (16 m) from the Big Lost River channel near the point where the channel intersects with Lincoln Boulevard as shown in Figure 2-18. The TMI-2 ISFSI site is located in the southern portion of the ICPP, about 2,800 feet (850 m) from the main river channel. The probable maximum flood event would result in flood water within the ICPP-controlled area up to about 4,917 feet (1,498.7 m) above mean sea level (Koslow and Van Haaften, 1986). The elevation of the existing ground surface at the ISFSI site ranges between 4,914.2 and 4,915.9 feet (1,497.8 and 1,498.4 m) and the proposed final elevation of the ISFSI pad would be 4,917 feet (1,498.7 m).

2.4.1.4 Surface Water Quality (Refer to Section 4.8.1.4, Vol. 2, Part A, DOE 1995)

Water quality in the Big and Little Lost Rivers and Birch Creek is similar and has not varied a great deal over the period of record. Measured physical, chemical, and radioactive parameters have not exceeded applicable drinking water quality standards (USGS 1982-1993). Chemical composition is determined primarily by the carbonate mineral composition of the rocks in surrounding mountain ranges northwest of the INEL site and by the chemical composition of irrigation water return flow to the surface water (Robertson et al. 1974).

INEL site activities do not affect the quality of surface water outside the INEL site because surface water does not flow directly offsite (Hoff et al. 1990). In accordance with the Clean Water Act, discharges from INEL site facilities are made to manmade seepage and evaporation basins, rather than to natural surface water bodies. However, water from the Big Lost River System, as well as seepage from wastewater disposal facilities (in other words, percolation and evaporation ponds and septic tank systems) and storm water injection wells, does infiltrate into the Snake River Plain Aquifer (Robertson et al. 1974, Wood and Low 1988, Bennett 1990). These areas are inspected, monitored, and sampled as stipulated in the INEL Stormwater Pollution Prevention Program (DOE-ID 1993a).

5 The floodplain map is now scheduled for completion in 1997.

Because of the large supply of groundwater beneath the INEL, no water supply ponds are used at the ICPP, and no surface water is used for any purpose. All water used at the ICPP comes from wells.

2.4.2 SUBSURFACE WATER

Subsurface water at the INEL site occurs in the Snake River Plain Aquifer and the vadose zone. This section describes regional and local hydrogeologic conditions and subsurface water quality. Generally, the term groundwater refers to water in the saturated zone that enters freely into wells under confined and unconfined conditions (Driscoll 1986). Subsurface water in the vadose zone, or unsaturated zone, is referred to as vadose water.

2.4.2.1 Regional Hydrogeology (Refer to Section 4.8.2.1, Vol. 2, Part A, DOE 1995)

The INEL site overlies the Snake River Plain Aquifer, the largest aquifer in Idaho (Figure 2-19). This aquifer underlies the Eastern Snake River Plain and covers an area of approximately 9,611 square miles (2,490,000 ha). Groundwater in the aquifer generally flows to the south and southwest. Water storage in the aquifer is estimated at 2 billion acre-feet (2.5×10^{12} m^3), which is approximately the same as the volume of water contained in Lake Erie (Robertson et al. 1974). Irrigation wells can yield as much as 7,000 gallons per minute (26.5 m^3/m) of water (Garabedian 1992). The Snake River Plain Aquifer is among the most productive aquifers in the nation.

The drainage basin recharging the Snake River Plain Aquifer covers an area of approximately 35,000 square miles (9,060,000 ha). The aquifer is recharged by infiltration of irrigation water, seepage from stream channels and canals, underflow from tributary stream valleys extending into the watershed, and direct infiltration from precipitation (Garabedian 1992). Most recharge occurs in surface water-irrigated areas and along the northeastern margins of the plain. Groundwater is primarily discharged from the aquifer through springs that flow into the Snake River and pumping for irrigation. Major springs and seepages that flow from the aquifer are located near the American Falls Reservoir (southwest of Pocatello), the Thousand Springs area between Milner Dam and King Hill (near Twin Falls), and between Lorenzo and Louisville, along the Snake River.

2.4.2.2 Local Hydrogeology (Refer to Section 4.8.2.2, Vol. 2, Part A, DOE 1995)

The INEL site covers about 890 square miles (230,000 ha) of the north-central portion of the Snake River Plain Aquifer. Depth to groundwater from the land surface at the INEL site ranges from approximately 200 feet (61 m) in the north to over 900 feet (274 m) in the south (Pittman et al. 1988). Groundwater flow is generally toward the south-southwest, and the upper surface is primarily unconfined (not overlain by impermeable soil or bedrock). However, the aquifer behaves as if it were partially confined because of localized geologic conditions (Whitehead 1987). The occurrence and movement of groundwater in the aquifer is dependent on the geologic setting and the recharge and discharge of water within that setting. Most of the aquifer is comprised primarily of numerous relatively thin, basaltic flows with interbedded sediments extending to depths of 3,500 feet (1,067 m) below the land surface (Bishop 1993). A majority of the groundwater migrates horizontally through fractured interflow zones (broken and rubble zones) that occur at various depths. Water also migrates vertically along joints and the interfingering edges of interflow zones (Garabedian 1986). Sedimentary interbeds may restrict the vertical movement of groundwater.

The rate water moves through the ground depends on the hydraulic gradient (change in elevation and pressure with distance in a given direction) of the aquifer, the effective porosity (percentage of void spaces), and hydraulic conductivity (capacity of a porous media to transport water) of the sediments and basalt. The upper 200 to 800 feet (61 to 244 meter) of the basalts have a markedly higher hydraulic conductivity than rocks below 1,500 feet (458 meter). Therefore, the base of the aquifer is considered to range from 800 to 1,500 feet (244 to 458 meter) below land surface.[6] Estimated flow rates within the aquifer range from 5 to 20 feet/day (1.5 to 6.1 m/d) (Barraclough et al. 1981).

The ability to transmit water (transmissivity) and the ability to store water (storativity) are important physical properties of the aquifer. In general, the hydraulic characteristics of the aquifer allow water to be readily transmitted, particularly in the upper portions. The variability in how the aquifer transmits and stores water increases the difficulty in aquifer investigations and modeling.

Near the INEL site, the aquifer is recharged by irrigation return and precipitation in the mountains to the west and north. Most of the inflow to the aquifer results from underflow of groundwater along alluvial-filled valleys adjacent to the Eastern Snake River Plain and secondarily from adjacent surface water drainages (that is, Big and Little Lost Rivers and Birch Creek). Recharge at the INEL site is also related to the amount of precipitation, particularly snowfall, for a given year (Barraclough et al. 1981).

2.4.2.3 Vadose Zone Hydrology (Refer to Section 4.8.2.3, Vol. 2, Part A, DOE 1995)

The vadose zone (unsaturated zone) extends from the land surface down to the regional water table. Within the vadose zone, voids in the geologic materials are occupied partially by water and partially by air. Subsurface water occurring in the vadose zone is referred to as vadose water. This complex zone at the INEL site consists of surface sediments (primarily clay and silt, with some sand and gravel) and numerous relatively thin, basaltic flows, with some sedimentary interbeds. Thick surficial deposits are found in the northern part of the INEL site, which thin southward where basalt is exposed at the surface.

6 The depth of the aquifer at ICPP is approximately 450 feet (137 m).

The vadose zone protects the groundwater by filtering out many contaminants through adsorption, buffering dissolved chemical wastes, and slowing the transport of contaminated liquids to the aquifer. The vadose zone also protects the aquifer by slowing the migration of large volumes of liquid or dissolved contaminants released to the environment through spills or migration from disposal pits or ponds, allowing natural decay processes to occur.

Travel times for water through the vadose zone are important for understanding contaminant movement. The flow rates in the vadose zone are directly dependent on the extent of fracturing and clay coatings on the fractures, the percentage of sediments versus basalt, and the moisture content of vadose zone material. Flow increases under wetter conditions and slows under dryer conditions. For example, under unsaturated flow conditions near the RWMC , an investigation into water movement in surface sediments found that infiltration ranged from 0.14 to 0.43 inch/yr (0.36 to 1.1 cm/yr) (Cecil et al. 1992). However, under nearly saturated conditions in surface sediments, standing water at land surface in the same area moved vertically 6.9 feet (2.1 m) in less than 24 hours (Kaminsky 1991). Under saturated conditions and matrix flow, over 100 days were required for saturation of 20-inch (a 50-cm)-long basalt rock from the RWMC (Bishop 1991).

2.4.2.4 Perched Water (Refer to Section 4.8.2.4, Vol. 2, Part A, DOE 1995)

Locally, saturated conditions may exist within the vadose zone above the water table and are called perched water. Perched water occurs when water migrates vertically and laterally from the surface until it encounters an impermeable layer of dense basalt or fine sedimentary material (Bishop 1993). Perched water may spread laterally, sometimes hundreds of meters, and then move over the edges of the impermeable layer and continue downward. Several perched water bodies can form between the land surface and the water table.

In general, the formation of perched water bodies slows the downward migration of fluids that infiltrate into the vadose zone from the surface. The largest occurrence of perched water at the INEL site is generally related to the presence of disposal ponds or other surface water bodies, but can also be related to vadose zone disposal wells. These bodies have been detected at the ICPP, TRA, TAN, and RWMC (Bishop 1993). For example, a field study performed in 1986 at the ICPP showed that perched water occurs in three areas at possibly three depth zones. These bodies are located at depths ranging from approximately 30 feet (9 m) to 322 feet (98 m) below ground surface and extend laterally as much 3,600 feet (as 1,097 m) (Bishop 1993). In general, the chemical concentrations, shape, and size of these bodies have fluctuated over time in response to the volume of water discharged to the infiltration ponds.

2.4.2.5 Subsurface Water Quality (Refer to Section 4.8.2.5, Vol. 2, Part A, DOE 1995)

Subsurface water quality is affected by natural water chemistry and contaminants originating at the INEL site. Monitoring programs are conducted under the INEL Groundwater Protection Management Program (Case et al. 1990). Under this program, the INEL Groundwater Monitoring Plan (Sehlke and Bickford 1993) was established to fulfill the groundwater monitoring requirements of DOE Order 5400.1, "General Environmental Protection Program" (DOE 1990a). As specified in the plan, samples are collected from surface water, perched water, and aquifer wells to identify contaminants and contaminant migration to and within the aquifer.

2.4.2.5.1 Natural Water Chemistry (Refer to Section 4.8.2.5.1, Vol. 2, Part A, DOE 1995)

The natural groundwater chemistry of the Snake River Plain Aquifer beneath the INEL site is determined by several factors. These factors include the weathering reactions that occur as water interacts with minerals in the aquifer and the chemical composition of (a) groundwater originating outside of the INEL site, (b) precipitation falling directly on the land surface, and (c) streams, rivers, and runoff infiltrating into the aquifer (Wood and Low 1986, 1988). The chemistry of the groundwater is different, depending on the source areas. For example, groundwater from the northwest contains calcium, magnesium, and bicarbonate leached from sedimentary rocks; and groundwater from the east contains sodium, fluorine, and silicate resulting from contact with volcanic rocks (Robertson et al. 1974).

The natural chemistry affects the mobility of contaminants introduced into the subsurface from INEL site activities. Many dissolved contaminants are adsorbed (or attached) to the surface of rocks and minerals in the subsurface, thereby retarding the movement of contaminants in the aquifer and inhibiting further migration of contamination. However, many naturally occurring chemicals compete with contaminants for adsorption sites on the rocks and minerals or react with contaminants to reduce their attraction to the rock and mineral surfaces.

2.4.2.5.2 Groundwater Quality (Refer to Section 4.8.2.5.2, Vol. 2, Part A, DOE 1995)

Previous waste discharges to unlined ponds and injection wells have introduced radionuclides, nonradioactive metals, inorganic salts, and organic compounds into the subsurface. Solid low-level and transuranic wastes have also been disposed of in several pits at the RWMC SDA since 1952. (Transuranic waste disposal at the Complex was discontinued in 1970; however, disposal of low- level waste is projected to continue until 2020.) Table 2-16 summarizes highest detected concentrations of contaminants observed in the aquifer between 1985 and 1992, concentrations near the INEL site boundary, existing U.S. Environmental Protection Agency (EPA) maximum contaminant levels, and contaminants and comparisons of observed concentrations to maximum contaminant levels.

Radionuclides. Radionuclide concentrations in the Snake River Plain Aquifer beneath the INEL site have generally decreased since the mid-1980s because of changes in disposal practices, radioactive decay, adsorption of radionuclides to rocks and minerals, and dilution by natural surface water and groundwater entering the aquifer (Pittman et al. 1988, Orr and Cecil 1991). Radionuclides released and observed in the groundwater include tritium, strontium-90, iodine-129, cobalt-60, cesium- 137, plutonium-238, plutonium-239/240, and americium-241 (Golder 1994). Most of the radionuclides released have been observed at the ICPP and TRA facility areas. However, radionuclides have also been observed in the TAN disposal well, near CFA, and in perched water near the RWMC.

Concentrations of radionuclides in the aquifer have decreased over time. This decrease is attributed to reduced discharges, adsorption, radioactive decay, and improved waste management practices. As of 1992, concentrations of iodine-129, cobalt-60, tritium, strontium-90, and cesium-137 exceeded the EPA maximum contaminant levels for radionuclides in drinking water in localized areas inside the INEL site boundary (Mann et al. 1988, Orr and Cecil 1991). Plutonium-238, plutonium-239/240, and americium-241 have not been detected at concentrations above the maximum contaminant levels at the INEL site (Golder 1994).

Extremely low concentrations of iodine-129 and tritium have migrated outside of INEL site boundaries. In 1992, iodine-129 concentrations were measured in two wells south of the INEL site boundary below the EPA's maximum contaminant level, as follows: (a) 10 × 10-6 picocuries per liter in Well No. 11, located approximately 4 miles (6 km) beyond the boundary, and (b) 30×10^{-6} picocuries per liter in Well No. 14, located 8 miles (13 km) beyond the boundary (Mann 1994). Tritium concentrations were observed much below maximum contaminant levels just south of the INEL site boundary in 1985. By 1988, the tritium plume encompassed by the 500-picocuries-per-liter contour was back inside the INEL site boundary, and its size has continued to decrease (Orr and Cecil 1991). Cobalt-60, strontium-90, cesium-139, plutonium- 238, plutonium-240/241, and americium-241 have not been detected outside the INEL site boundaries.

Nonradioactive Metals. Sodium, chromium, lead, and mercury have been released on the INEL site and into the subsurface through unlined ponds and deep wells. Of these metals, sodium was released in the greatest quantity from water treatment processes; however, it is not considered toxic and does not have an established maximum contaminant level. In 1988, chromium concentrations exceeding the maximum contaminant level were measured near the TRA. Lead and mercury have been observed at concentrations below the maximum contaminant level near the ICPP (Orr et al. 1991).

Inorganic Salts. Chloride, sulfate, and nitrate have been released into the subsurface by human activities at the INEL site. Although chloride and sulfate have been released, only nitrate has exceeded maximum contaminant levels (near the ICPP in 1981).

only nitrate has exceeded maximum contaminant levels (near the ICPP in 1981). Disposal of nitrates to the injection well and infiltration ponds at the ICPP accounts for the elevated nitrate levels in the central portion of the INEL site. Since 1988, the levels of nitrate have decreased to below the maximum contaminant level as a result of reduced disposal rates.

Organic Compounds. Concentrations of volatile organic compounds have been detected in the aquifer beneath the INEL site. Many of these compounds were detected at amounts near the detection limit (0.002 milligrams per liter), which is the lowest concentration at which a contaminant can be detected by a specific analytical method. However, concentrations of the following compounds exceeding the maximum contaminant levels have been observed in and near the TAN disposal well: chloroform, 1,2-cis-dichloroethylene, 1,1-dichloroethylene, 1,2-transdichloroethylene, trichloroethylene, tetrachloroethylene, and vinyl chloride (Leenheer and Bagby 1982, Mann and Knobel 1987, Mann 1990, Liszewski and Mann 1992, Golder 1994). Carbon tetrachloride was detected beneath the RWMC in the aquifer at concentrations above the maximum contaminant level; however, this concentration was only observed once.

2.4.2.5.3 Perched Water Quality (Refer to Section 4.8.2.5.3, Vol. 2, Part A, DOE 1995)

Wastewater discharges from INEL site operations have infiltrated into the vadose zone and created locally perched water beneath the INEL site. Elevated concentrations of the following contaminants have been detected in samples collected from the following locations: tritium, cesium-137, cobalt-60, chromium, and sulfate concentrations in deep perched water near the TRA; tritium in shallow perched water and carbon tetrachloride, chloroform, 1,1,1-trichloroethane, tricholorethylene, tetrachloroethylene, and 1,1,-dichloroethylene in deep perched water near the RWMC; and strontium-90 in perched water near the ICPP (Bishop 1993). In general, the chemical concentrations, shape, and size of these bodies have fluctuated over time in response to the volume of water discharged to the infiltration ponds. Potential concentrations of contaminants in all perched water bodies have not yet been measured.

2.5 GEOLOGY

This section describes the geological, seismic, and volcanic characteristics of the INEL site and surrounding region.

2.5.1 GENERAL GEOLOGY (Refer to Section 4.6.1, Vol. 2, Part A, DOE 1995)

The INEL site is located on the Eastern Snake River Plain (Figure 2-20). The Plain forms a broad, northeast-trending, crescent-shaped trough with low relief, comprised primarily of basaltic lava flows. These flows at the surface range in age from 1.2 million to 2,100 years. The Plain features thin, discontinuous, interbedded deposits of wind-sediments; and rhyolitic domes formed 1,200,000 to 300,000 years ago (Kuntz et al. 1990). The Plain is bounded on the north and south by the north-to-northwest-trending mountains and valleys of the Basin and Range Province, comprised of folded and faulted rocks that are more than 70 million years old. The Plain is bounded on the northeast by the Yellowstone Plateau. The major episode of Basin and Range faulting began 20 to 30 million years ago and continues today, most recently associated with the October 28, 1983, Borah Peak earthquake [Ms 7.3; 0.022 to 0.078g at the INEL site (Jackson 1985)], which occurred along the Lost River fault, approximately 62 miles (100 km) from INEL site facilities, and the 1959 Hebgen Lake earthquake (Ms 7.5), approximately 93 miles (150 km) from the INEL site (Figure 2-20).

The northeast-trending volcanic terrain of the Plain has a markedly different geologic history and tectonic pattern compared to the older folded and faulted terrain of the northwest-trending Basin and Range. The northwest-trending Basin and Range faults have not been observed to extend across the Plain. Four northwest-trending volcanic rift zones are known to lie across the Plain at or near the INEL site; they have been attributed to basaltic eruptions that occurred 4 million to 2,100 years ago (Bowman 1995, Hackett and Smith 1992, Kuntz et al. 1990).

The seismic characteristics of the Plain and the adjacent Basin and Range Province also are different. Earthquakes and active faulting are associated with Basin and Range tectonic activity. The Plain has historically experienced few and small earthquakes (King et al. 1987, Pelton et al. 1990, WCC 1992, Jackson et al. 1993) (Figure 2-21).

A typical soil association occurring on a lava flow on the INEL site consists of three to four soil series differentiated from one another largely on the basis of soil depth. The INEL site landscapes are covered with a thin-to-thick blanket of eolian sediments, which are deposited in episodes associated with climatic cycles. The thickness of eolian sediments on the INEL site is generally less than 7 feet (2.1 m) and commonly between 1 to 3 feet (0.3 to 0.9 m). Most soils formed in eolian deposits containing a layer of secondary carbonates, which ranges from powdery to cemented.

2.5.2 GEOLOGIC RESOURCES (Refer to Section 4.6.2, Vol. 2, Part A, DOE 1995)

A geothermal exploration well was drilled at the INEL site to a depth of 10,320 feet (3,147 m) in 1979. A temperature of 288°F (142°C) was measured, but no commercial quantities of geothermal fluids were identified (Mitchell et al. 1980). Mineral resources include several quarries or pits within the INEL site boundary to supply sand, gravel, pumice, silt, clay, and aggregate for road construction and maintenance, new facility construction and maintenance, waste burial activities, and ornamental landscaping cinders. During the course of excavation, the gravel pits may be studied to characterize the local surficial geology of the INEL site. Outside the INEL site boundary, mineral resources include sand, gravel, pumice, phosphate, and base and precious metals (Strowd et al. 1981, Mitchell et al. 1981). The geologic history of the Plain makes the potential for petroleum production at the INEL site very low.

2.5.3 SEISMIC HAZARDS (Refer to Section 4.6.3, Vol. 2, Part A, DOE 1995)

The distribution of earthquakes at and near the INEL site from 1884 to 1989 clearly shows that the Plain has a remarkably low rate of seismicity, whereas the surrounding Basin and Range has a fairly high rate of seismicity (Figure 2-21). The mechanism for faulting and generation of earthquakes in the Basin and Range is attributed to northeast-southwest directed crustal extension.

Several investigators have suggested hypotheses for the low rate of seismic activity within the Plain compared to the Centennial Tectonic Belt (Stickney and Bartholomew 1987) and Intermountain Seismic Belt (Smith and Arabasz 1991):

- Smith and Sbar (1974) and Brott et al. (1981) suggested that high crustal temperatures beneath the Plain and adjacent region inside the seismic parabola (Figure 2-20) resulted in ductile deformation (aseismic creep), in contrast to the brittle deformation (rock fracture) that occurs in the Basin and Range.

- Anders et al. (1989) suggested that the Plain and the adjacent region inside the seismic parabola (Figure 2-20) have increased integrated lithospheric strength. They proposed that the presence of mid-crustal mafic intrusive rock strengthens the crust so that it is too strong to fracture (see also Smith and Arabasz 1991).

- Parsons and Thompson (1991) proposed that magmatic dike injection suppresses normal faulting and associated seismicity by altering the local tectonic stress field. As dikes are injected in volcanic rift zones, they push apart the surrounding rocks and decrease differential stress, thereby preventing earthquakes from occurring.

- Recently, Anders and Sleep (1992) proposed that introduction of mantle-derived magma into the midcrust beneath the Plain has decreased faulting and earthquakes by lowering the rate of deformation.

The markedly different late-Tertiary and Quaternary tectonic and seismic histories of the Plain and Basin and Range Province reflect the dissimilar deformational processes acting in each region. Both regions are being subjected to the same extensional stress field (Weaver et al. 1979, Zoback and Zoback 1989, Pierce and Morgan 1992, Jackson et al. 1993); however, crustal deformation within the Plain occurs through dike injection and, in the Basin and Range, through large-scale normal faulting (Rodgers et al. 1990, Parsons and Thompson 1991, Hackett and Smith 1992).

Major seismic hazards include the effects from ground shaking and surface deformation (surface faulting, tilting). Other potential seismic hazards (for example, avalanches, landslides, mudslides, soil settlement, and soil liquefaction) are not likely to occur at the INEL site because the local geologic conditions are not conducive to them. Based on the seismic history and the geologic conditions, earthquakes greater than magnitude 5.5 (and associated strong ground shaking and surface fault rupture) are not likely to be generated within the Plain. However, moderate to strong ground shaking can affect the

INEL site from earthquakes in the Basin and Range. Patterns of seismicity and locations of mapped faults are used to assess potential sources of future earthquakes and to estimate levels of ground motion at the INEL site. The sources and maximum magnitudes of earthquakes that could produce the maximum levels of ground motions at all INEL site facilities include (WCC 1990, 1992):

- A moment magnitude 7.0 earthquake at the southern end of the Lemhi fault along the Howe and Fallert Springs segments

- A moment magnitude 7.0 earthquake at the southern end of the Lost River fault along the Arco segment

- A moment magnitude 5.5 earthquake associated with dike injection in either the Arco or Lava Ridge-Hell's Half Acre Volcanic Rift Zones and the Axial Volcanic Zone

- A "random" moment magnitude 5.5 earthquake occurring within the Eastern Snake River Plain.

An example of the relationship of the peak ground acceleration on the INEL site to the annual frequency of occurrence of seismic events for various seismic hazards in the region, including the above four events, is illustrated in Figure 2-22 (WCFS 1993). The curves were developed specifically for the site of the ICPP in the south-central INEL site and do not directly apply to other INEL site areas. Ground motion contributions from seismic sources not shown on Figure 2-22 (that is, Intermountain Seismic Belt, Idaho Batholith, and Yellowstone Region) are significantly smaller because of their distant locations or lower maximum magnitudes. The INEL site- specific seismic hazard study (WCFS 1993) will provide curves similar to Figure 2-22 for other INEL site areas. INEL site seismic design basis events are determined by the INEL Natural Phenomena Committee and incorporated into the INEL Architectural and Engineering Standards based on studies (WCC 1990).

A probabilistic seismic hazards evaluation conducted in 1996 provides uniform seismic hazard curves (peak ground accelerations vs return periods) and response spectra for the INEL including ICPP (WCFS 1996). This evaluation assessed earthquake magnitudes and recurrence rates for all earthquake sources which contribute to potential ground motions at the ICPP site. The four closest sources that contribute to the hazard at ICPP include: 1) Basin and Range normal faults; 2) northern Basin and Range background seismicity; 3) ESRP background seismicity; and 4) when active, volcanic rift zones of the ESRP.

Results of this INEL seismic hazard evaluation significant to the ISFSI include:

- The ISFSI is located within the ESRP, which is characterized by a very low rate of seismicity and small magnitude earthquakes. Thus, the background earthquakes within the ESRP contribute very little to the hazard at the ISFSI.

- There is very little contribution from the volcanic rift zones because the volcanic episodes have long recurrence intervals (>15,000 yrs) and any associated seismicity is characterized by small magnitude (< 5.5) earthquakes.

- In general, the stochastic relationship results in lower motions at short periods than the empirical relationships because of the interbedded volcanic stratigraphy which has a lower velocity gradient in the upper 1 km than homogeneous rock and the alternating high and low velocities which tend to dampen out high frequency ground motions.

- At shorter return periods (<2000 yrs) the hazard is dominated by the northern Basin and Range background seismicity due in part to the extremely low level of seismicity in the ESRP and the long recurrence intervals of the Basin and Range faults.

- The Basin and Range faults contribute more to the hazard at 10,000 yrs because this return period approaches the average recurrence interval of the faults.

In addition to the above probabilistic evaluation, a deterministic analysis was also performed for the ISFSI site. This analysis was based in part on the results of a 1990 deterministic evaluation for INEL (WCC 1990) and recent fault-trenching studies conducted along the Lemhi and Lost River faults (WCC 1992,WCFS 1995). The Lemhi fault is the closest basin-and-range normal fault to the ISFSI site and controls the deterministic seismic hazard. The paleoseismic characteristics and geometry of this fault indicate that it has the potential for a moment-magnitude 7.1 earthquake at a distance of 22 km from the ISFSI site. The same attenuation relationships from the probabilistic study were used in the deterministic analysis and were weighted the same as in the probabilistic evaluation.

2.5.4 VOLCANIC HAZARDS (Refer to Section 4.6.4, Vol. 2, Part A, DOE 1995)

Volcanic hazards at the INEL site can come from sources inside or outside the Plain's boundaries. Volcanic hazards include the effects of lava flows, ground deformation (fissures, uplift, subsidence), volcanic earthquakes (associated with magmatic processes as distinct from earthquakes associated with tectonics), and ash flows or airborne ash deposits (Bowman 1995). Most of the basalt volcanic activity occurred from 4 million to 2,100 years ago in the INEL site area. The most recent and closest volcanic eruption occurred 2,100 years ago at the Craters of the Moon National Monument 15 miles (25 km) southwest of the INEL site (Kuntz et al. 1992). The rhyolite domes along the Axial Volcanic Zone formed between 1.2 and 0.3 million years ago and have a recurrence interval of about 200,000 years. Therefore, the probability of future dome formation affecting INEL site facilities is very low.

Catastrophic Yellowstone eruptions have occurred three times in the past 2 million years, but the INEL site lies more than 70 miles (160 km) from the Yellowstone Caldera rim, and high-altitude winds would not disperse Yellowstone ash in the direction of the INEL site. For these reasons of infrequency, great distance, and unfavorable dispersal, pyroclastic flows or ash fallout from future Yellowstone eruptions are not expected to impact the INEL site.

Basaltic lava flows and eruptions from fissures or vents have been evaluated and based on a probability analysis of the volcanic history in and near the southcentral INEL site area, the Volcanism Working Group (VWG 1990) estimated that the conditional probability that basaltic volcanism would affect a south-central INEL site location is less than 2.5×10^{-5} per year (once per 40,000 years or longer), where the hazard associated with Axial Volcanic Zone volcanism is greatest. The probability of volcanic impact on INEL site facilities farther north, where both silicic and basaltic volcanism have been older and less frequent, is estimated to be less than 10^{-6} per year (once every million years or longer). The statistics of 116 measured INEL-area lava flow lengths and areas were used to define the two lava flow hazard zones (Figure 2-23). The mean lava flow length plus one standard deviation from the mean corresponds to 8.7 miles (14 km). The hazard for a particular site within or near a volcanic zone is much lower, typically by an order of magnitude or more, and must be assessed on a site-specific basis (Bowman,1995).

Hazards associated with INEL-area volcanism as well as distant volcanic sources are evaluated. The most significant hazards and risks to the ISFSI site are associated with basaltic volcanism and related phenomena from ESRP vents.

For volcanic areas such as the ESRP, with no historical volcanism and an incomplete chronologic record of prehistoric volcanism, assessments of potential volcanic hazards and volcanic risk are based on interpretation of the long-term geologic record, and on the documented effects of historical eruptions in analog regions such as Iceland and Hawaii. Volcanic hazards to the ISFSI site are related to future basaltic and rhyolitic eruptions along volcanic-rift zones and the axial volcanic zone. The most significant volcanic hazard to INEL is the inundation or burning of facilities by basaltic lava flows from volcanic-rift zones. A significant, related hazard is disruption of facilities due to ground deformation accompanying magma intrusion along volcanic-rift zones: opening of fissures, normal faulting, broad-region tilting and uplift within several km of vents. Other, less significant basaltic hazards include volcanic-gas emission and disruption of groundwater.

Available geologic-map data and geochronometry of INEL basalt lava flows suggest minimum (most conservative) volcanic-recurrence intervals of 10^{-4} to 10^{-5} per year, for the Axial volcanic zone, and the Arco and Lava Ridge-Hells Half Acre volcanic-rift zones. The probabilistic risk of basalt-lava inundation or intrusion-related ground disturbance is therefore estimated to be $< 10^{-5}$ per year, for the ISFSI site and other sites on the southern INEL. Risk from these phenomena at northern-INEL sites is still lower, because volcanism there has been less frequent and less recent. The probability of significant impact from all other volcanic phenomena, such as growth of new rhyolite domes on the ESRP or thicker than 8-cm tephra fall from non-ESRP vents, is estimated to be $<10^{-5}$ per year, due to the combined effects of great distance, infrequency, low volume, and topographic or atmospheric barriers to the dispersal of tephra on the INEL.

2.6 REGIONAL HISTORIC, ARCHAEOLOGICAL SITES, HISTORIC STRUCTURES, CULTURAL, SCENIC, AND NATURAL FEATURES

This section discusses all cultural resources at the INEL, including prehistoric and historic archaeological sites, historic sites and structures, and traditional resources that are of cultural or religious importance to local Native Americans. Paleontological localities on the INEL site are also discussed.

2.6.1 ARCHAEOLOGICAL SITES, HISTORIC STRUCTURES, AND CULTURAL RESOURCES (Refer to Section 4.4.1, Vol. 2, Part A, DOE 1995)

As summarized in the INEL Draft Management Plan for Cultural Resources (Miller 1992), the INEL contains a rich and varied inventory of cultural resources. This includes fossil localities that provide an important paleoecological context for the region and the numerous prehistoric archaeological sites that are preserved within it. These latter sites, including campsites, lithic workshops, cairns, and hunting blinds, among others, are also an important part of the INEL inventory. These sites provide information about the activities of aboriginal hunting and gathering groups who inhabited the area for approximately 12,000 years. Archaeological sites, pictographs, caves, and many other features of the INEL landscape are also important to contemporary Native American groups for historical, religious, and traditional reasons. Historic sites document use of the area during the late 1800s and 1900s. These include the abandoned town of Powell/Pioneer, a northern spur of the Oregon Trail known as Goodale's Cutoff, many small homesteads, irrigation canals, sheep/cattle camps, and stage/wagon trails. Finally, important information on the historical development of nuclear science in America is also preserved in the many scientific and technical facilities constructed within the INEL boundaries.

As of June 1994, more than 100 cultural resource surveys have been conducted over approximately 4 percent of the area within the INEL site. During the course of these surveys, most of which have been conducted near major facility areas, 1,506 individual archaeological resources have been identified, including 688 prehistoric sites, 38 historic sites, 753 prehistoric isolates, and 27 historic isolates (Miller 1992, Gilbert and Ringe 1993). Until formal significance evaluations (archaeological testing and historic records searches) are completed, all of the cultural sites in this inventory are considered to be potentially eligible for nomination to the National Register of Historic Places. However, all of the isolates have been categorized as unlikely to meet eligibility requirements (Yohe 1993).

Due to the relatively high density of prehistoric sites on the INEL site and the need to allow for consideration of these resources during Federal undertakings, a preliminary study, which resulted in the development of a predictive model, has been completed.

This study identified areas where densities of sites are apparently highest and the potential impacts to significant archaeological resources, as well as the costs of compliance, will likely increase correspondingly (Ringe 1993). This information is intended to provide some guidance for INEL project managers in selecting appropriate areas for new construction. However, it does not take the place of inventories that are required by the National Historic Preservation Act in advance of all ground-disturbing projects (NHPA). The predictive model was constructed using a multivariate technique on environmental variables associated with areas containing sites and areas with no sites. This model shows that prehistoric cultural resources appear to be concentrated in association with certain definable physical features of the land. In this context, very high densities of resources are likely to be found along the Big Lost River and Birch Creek, atop buttes, and within craters and caves. The Lemhi Mountains, the Lake Terreton basin, and a 1.75-mile- (2,800-m) wide zone along the edge of local lava fields probably contain a fairly high density of sites. Within the extensive flows of basaltic lava and along the low foothills of the Lemhi Mountains, site density is classified as moderate. The lowest density of prehistoric resources probably occurs within the floodplain of the Big Lost River and the alluvial fans emerging from the Birch Creek Valley, within the sinks, and within the recent Cerro Grande lava flow. However, a classification of low or medium density does not eliminate the possibility that significant resources exist within those areas. Although this model has not been tested, it is useful as a planning guide for defining those areas most likely to contain archaeological resources based on past surveys.

Although no systematic inventory of historically significant facilities associated with the creation and operation of the INEL has been completed, a preliminary study indicated that all INEL facilities will require evaluation (Braun et al. 1993). The Experimental Breeder Reactor-I is a National Historic Landmark listed in the National Register of Historic Places. To date, however, few of the other properties have been formally evaluated for eligibility to the National Register of Historic Places. However, Memoranda of Agreement between DOE, the Idaho State Historic Preservation Office, and the National Advisory Council on Historic Preservation establish that certain structures located at TAN (DOE-ID 1993b) and Auxiliary Reactor Area (DOE-ID 1993c) are eligible for nomination. These memoranda outline specific techniques for preserving the historic value of the areas in conformance with the requirements of the Historic American Building Survey and the Historic American Engineering Record. Other facilities on the INEL site are likely to require similar efforts if scheduled for major modification, demolition, or abandonment.

Due to the highly disturbed nature of the ISFSI site it is unlikely that any archaeological resources are present. However, in the event that materials such as bones, obsidian debris, "arrowheads," or charcoal-colored soil horizons are encountered, the INEL Stop Work Authority would be invoked and the INEL Cultural Resource Management Office consulted.

2.6.2 NATIVE AMERICAN CULTURAL RESOURCES (Refer to Section 4.4.2, Vol. 2, Part A, DOE 1995)

Because Native American people hold the land sacred, in their terms the entire INEL reserve is culturally important. Cultural resources, to the Shoshone-Bannock Tribes, include all forms of traditional lifeways and usage of all natural resources. This includes not only prehistoric archaeological sites, which are important in a religious or cultural heritage context, but also features of the natural landscape and air, plant, water, or animal resources that have special significance. These resources may be affected by changes in the visual environment (construction, ground disturbance, or introduction of a foreign element into the setting), dust particles, or by contamination. Geographically, the INEL site is included within a large territory once inhabited by and still of importance to the Shoshone-Bannock. Plant resources used by the Shoshone-Bannock that are located on or near the INEL site are listed in Table 2-17. Areas significant to the Shoshone-Bannock would include the buttes, wetlands, sinks, grasslands, juniper woodlands, Birch Creek, and the Big Lost River.

Five Federal laws prompt consultation between Federal agencies and Native American tribes: the National Environmental Policy Act (NEPA), the National Historic Preservation Act, as amended (NHPA), the American Indian Religious Freedom Act (AIRFA), the Archaeological Resources Protection Act (ARPA), and the Native American Graves Protection and Repatriation Act (NAGPRA). In accordance with these directives and in consideration of DOE's written Native American policy (DOE 1990b, 1992), DOE at the INEL has committed to additional interaction and exchange of information with the Shoshone-Bannock Tribes of the nearby Fort Hall Indian Reservation and is developing procedures for consultation and coordination. This relationship is outlined in a formal Working Agreement between the Shoshone-Bannock and DOE (DOE-ID 1992), the Cultural Resources Management Plan for the INEL (Miller 1992), and the curation agreement for permanent storage of archaeological materials are planned for completion by June 1996[7]. The Cultural Resources Management Plan would define procedures for involving the Shoshone-Bannock during the planning stages of project development. The curation agreement would provide for the repatriation of burial goods in accordance with the Native American Graves Protection and Repatriation Act.

2.6.3 PALEONTOLOGICAL RESOURCES (Refer to Section 4.4.3, Vol. 2, Part A, DOE 1995)

There are 31 known fossil localities at the INEL site, and available information suggests that the region has relatively abundant and varied Paleontological resources. Preliminary analyses suggest that these materials are most likely to be found in association with

7 Memorandum of Understanding for Curatorial Services between the U. S. Department of Energy, Idaho Operations Office, and the Archaeological Survey of Idaho", signed by R. Cullison (DOE-ID), R Yohe (archaeological Survey of Idaho), A. Jackson (Idaho Museum of Natural History, and R. Bowen (Idaho State University), June 1996. Cultural Resource Management Plan for the INEL completed (Miller, 1995).

archaeological sites; in areas of basalt flows; in deposits of the Big Lost River, Little Lost River, and Birch Creek; in deposits of Lake Terreton and playas; in some wind and sand deposits; and in sedimentary interbeds or lava tubes within local lava flows (Table 3-1 in Miller 1992).

2.6.4 VISUAL AND SCENIC RESOURCES

2.6.4.1 Visual Resources (Refer to Section 4.5.1, Vol. 2, Part A, DOE 1995)

The INEL site is bordered on the north and west by the Bitterroot, Lemhi, and Lost River mountain ranges. Volcanic buttes near the southern boundary of the INEL can be seen from most locations on the site and the Fort Hall Indian Reservation. Most of the INEL site consists of open, undeveloped land, predominantly covered by Big Sagebrush and grasslands (see Section 2.2, Ecology). Pasture and irrigated farmland border much of the INEL site (see Section 2.1.3, Uses of Adjacent Lands and Waters).

Nine facility areas are located on the INEL site. Although the INEL has a master plan, no specific visual resource standards have been established. The generally low density INEL facilities look like commercial/industrial complexes and are dispersed throughout the INEL site. The structures range in height from 10 feet (3 m) to approximately 100 feet (30 m), with a few stacks and towers that reach up to 250 feet (76 m). Although many INEL facilities are visible from highways, most facilities are located over half a mile (0.8 km) from public roads. The facility closest to a public road, 0.4 mile (0.6 km) is the Water Reactor Research Test Facility about 60 feet in height (18 m), located off State Highway 33. This section of Highway 33 is used primarily by the INEL workforce at TAN.

About 90 miles (144 km) of paved public highway run through the INEL site. U.S. Highway 20 runs east and west across the southern portion, and has one rest stop within the INEL boundaries. This is the highway most heavily used by the INEL workforce. It is a direct route from the Idaho Falls area to Boise, Idaho, and recreational areas such as Sun Valley and Craters of the Moon National Monument. The Experimental Breeder Reactor-I, just off Highway 20, is a National Historic Landmark. It had 14,000 visitors in 1992 (Braun 1993) but was closed temporarily for repairs in 1993. U.S. Highway 26 runs southeast and northwest, intersecting Highway 20 near the CFA. State Highways 22, 28, and 33 cross the northeastern part of the INEL site.

2.6.4.2 Scenic Areas (Refer to Section 4.5.2, Vol. 2, Part A, DOE 1995)

The Craters of the Moon National Monument is located about 15 miles southwest of the INEL site's western boundary. The seasonal visual range from Craters of the Moon is from 81 to 97 miles (130 to 156 km) (Notar 1993). The Monument is located in a designated Wilderness Area, for which Class I (very high) air quality standards, or minimal degradation, must be maintained, as defined by the Clean Air Act (CFR 1977, 1990). Under the Clean Air Act, air quality is defined to include visibility and scenic view considerations.

Lands adjacent to the INEL, under Bureau of Land Management jurisdiction, are designated as Visual Resource Management Class II areas (BLM 1984, 1986). This designation urges preservation and retention of the existing character of the landscape. Lands within INEL site boundaries are designated as Class III and IV, the most lenient classes in terms of modification. The Bureau of Land Management is considering the Black Canyon Wilderness Study Area, located adjacent to the INEL, for Wilderness Area designation (BLM 1986), which, if approved, would result in an upgrade of its Visual Resource Management class from Class II to Class I.

Features of the natural landscape have special significance to the Shoshone-Bannock tribes. The visual environment of the INEL site is within the visual range of the Fort Hall Indian Reservation.

2.7 NOISE (Refer to Section 4.10, Vol. 2, Part A, DOE 1995)

The noise level at the INEL ranges from 10 dBA for the rustling of grass to 115 dBA, the upper limit for unprotected hearing exposure established by the Occupational Safety and Health Administration (OSHA), from the combined sources of industrial operations, construction activities, and vehicular traffic, including aircraft. The playas and remote lava flows of the INEL site have relatively low ambient noise levels of about 35 to 40 dBA. Onsite, in accordance with INEL procedures, industrial hygiene practices assure hearing protection for workers. Noise limits for the workplace are established to protect workers in accordance with OSHA standards (CFR 1992). Site workers are required by OSHA to wear ear protection devices when exposed to noise levels above 85 dBA on an eight-hour time-weighted average. Shredding and painting operations at the CFA produced the highest noise levels measured at the INEL at 104 dBA and 99 dBA, respectively. The computer room measured 88 dBA, and the snack bar measured 60 dBA. The noise generated at the INEL site is not propagated at detectable levels offsite, since all public areas are at least 5 miles (8 km) away from site facility areas.

Previous studies of the effects of noise on wildlife indicate that even very high intermittent noise levels at the INEL (over 100 dBA) would have no deleterious effect on wildlife productivity (Leonard 1993).

2.8 FIGURES, TABLES, AND REFERENCES

2.8.1 FIGURES

2.8.2 TABLES

Table 2-17. Plants used by the Shoshone-Bannock that are located on or near the Idaho National Engineering Laboratory site.

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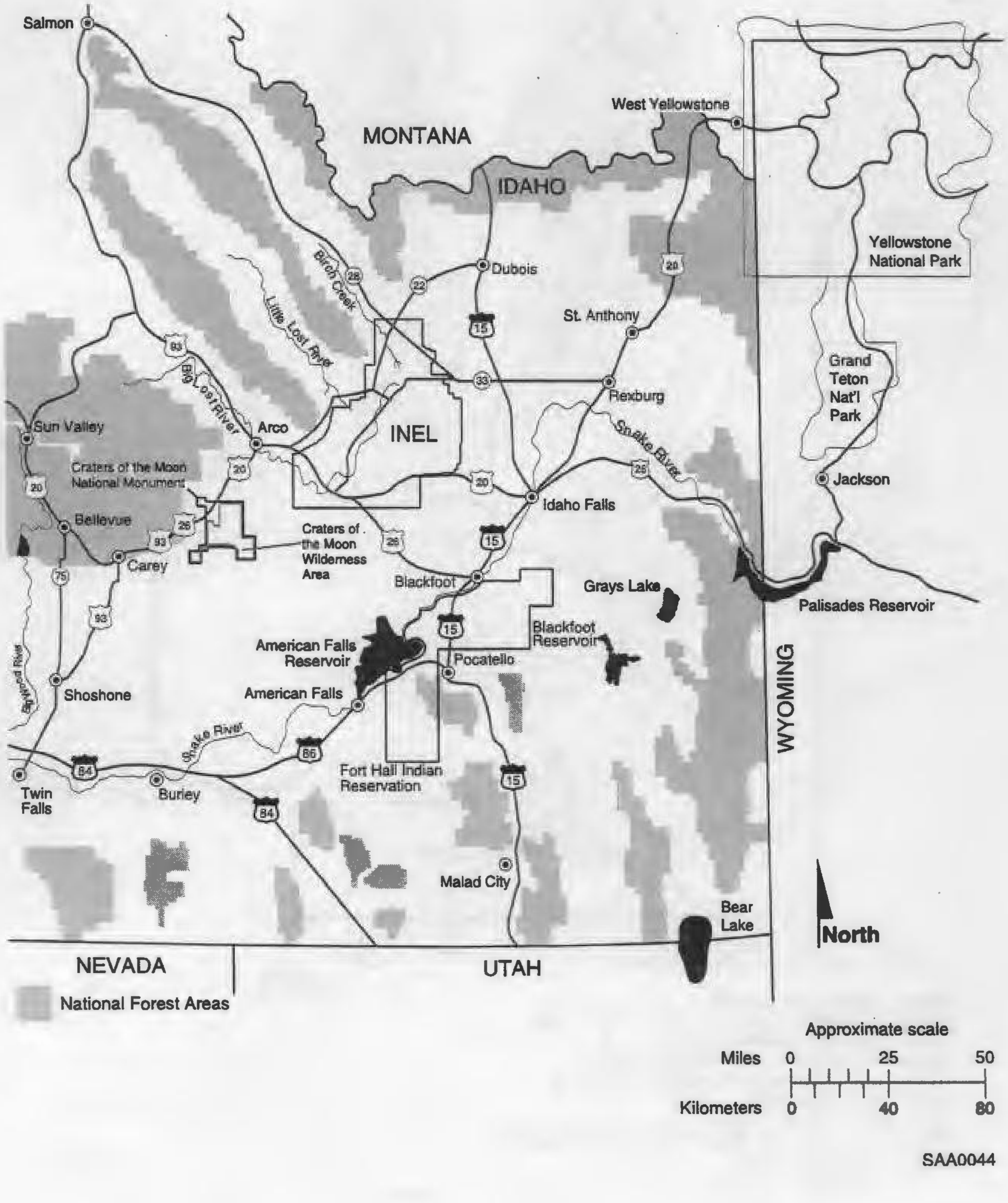


Figure 2-1 Location of the INEL in southeastern Idaho.

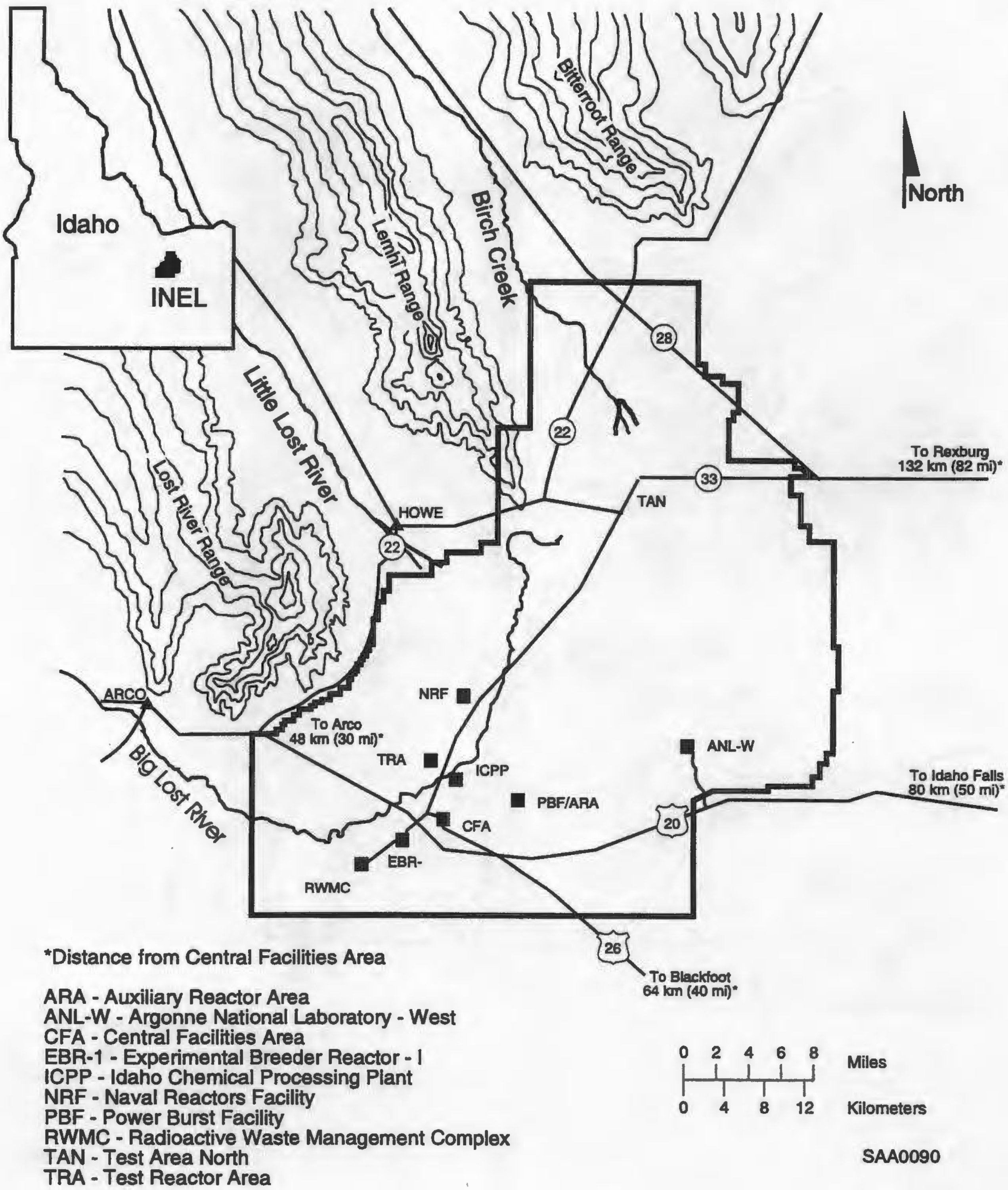


Figure 2-2 Idaho National Engineering Laboratory's primary facility areas.

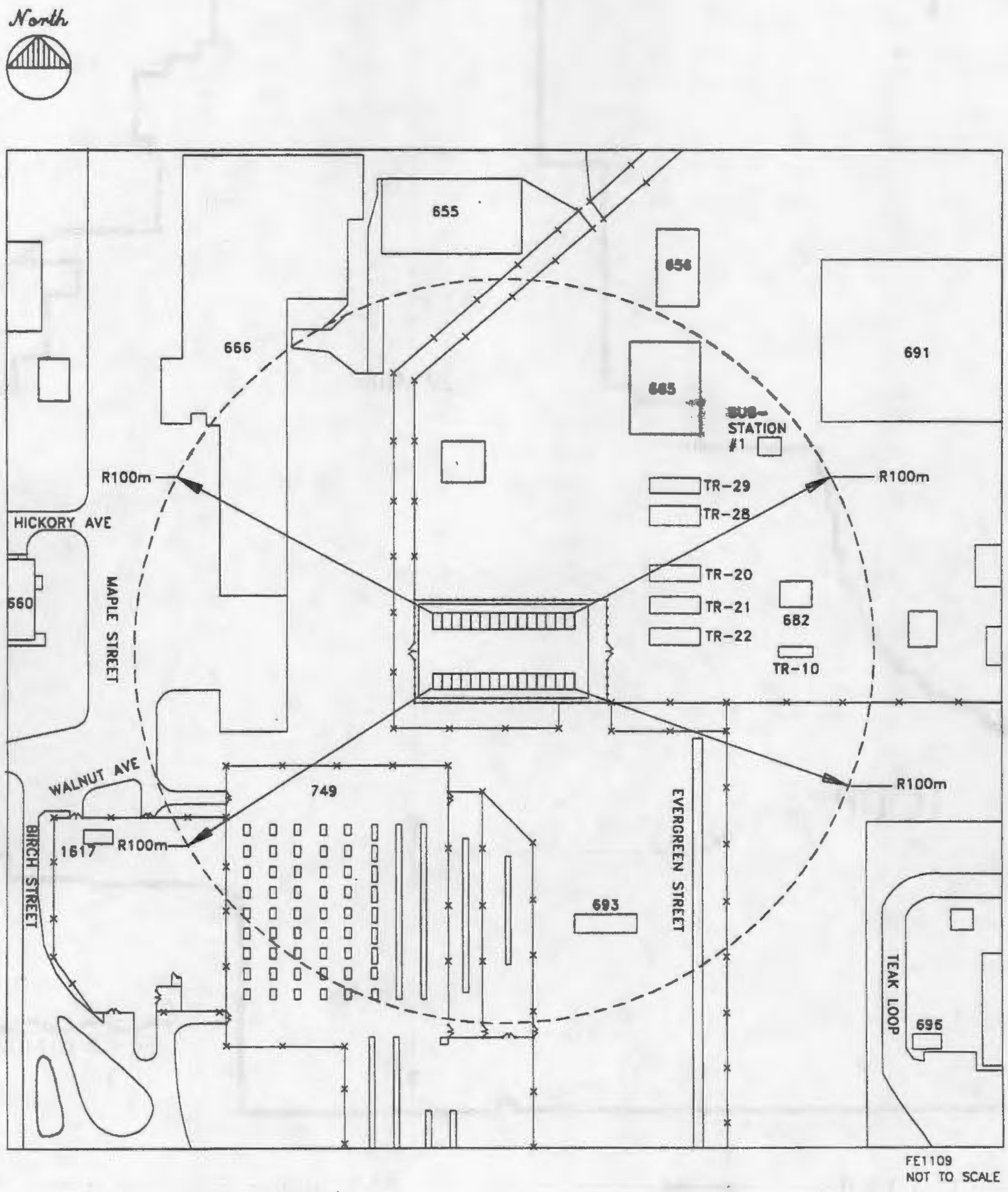


Figure 2-3 TMI-2 ISFSI Location with 100 meter Radius Line.

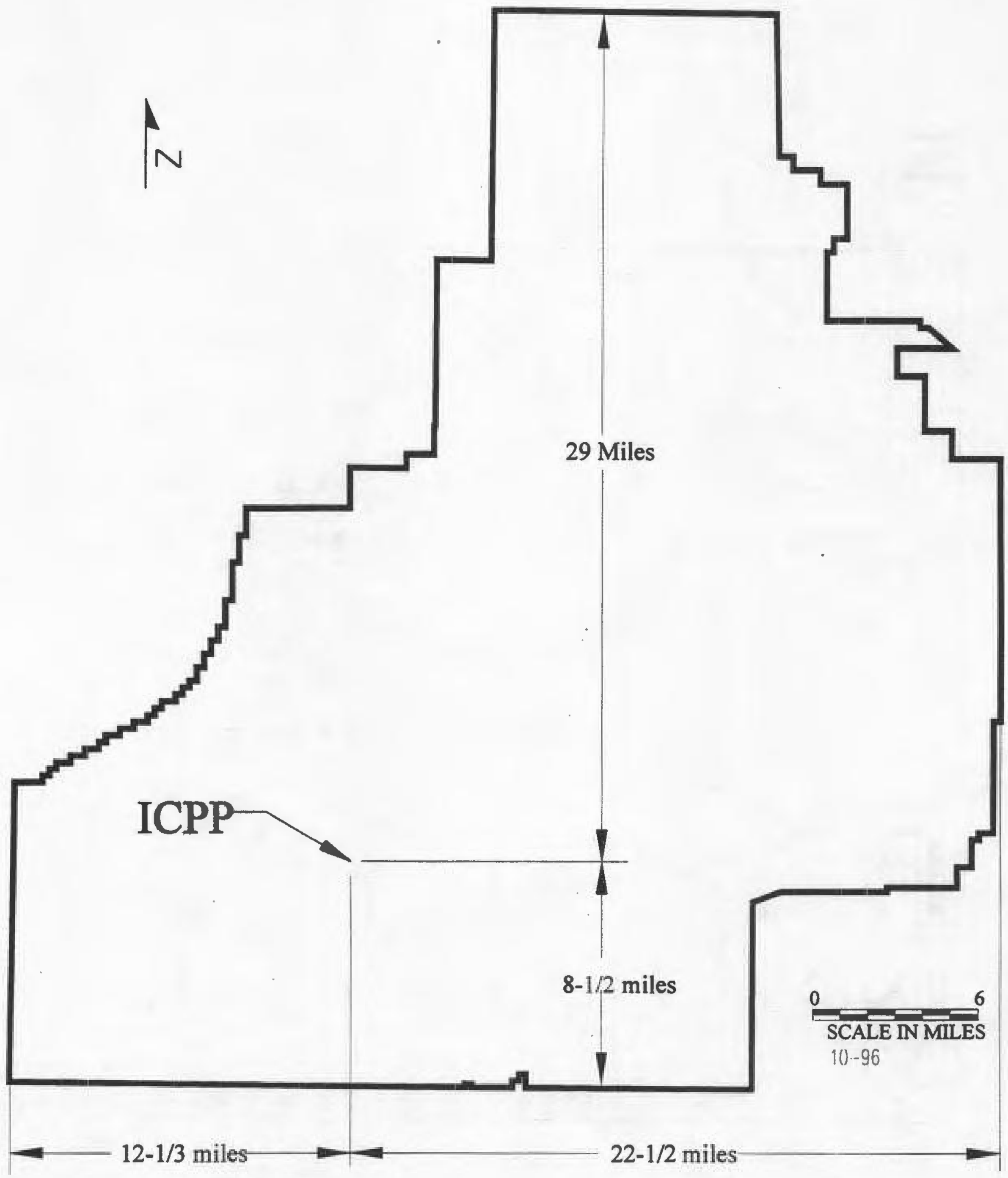


Figure 2-4. Distance from the ICPP to the INEL Boundary.

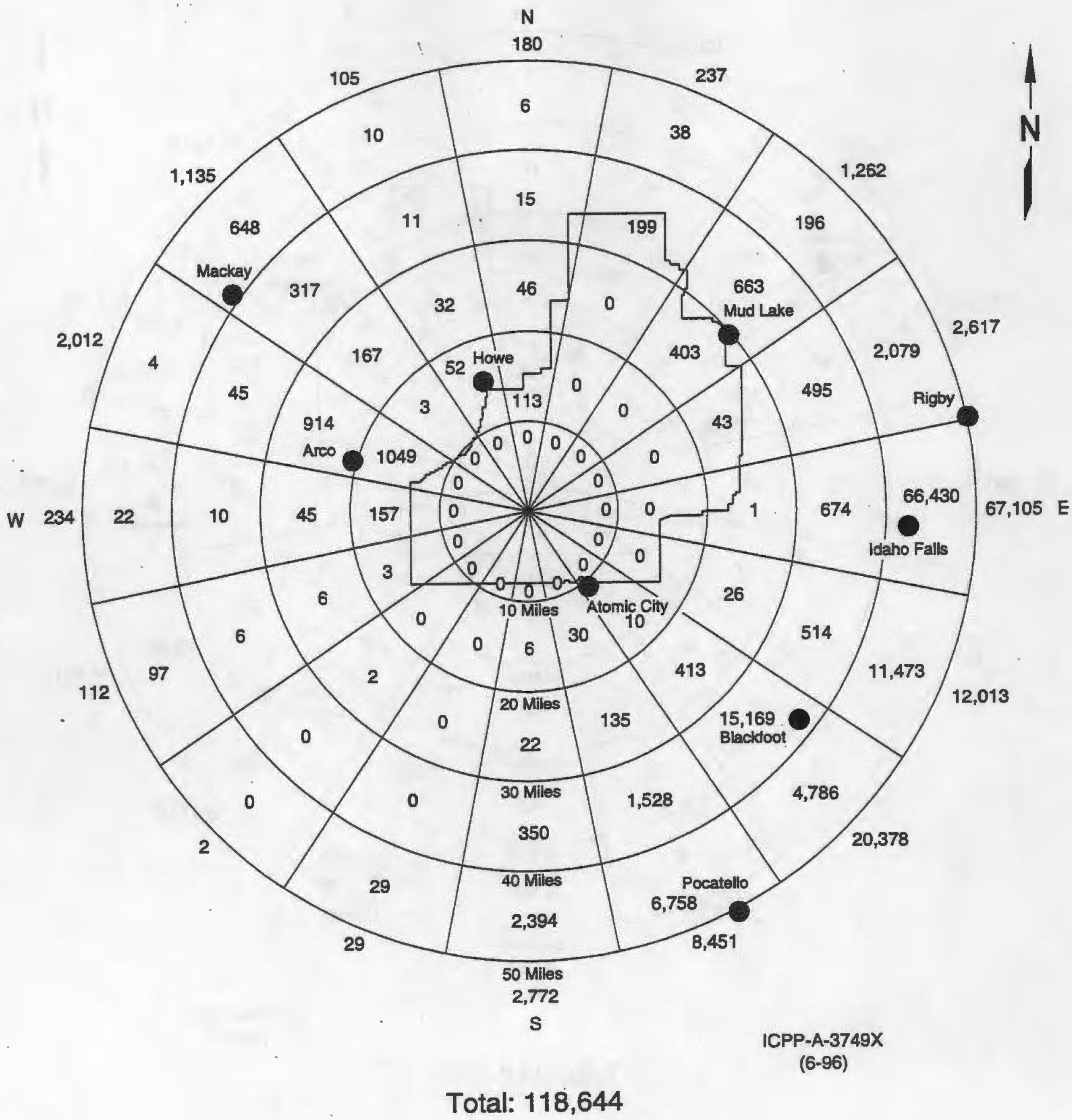


Figure 2-5 Population Distribution for 1990 within 50 miles (80 km.) of ICPP.

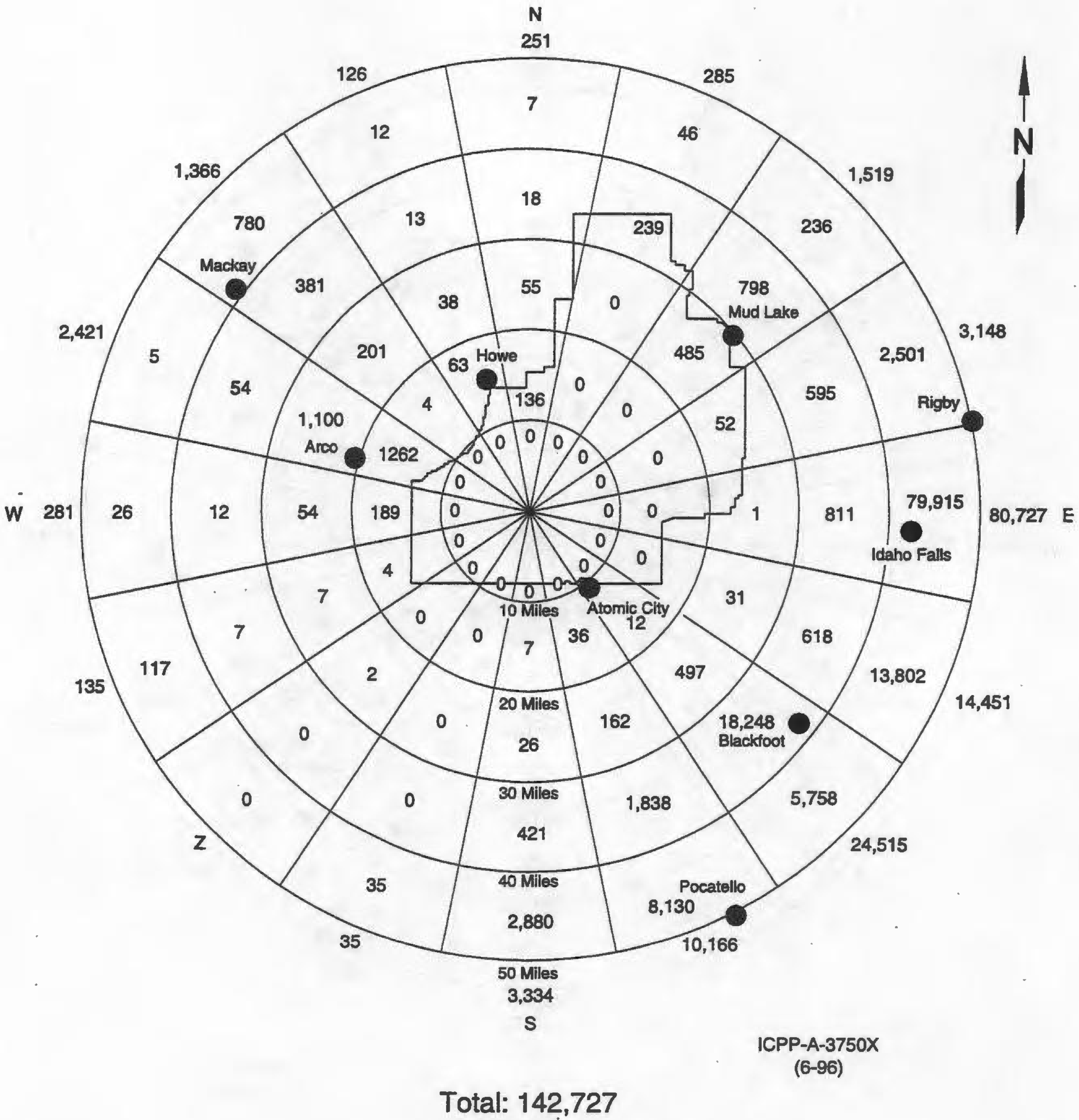
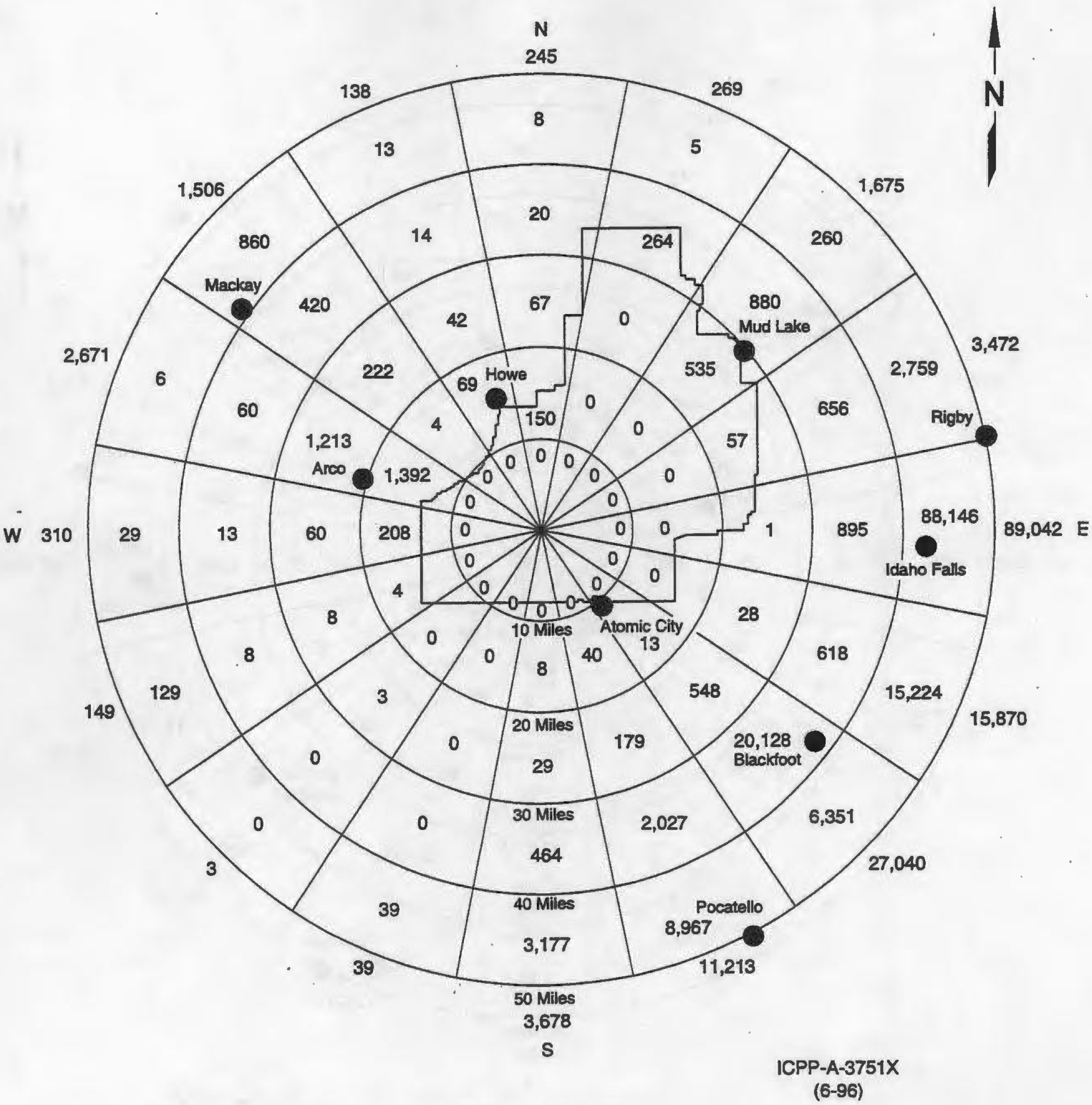


Figure 2-6 Population Distribution for 2000 within 50 miles (80 km.) of ICPP.



Total: 157,320

Figure 2-7 Population Distribution for 2010 within 50 miles (80 km.) of ICPP.

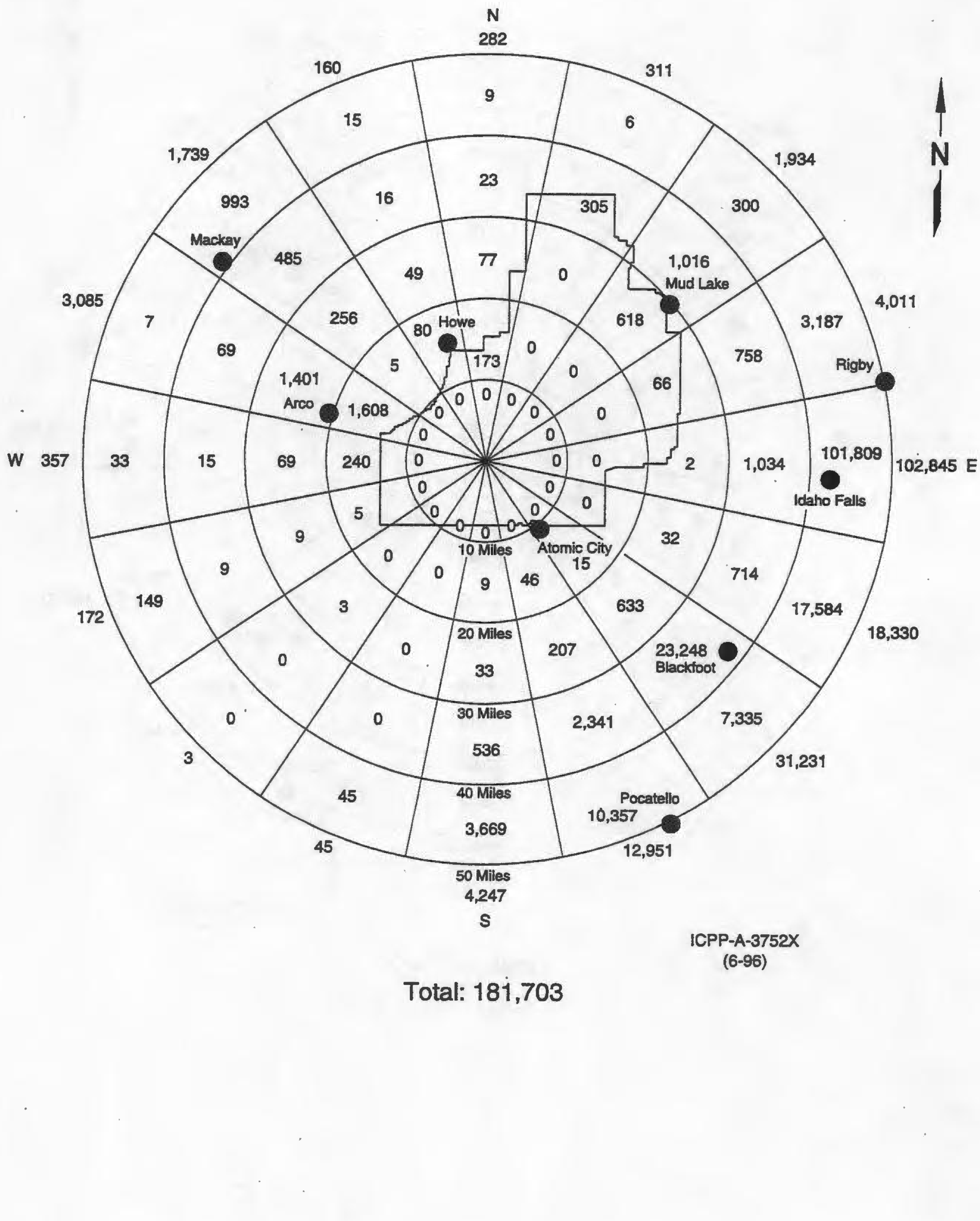


Figure 2-8 Population Distribution for 2020 within 50 miles (80 km.) of ICPP.

ANL-W	Argonne National Laboratory-West
ARA	Auxiliary Reactor Area
CFA	Central Facilities Area
EBR-I	Experimental Breeder Reactor - I
ICPP	Idaho Chemical Processing Plant
NRF	Naval Reactors Facility
PBF	Power Burst Facility
RWMC	Radioactive Waste Management Complex
TAN	Test Area North
TRA	Test Reactor Area
WERF	Waste Experimental Reduction Facility

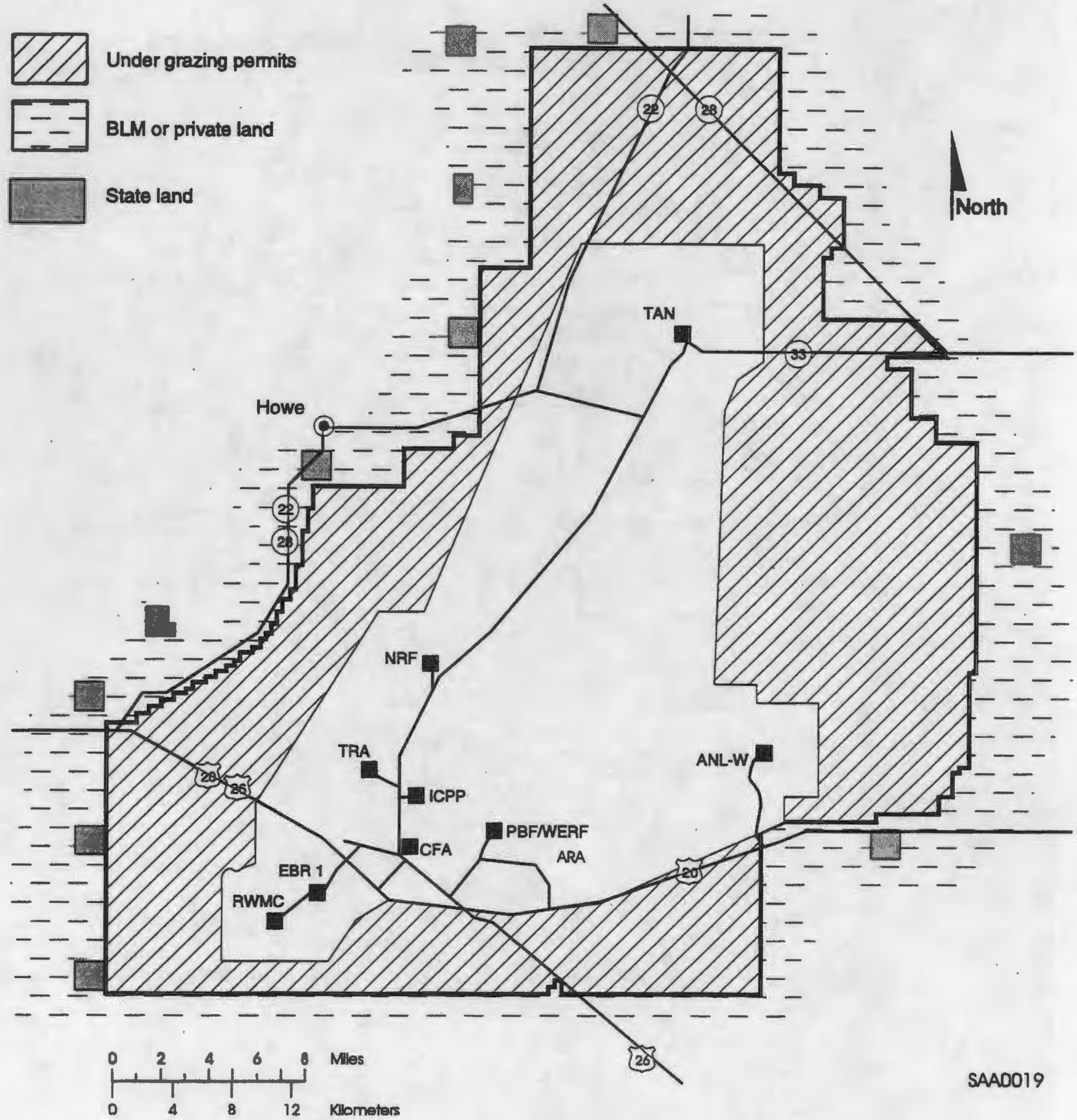


Figure 2-9 Selected land uses at the INEL and surrounding region.

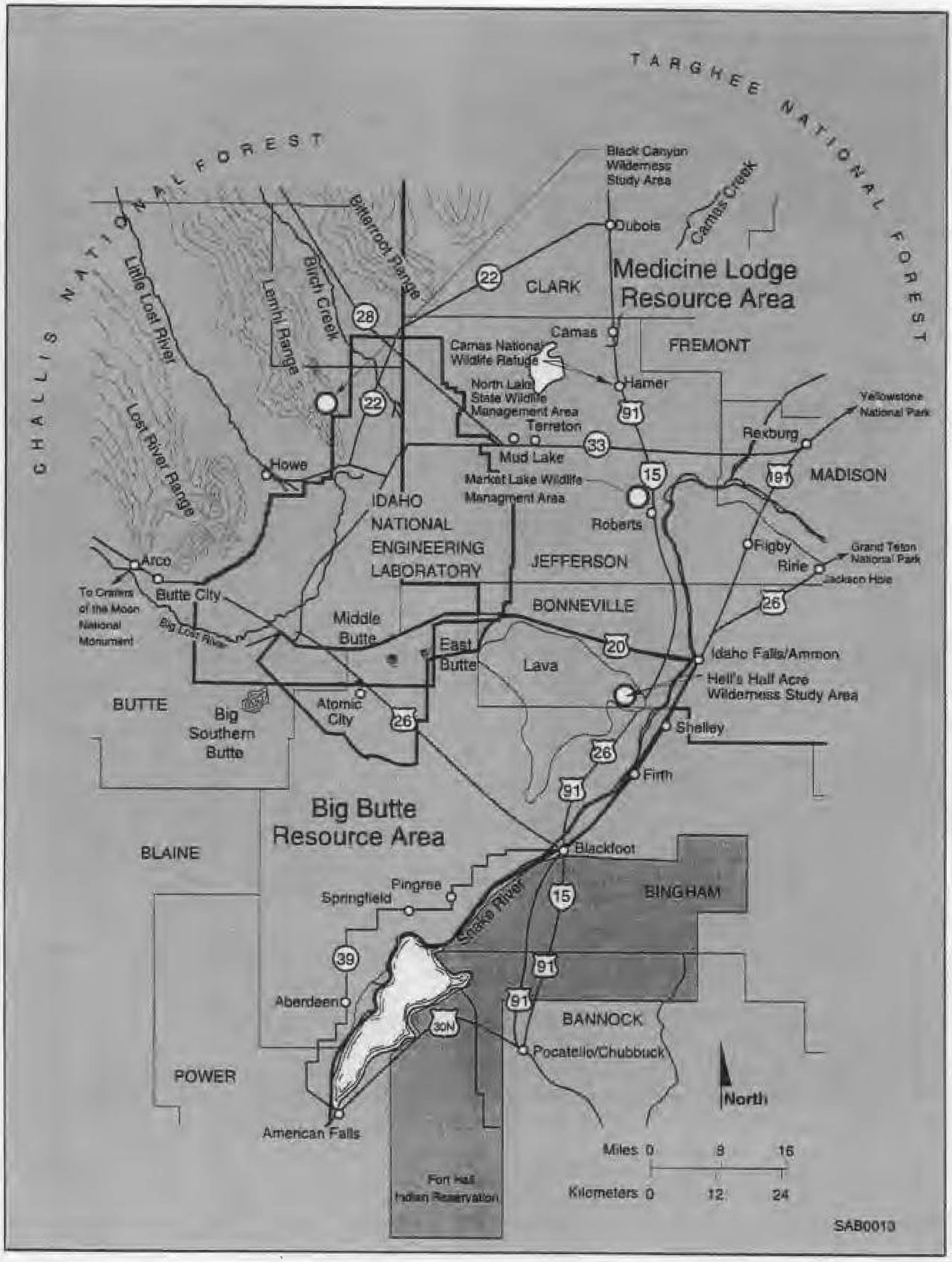


Figure 2-10 INEL site vicinity map.

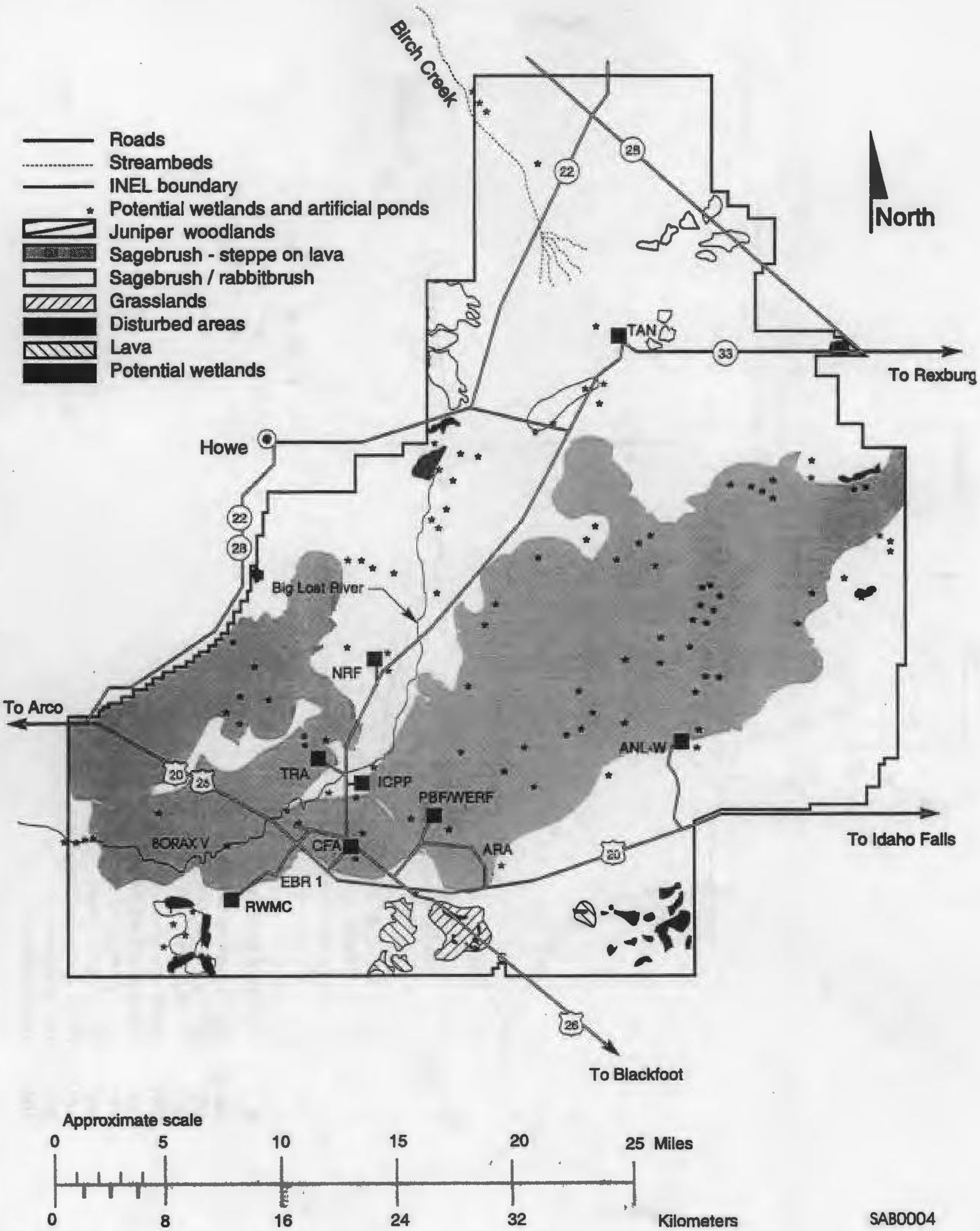


Figure 2-11 Approximate distribution of vegetation at the INEL.

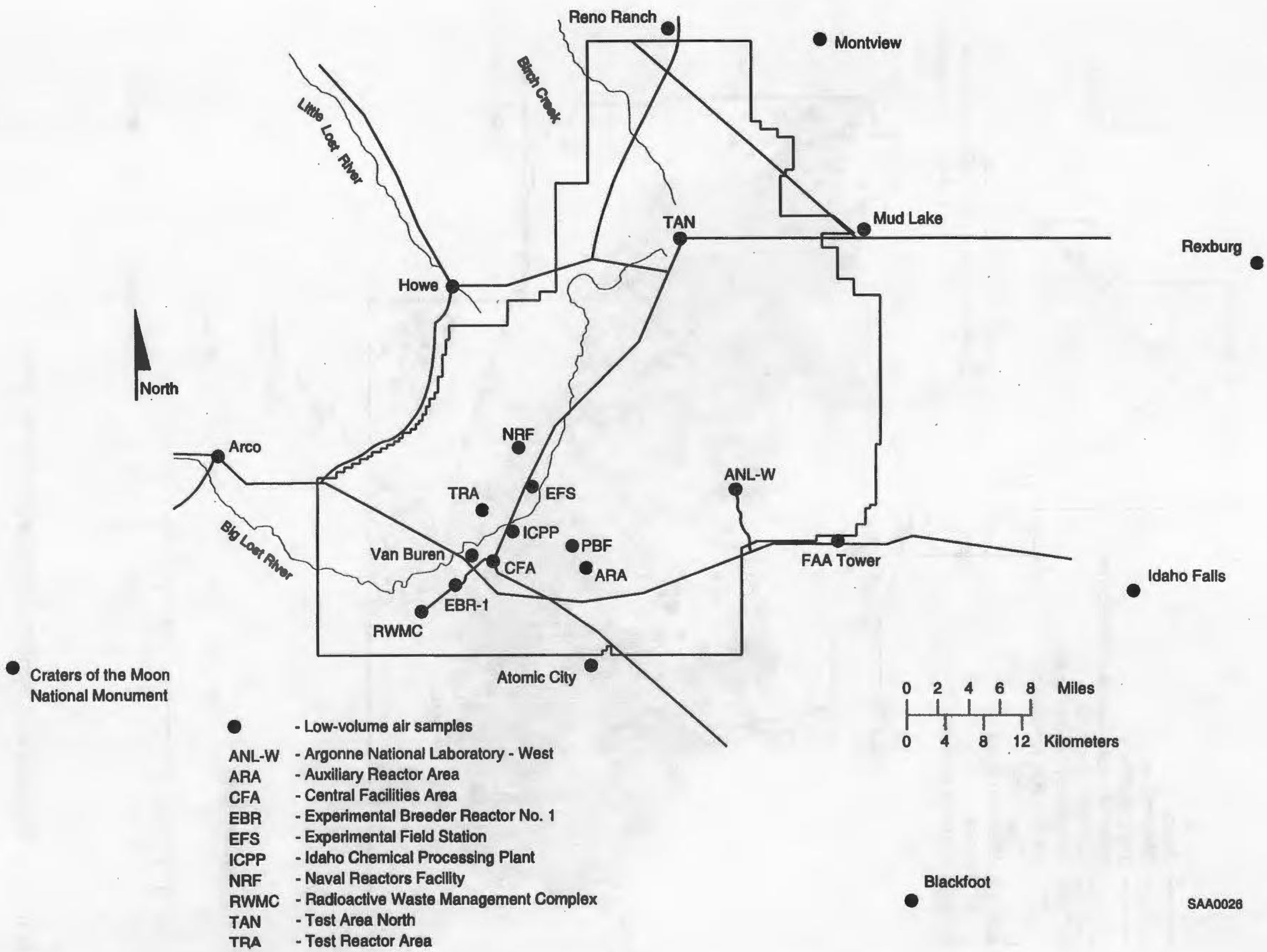


Figure 2-12 The airborne radioactivity monitoring network at the INEL (on-site and off-site).

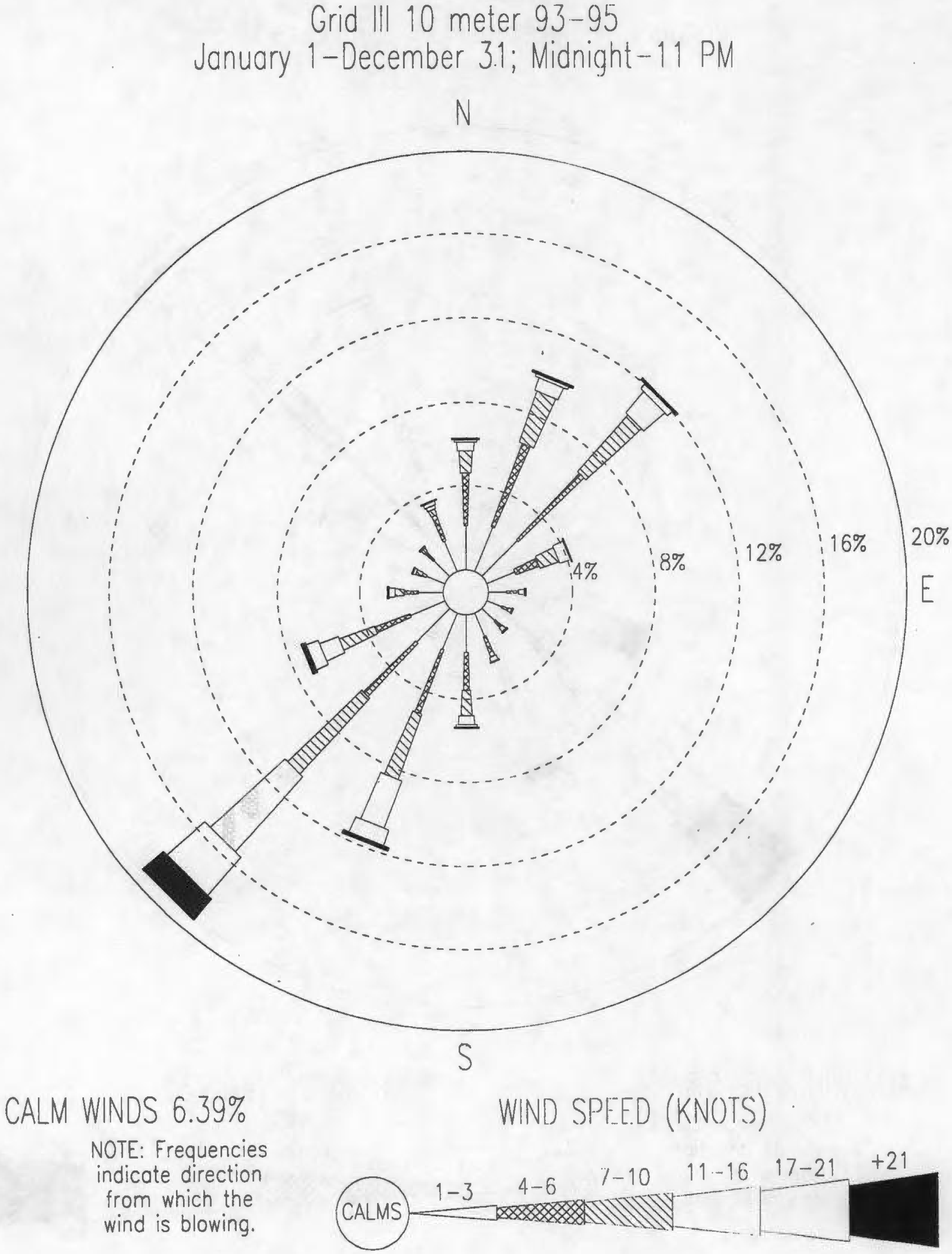


Figure 2-13 Grid III 10 Meter Wind Roses, January 1993 to December 1995.

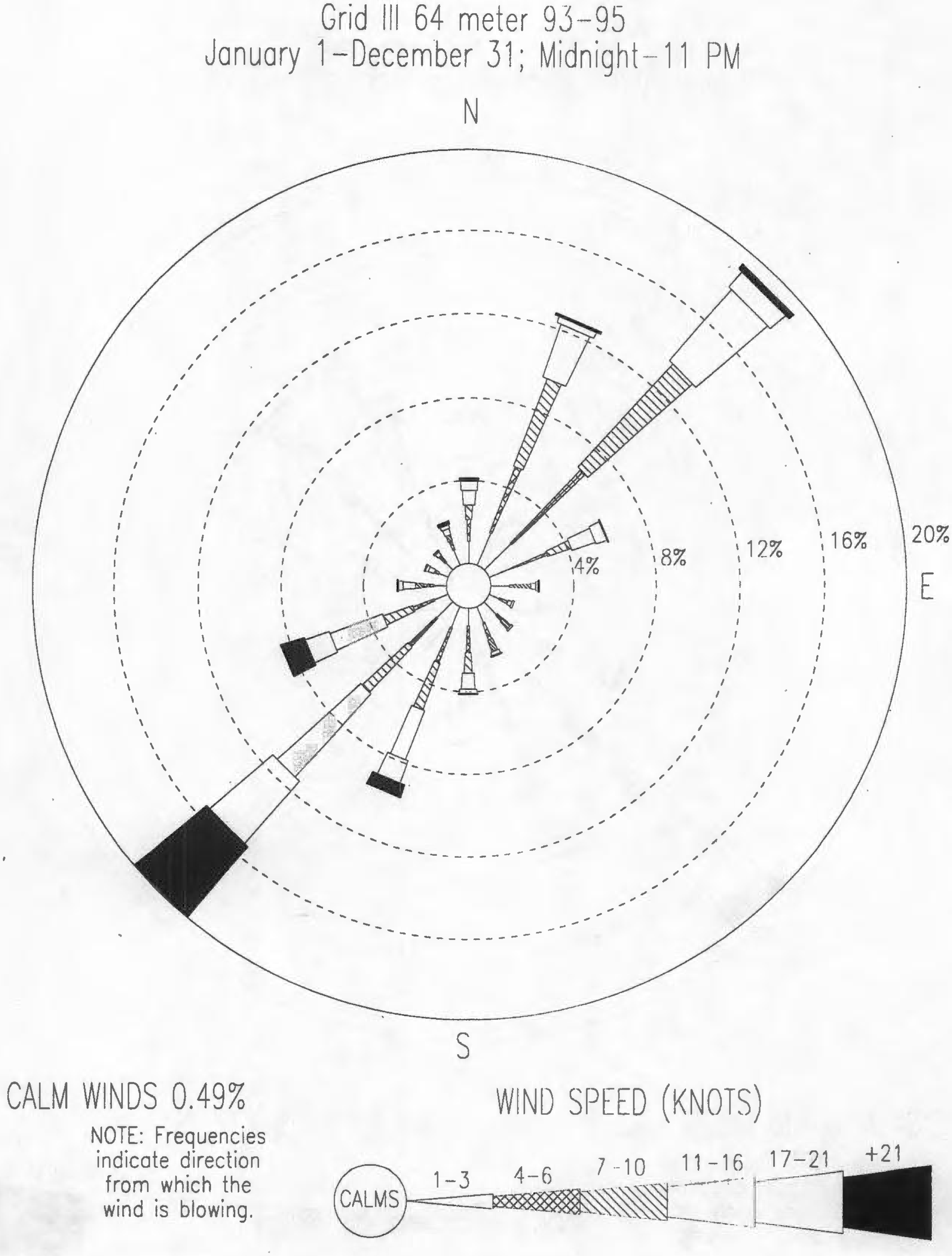


Figure 2-14 Grid III 64 Meter Wind Roses, January 1993 to December 1995

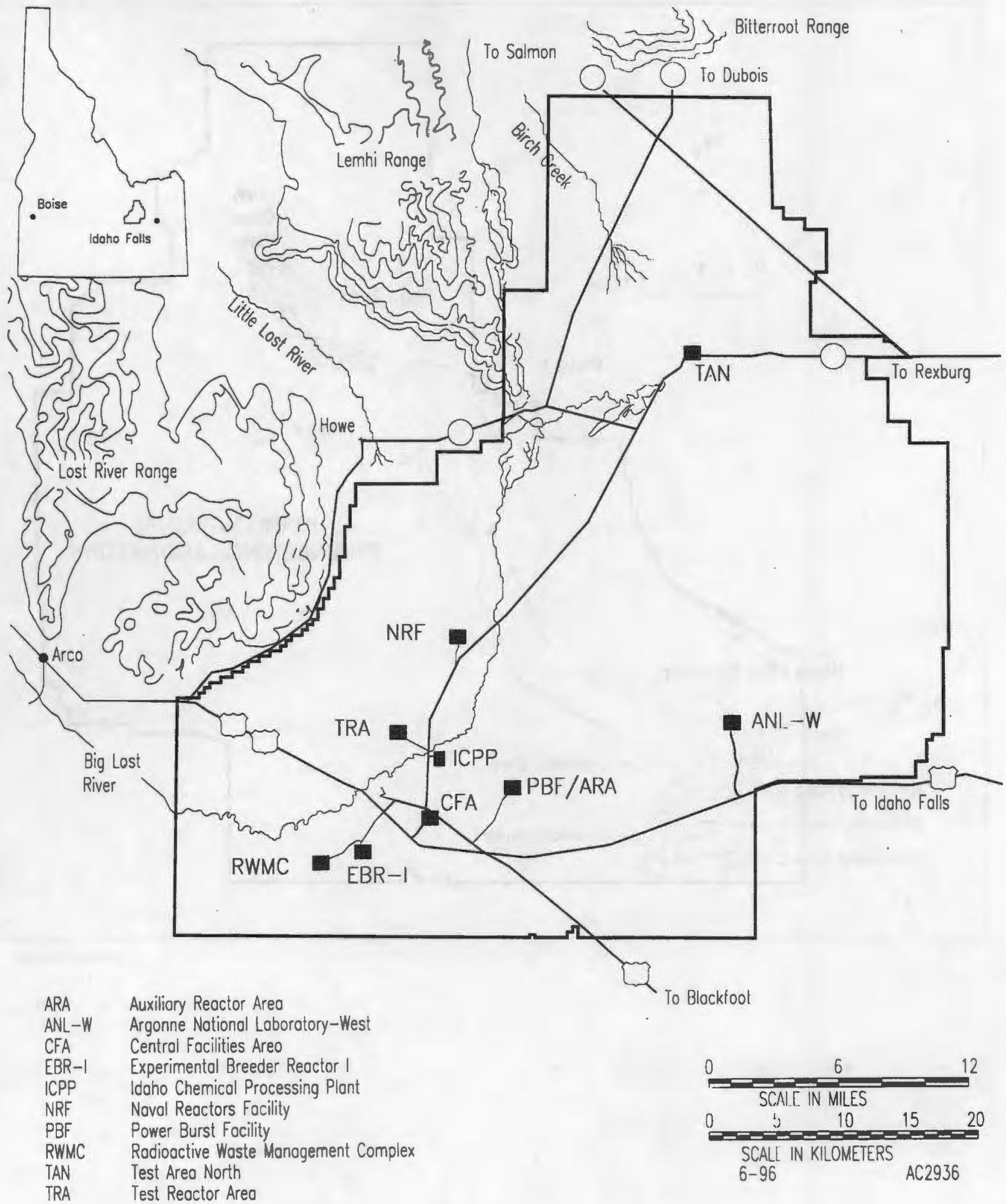
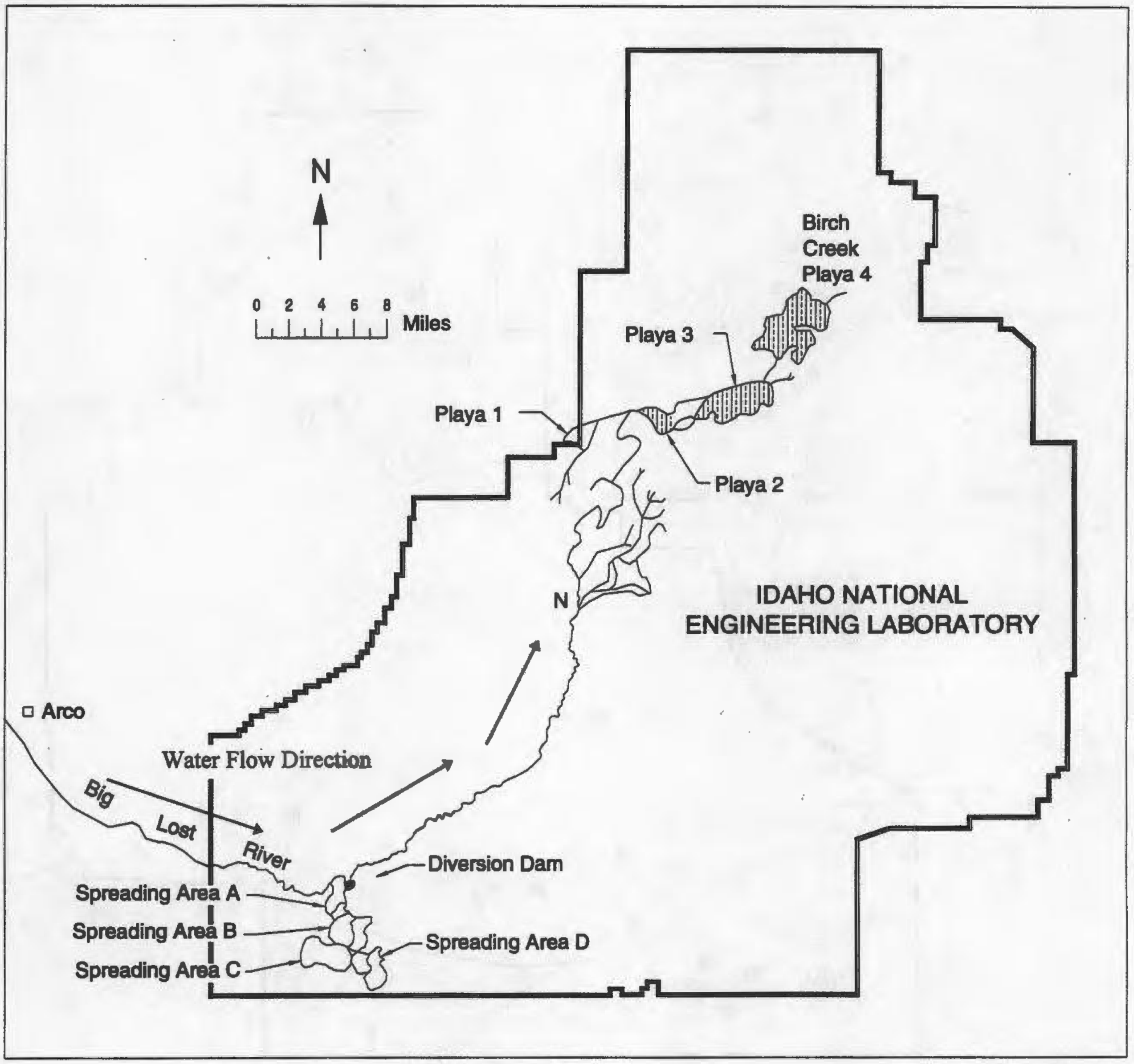


Figure 2-15 INEL site map with major drainages



ICPP-A-16942X
(1-91)

Figure 2-16. Big Lost River System on the INEL

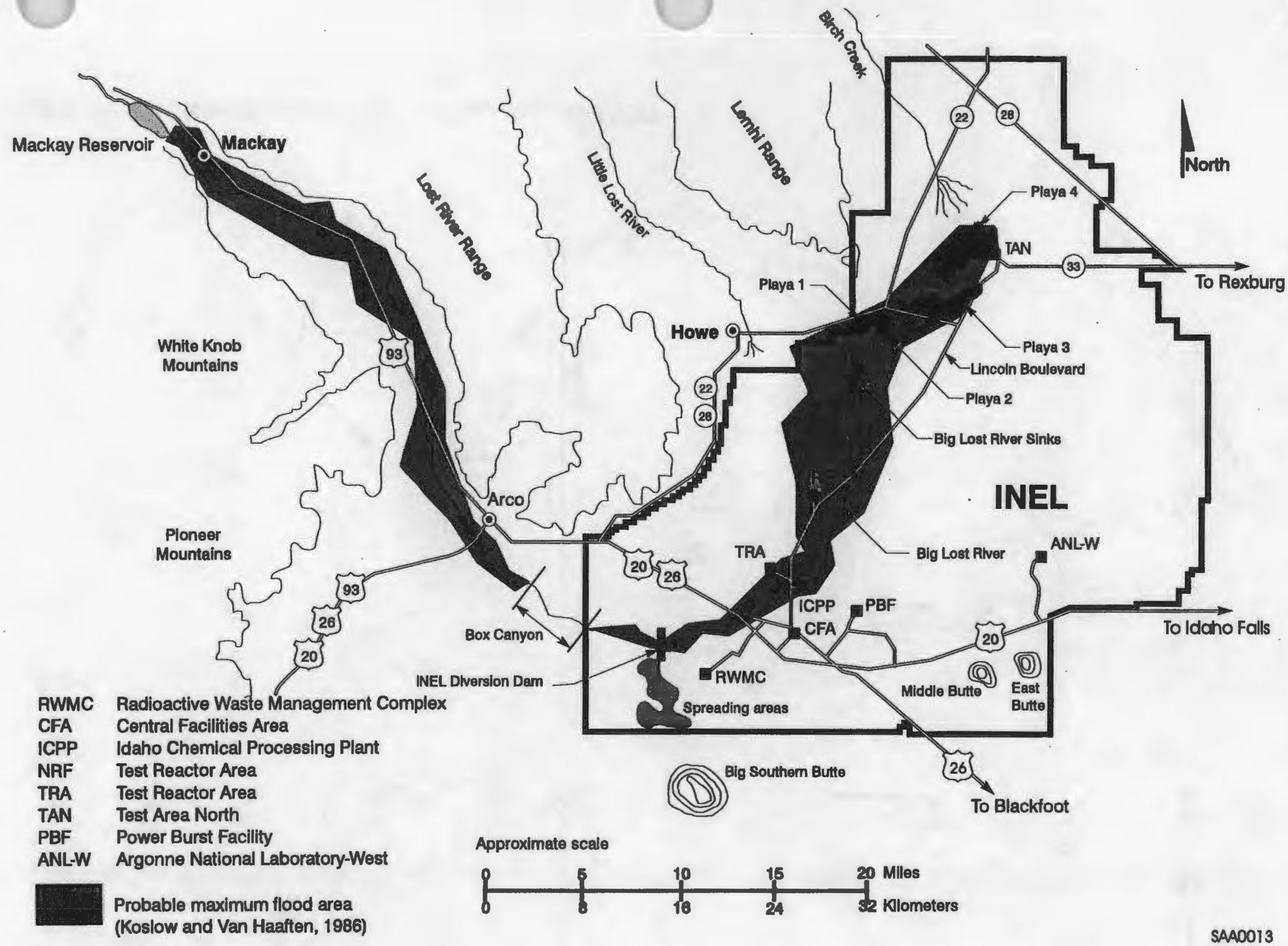


Figure 2-17 INEL facilities with the predicted inundation area for the probable maximum flood-induced overtopping of the Mackay Dam (Bennett 1990).

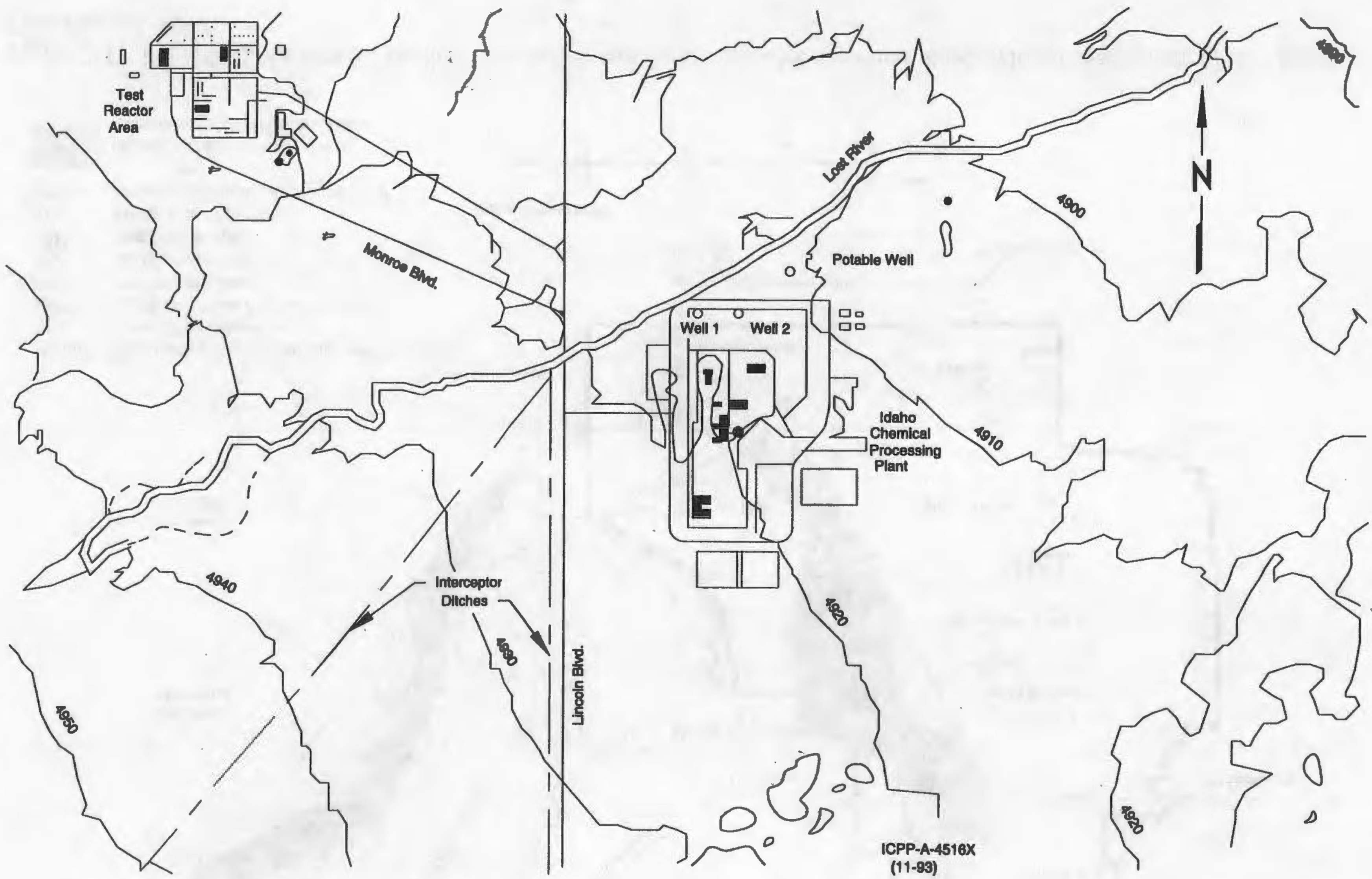


Figure 2-18. Relative Positions of the Big Lost River and ICPP

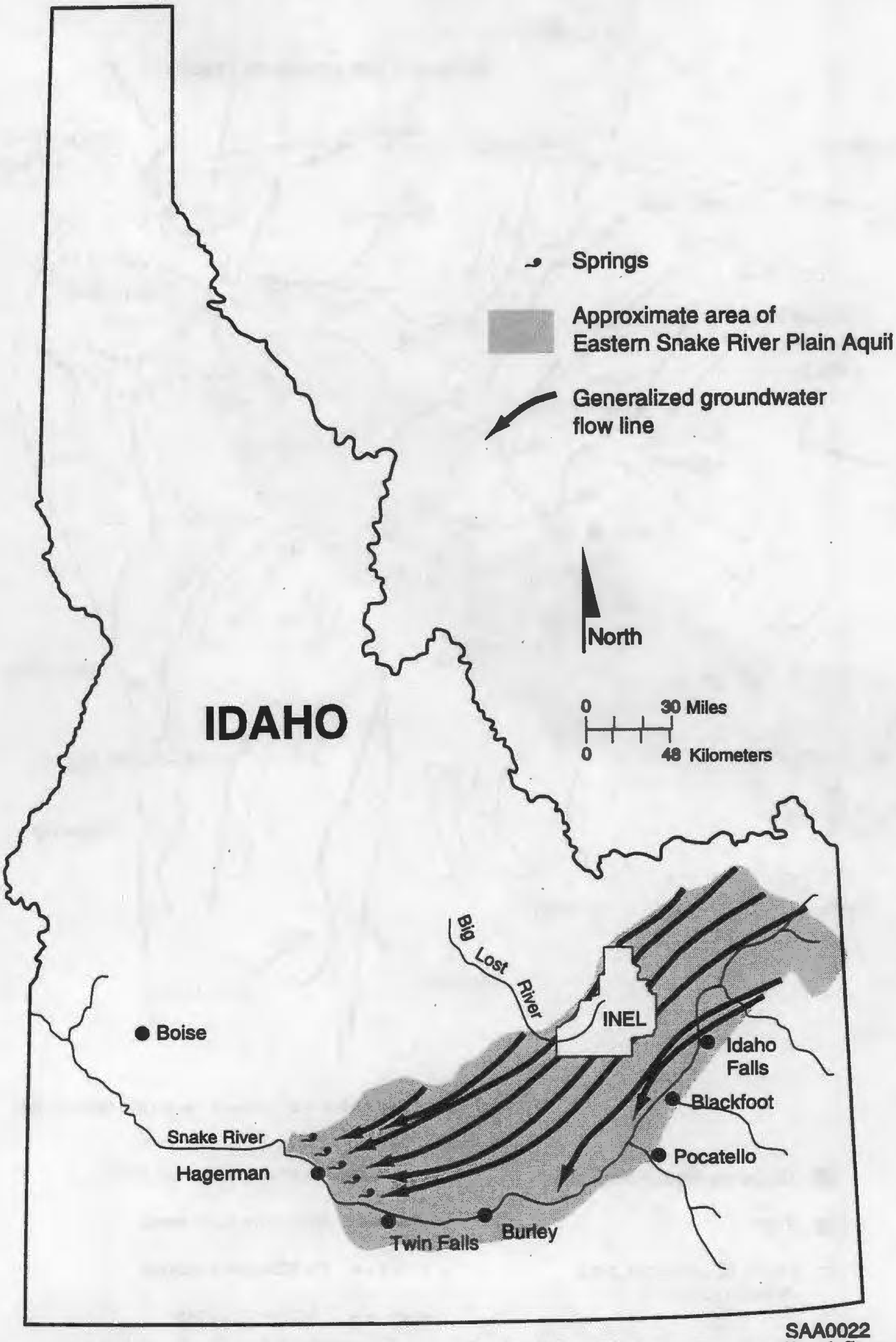


Figure 2-19 Location of the INEL, Eastern Snake River Plain, and generalized flow direction of the Snake River Plain Aquifer

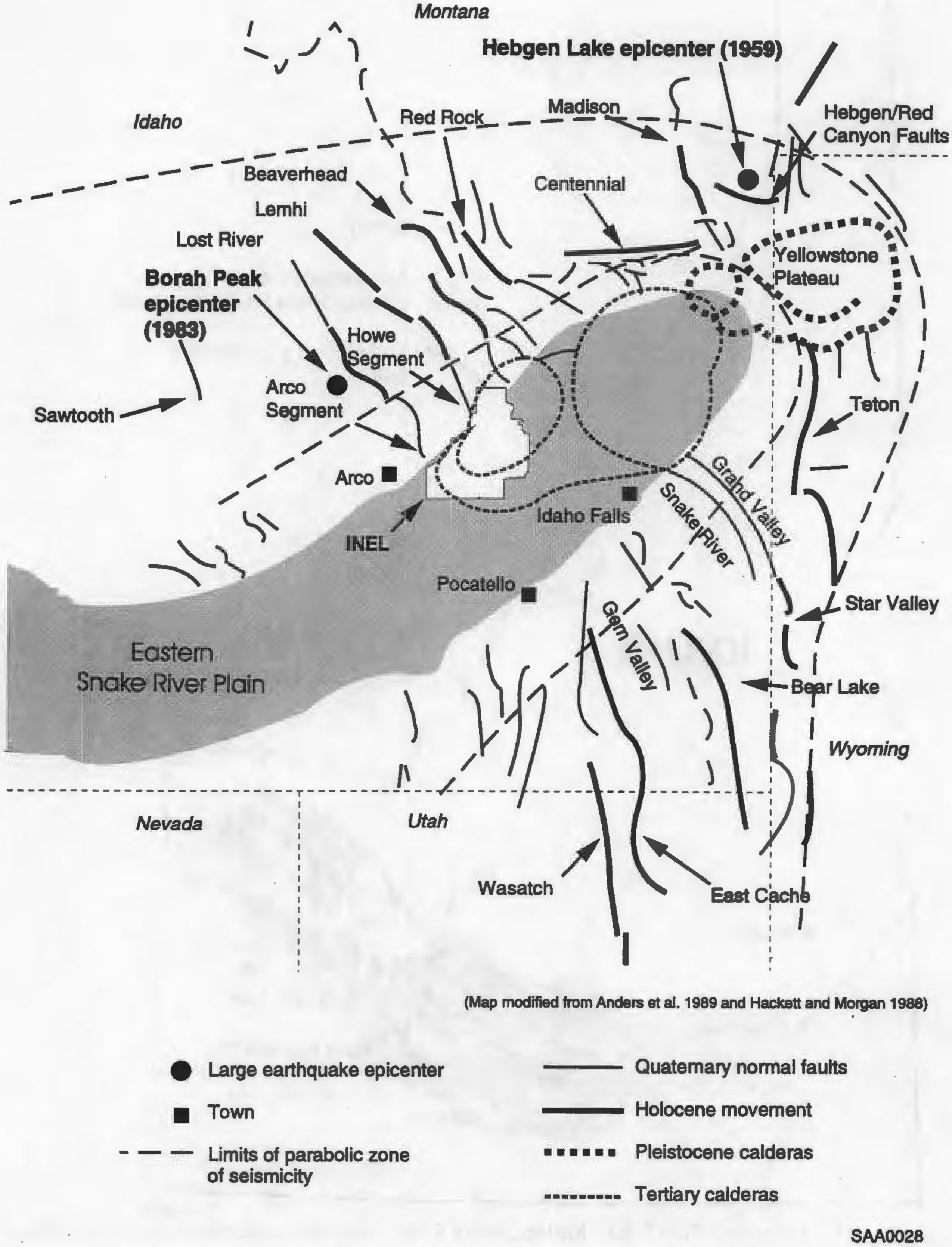


Figure 2-20 Geologic features in the region of the INEL site.

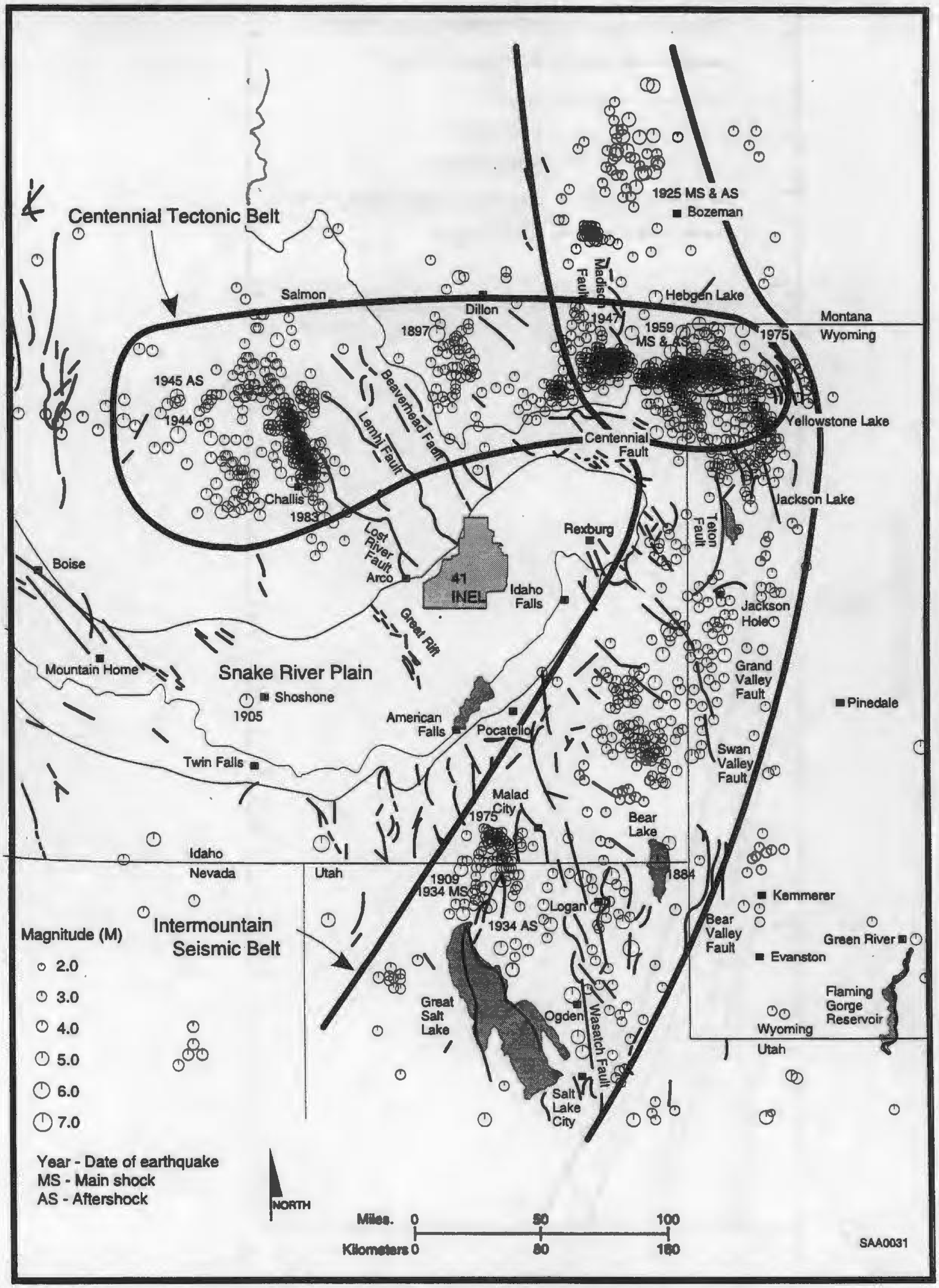


Figure 2-21 Historic earthquakes in the INEL region with magnitudes greater than 2.5 (1884 to 1989) (WCC 1992)

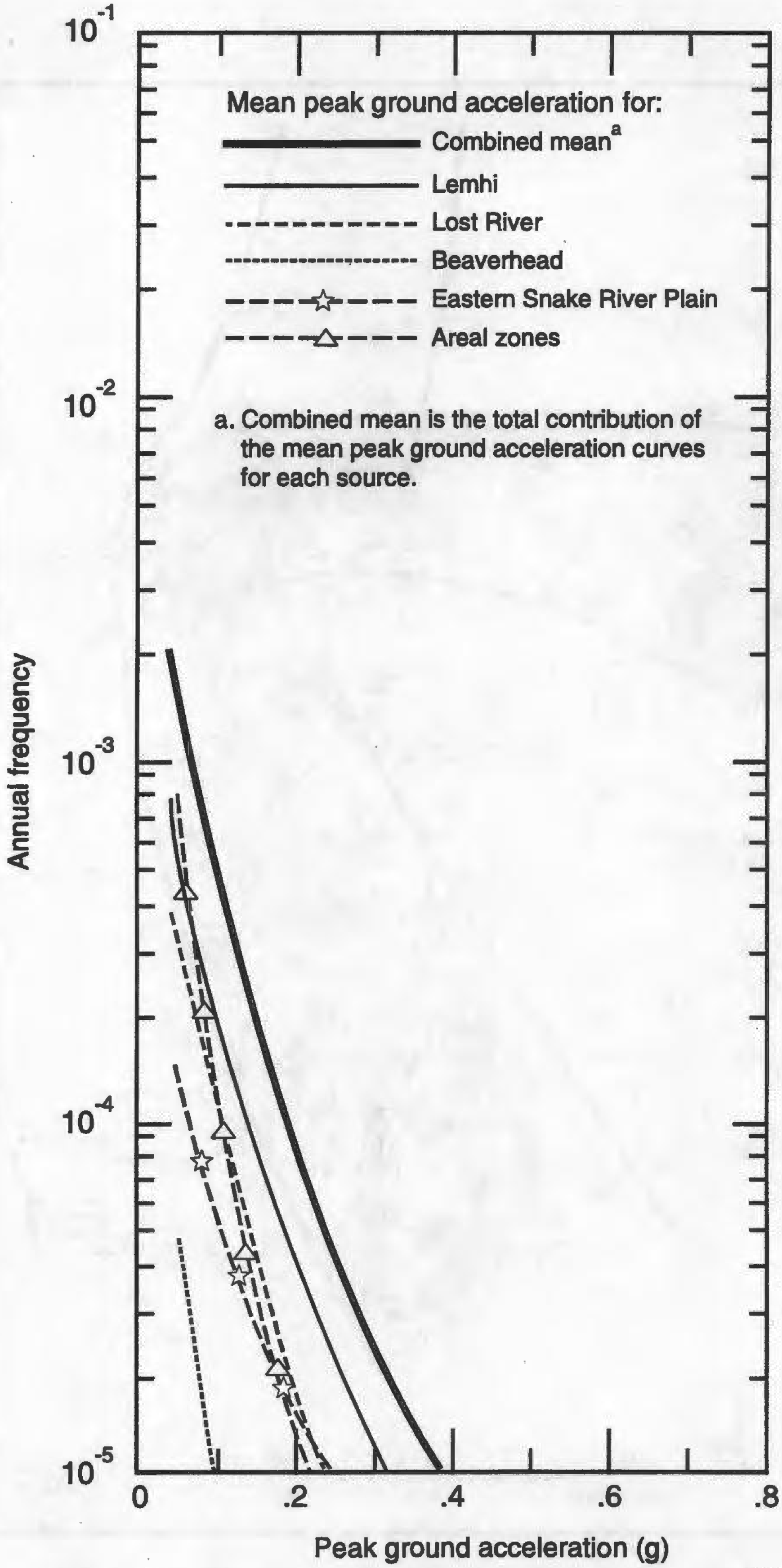


Figure 2-22 Contribution of the various seismic sources to the mean peak ground acceleration at the Idaho Chemical Processing Plant (WCFS 1993).

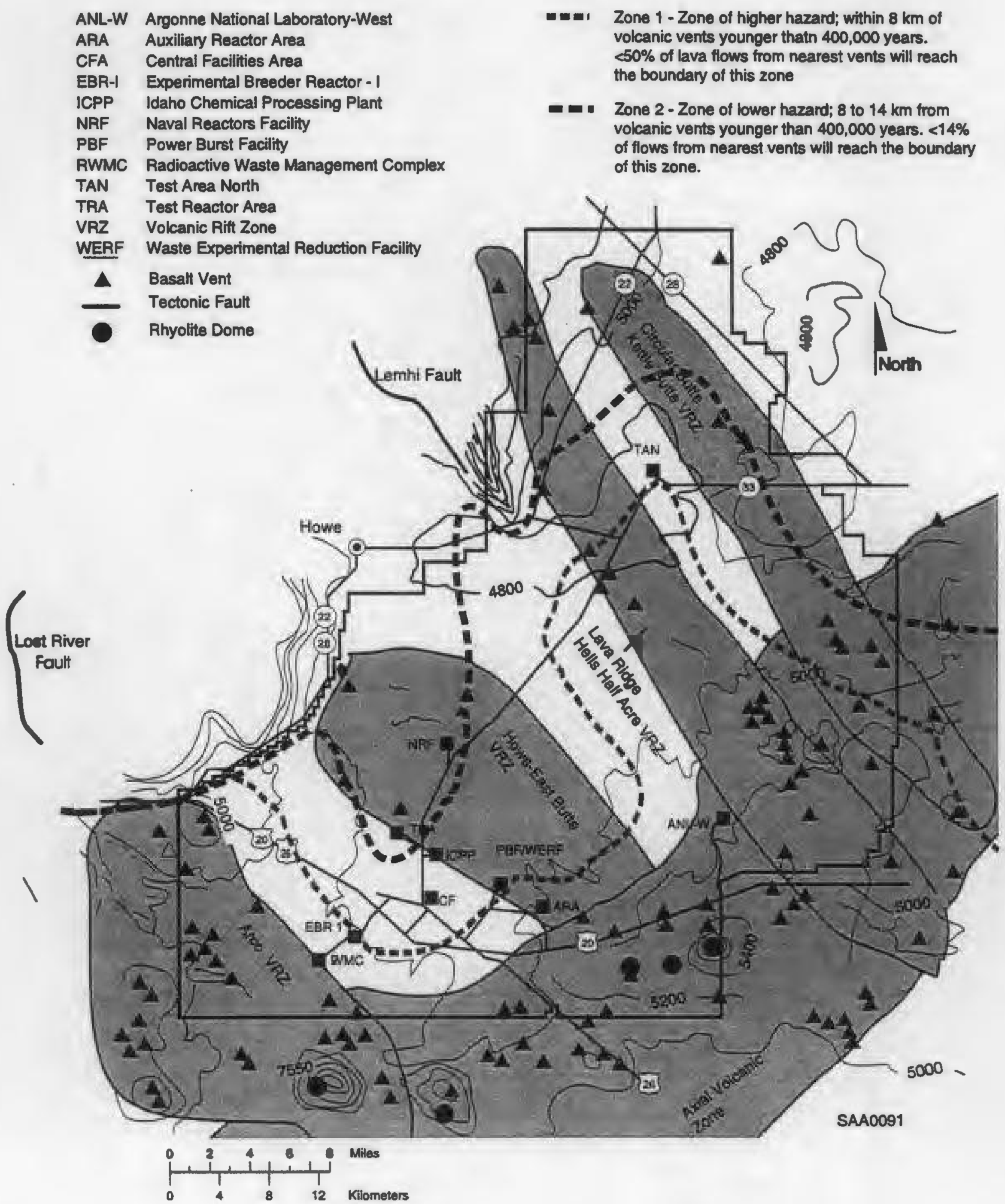


Figure 2-23 Map of the INEL showing location of volcanic rift zones and lava flow hazard zones

Table 2-1. Nuclear Facilities within 50-mi (80-km) of the ICPP

Nuclear Facility	Description	Location
Test Area North	Includes several facilities constructed for conducting reactor safety tests. Current programs at TAN include the Three Mile Island Core Examination Program, the Spent Fuels Program, Special Manufacturing Capability, and the Process Experimental Pilot Plant.	Located approximately 34 km (21 mi) northeast of the ICPP Longitude 112° 42' 5.651752" Latitude 43° 50' 52.641304"
Naval Reactor Facility	Includes ship propulsion reactors used for testing and training Navy personnel.	Located 8 km (5 mi) north of the ICPP Longitude 112° 54' 55.493653" Latitude 43° 38' 56.884845"
Test Reactor Area	Includes test reactors, hot cells, and spent fuel storage pools for research and development for nuclear fuel systems and irradiation testing.	Located approximately 2 km (1 mi) northwest of the ICPP Longitude 112° 57' 50.066574" Latitude 43° 35' 14.590760"
Central Facility Area	Provides centralized support services (including site medical services) for the INEL operations.	Located approximately 5 km (3 mi) south of the ICPP Longitude 112° 56' 37.619069" Latitude 43° 31' 42.752483"
Power Burst Facility	Includes facilities constructed for the Special Power Excursion Reactor Tests. The PBF was used to conduct light water reactor (LWR) fuel behavior studies and is proposed for boron neutron capture therapy for brain tumors.	Located approximately 5 km (3 mi) southeast of the ICPP Longitude 112° 52' 28.578907" Latitude 43° 31' 16.993036"
Auxiliary Reactor Area	Includes facilities used for materials testing and development and weld qualification.	Located approximately 11 km (7 mi) southeast of the ICPP Longitude 112° 49' 46.086985" Latitude 43° 31' 56.693159"
Argonne National Laboratory-West	Includes facilities for conducting liquid metal breeder reactor research and development.	Located approximately 23 km (14 mi) east of the ICPP Longitude 112° 39' 17.328526" Latitude 43° 35' 44.104053"
Radioactive Waste Management Complex	Provides long-term storage facility for low-level radioactive waste and a certification and storage facility for transuranic waste.	Located approximately 10 km (6 mi) southwest of the ICPP Longitude 113° 2' 35.627814" Latitude 43° 29' 59.134109"

Source: Idaho Chemical Processing Plant Site Characterization Document and Lee 1996.

Table 2-2. County population by age distribution

County	0 - 14	15 - 64	> 64
	Percentage by Age Group		
Bannock	28	62	10
Bingham	33	57	10
Bonneville	30	61	9
Butte	29	58	13
Clark	27	61	12
Jefferson	34	56	10
Madison	27	67	6
Average	30	60	10

Source: 1990 Census

Table 2-3. INEL workforce at facilities on the INEL

Facility	INEL Workforce
CFA	854
ICPP	1,157
PBF	116
NRF	1,022
TAN	335
TRA	430
WMF (RWMC)	196
Total	4,110

Source: LITCO Monthly Headcount Report - March 1996

Table 2-4. INEL Climatological Stations and Periods of Record

Station	Surface Wind	Tower Winds & Temperatures	Temperature & Radiation Heating Surface	Precipitation	Station Discontinued	Period of Record (through 12/88) Years
CFA[a]	04/11/50	06/22/51	11/26/49	03/01/50	---	39
TAN[b] (WXA-1) (WXA-2)[c]	11/17/52	04/15/56	10/17/52	10/17/52	1969	18
Monteview (MIV)	06/14/55	---	06/22/55	06/22/55	06/30/63	8
Birch Creek (BC)	09/23/55	---	09/29/55	09/29/55	04/18/61	5
Station x, y, & z[c]	12/21/55	---	01/10/56	01/10/56	07/25/58	2
Well 21	11/15/56	---	---	---	12/03/58	2
NRF (STR 1, 2, 3, & 4)[c]	11/13/51	09/16/64	09/01/53	---	1958	6[f]
Midway (M)	06/06/50	---	04/03/50	05/08/50	05/12/52	2
Howe (H)	05/16/50	---	04/03/50	04/13/50	11/20/53	3
Arco (A)	06/06/50	---	04/12/50	05/17/50	08/31/52	2
Terreton (T, 179)[c]	07/01/50	---	04/13/50	04/13/50	04/18/61	5[f]
E. Perimeter (EP)	03/29/51	---	03/29/51	03/29/51	09/01/54	3
Prickly Pear Flats (PP)	07/21/53	---	07/21/53	---	09/01/54	1
East Butte	01/01/54	---	01/01/54	---	02/09/55	1
Blue Dome	10/19/54	---	10/19/54	10/19/54	04/13/55	0.5
Craters of the Moon	08/17/61	---	07/27/61	---	04/29/63	2
Rexburg	11/03/59	---	---	---	05/05/62	2
SPERT	08/08/55	10/21/64[d]	08/09/55	09/01/55	---	3[f]
LOFT	06/05/53	---	---	---	---	2
EBR II	---	10/21/64	---	---	---	0.3
EBR I	---	11/09/64[d]	---	---	---	0.3
Test Grid No. 3, CERT[a]	05/07/64	06/18/62[c]	---	---	---	2

[a] Following variables have also been measured at WBO: net radiation (solar and terrestrial), soil temperatures, wind and temperature soundings, dust, snow amounts, pressure, state of the ground, and general weather observations.

[b] Dust, wind, and temperature soundings have also been made at this location.

[c] Stations considered as one location for climatological purposes.

[d] 50-ft wind only.

[e] Winds only recorded.

[f] Intermittent record.

Table 2-5. INEL Tornado Frequency

	Number of Cases	Comments
Confirmed Tornadoes	3	There have been tornado reports from outside INEL boundaries in Bingham, Butte, and Jefferson counties. Two were sighted and well documented by INEL employees. June 6, 1967 - Tornado 15 miles east of EBR II, approximately 4 miles north of Mile Post 291 on Highway 20. Time was about 1300 Mountain Standard Time (MST). A photograph is on record. July 27, 1972 - Tornado approximately 8 miles south of EBR II or 4 miles south of Mile Post 279 on Highway 20. Time was about 1430 MST. A photograph of a second funnel that remained aloft was obtained.
Confirmed Funnel Clouds	11	April 28, 1954, at 1220, and June 9, 1954, at 1310-1317, 15 miles NE of CFA. Both of these funnels are included in the 32 reported by the State Climatologist's report. July 20, 1972, 1325-1335 MST, funnel aloft sighted by AEC security and NOAA personnel about 10 miles SE of CFA. May 20, 1974, 1153 MST. The first funnel cloud was approximately 5 miles WSW of NRF. The second funnel was reported to be sighted approximately 1300 MST SW of CFA. The third sighting occurred at 1431 MST. This funnel cloud was determined to be west of TRA. May 8, 1975, near middle butte by NOAA meteorologists - 2 funnels. May 18, 1976, 1515-1520 MST approximately 25 miles west of CFA by NOAA meteorologist, 1 funnel. June 24, 1977, at 1210 MST in the vicinity of Howe, 1 funnel cloud by meteorologists from Atmospheric Turbulence and Diffusion Laboratory. July 23, 1984, 1225 MST, 10 miles west southwest of ICPP, 1 funnel.
Unconfirmed Reports	3	Each of these was apparently only a funnel cloud. The occurrences are unconfirmed as to dates, although two of them were sighted in May 1968 about 1/2 miles east of NRF. The third was reported in the INEL climatograph (IDO-12048), date unavailable.

Table 2-6 Monthly and Annual Temperature Averages and Extremes Averages[a]

	MAXIMUM			AVERAGE			MINIMUM		
	High	**Average**	**Low**	**High**	**Average**	**Low**	**High**	**Average**	**Low**
January	37.9	27.6	19.5	25.1	15.8	6.5	13.1	3.8	- 8.8
February	45.9	34.0	25.6	34.2	21.6	9.9	22.4	9.1	- 6.5
March	51.5	42.9	33.6	37.5	30.7	19.1	24.6	8.4	4.5
April	64.7	55.3	46.1	45.9	41.3	35.4	32.0	27.2	22.5
May	76.1	66.3	59.9	58.3	51.3	46.7	40.7	36.2	33.3
June	85.3	76.1	69.9	67.5	59.9	56.2	49.7	43.7	40.4
July	91.2	87.0	82.5	71.8	68.2	66.1	53.1	49.3	46.5
August	90.2	84.8	75.4	70.2	65.9	60.3	53.4	47.1	43.2
September	81.2	73.4	64.1	61.1	55.5	48.6	45.2	37.4	31.9
October	67.7	60.5	53.7	49.2	43.5	38.2	32.1	26.5	21.2
November	50.7	42.5	37.8	36.4	29.9	24.5	24.3	17.3	10.3
December	37.1	31.2	22.3	26.8	19.6	10.2	17.6	7.5	- 1.9
Annual	59.5	59.0	53.8	44.3	41.8	39.1	29.9	28.1	24.0

a. Temperature in °F, based on NWS archived CFA data from April 1954 through December 1982. (NOAA 1984)

Table 2-7. Average, Highest, and Lowest Total Precipitation, CFA

Month	Average[a] cm (in.) of H_2O	Highest[a] cm (in.) of H_2O	Lowest[a] cm (in.) of H_2O	Normal cm (in.) of H_2O
January	1.75 (0.69)	6.50 (2.56)	0.00 (0.00)	1.85 (0.73)
February	1.63 (0.64)	6.10 (2.40)	0.03 (0.01)	1.96 (0.77)
March	1.52 (0.60)	3.66 (1.44)	0.18 (0.07)	1.57 (0.62)
April	1.85 (0.73)	6.35 (2.50)	0.00 (0.00)	1.30 (0.51)
May	3.05 (1.20)	11.23 (4.42)	0.18 (0.07)	2.79 (1.10)
June	3.00 (1.18)	9.88 (3.89)	0.05 (0.02)	2.77 (1.09)
July	1.35 (0.53)	5.82 (2.29)	0.00 (0.00)	0.66 (0.26)
August	1.45 (0.57)	8.31 (3.27)	0.00 (0.00)	1.22 (0.48)
September	1.60 (0.63)	8.94 (3.52)	0.00 (0.00)	0.89 (0.35)
October	1.32 (0.52)	4.24 (1.67)	0.00 (0.00)	1.68 (0.66)
November	1.73 (0.68)	4.42 (1.74)	0.00 (0.00)	1.04 (0.41)
December	1.91 (0.75)	8.71 (3.43)	0.05 (0.02)	1.50 (0.59)
Annual	22.12 (8.71)	36.58 (14.40)	11.43 (4.50)	19.23 (7.57)

[a] Data period of record spans January 1950 through December 1988. (Clawson et al. 1989)

Table 2-8 Snowfall Amounts, CFA[a] (NOAA 1984)

	MONTHLY			
	Average[b] (in.)	Maximum (in.)	Minimum (in.)	Maximum 24-h Period[c] (in.)
January	7.7	18.1	1.4	8.5
February	5.3	15.0	0.1	7.5
March	3.5	10.2	0.8	8.6
April	2.4	11.9	0.0	6.7
May	1.1	8.3	0.0	4.7
June	0.0	Trace	0.0	Trace
July	0.0	0.0	0.0	0.0
August	0.0	0.0	0.0	0.0
September	0.1	1.0	0.0	1.0
October	0.7	7.2	0.0	4.5
November	3.0	12.3	0.0	6.5
December	6.4	22.3	Trace	7.0
SEASONAL	26.0	40.9	11.3	8.6

a. Based on CFA data from January 1950 through December 1982.
b. Average based on data measured during period from March 1954 through December 1982.
c. Based on data measured from January 1950 through September 1983.

Table 2-9. Dewpoint Temperatures,[a] Monthly and Annual Averages

Month	Average Air Temperature °C (°F)	Average Wet Bulb °C (°F)	Average Dewpoint °C (°F)
January	-8.6 (16.5)	-9.6 (14.7)	-13.7 (7.4)
February	-5.6 (22.0)	-6.9 (19.6)	-10.8 (12.5)
March	-0.3 (31.5)	-3.1 (26.4)	-8.8 (16.1)
April	5.5 (41.9)	0.6 (33.0)	-7.2 (19.0)
May	11.3 (52.3)	5.0 (41.0)	-2.3 (27.8)
June	16.3 (61.3)	7.9 (46.2)	-0.6 (31.0)
July	20.6 (69.0)	10.2 (50.3)	0.8 (33.5)
August	19.1 (66.4)	8.8 (47.9)	-1.5 (29.3)
September	13.4 (56.2)	5.4 (41.7)	-4.6 (23.8)
October	6.7 (44.1)	1.3 (34.4)	-6.8 (19.7)
November	-2.3 (27.9)	-4.6 (23.7)	-10.0 (14.0)
December	-5.6 (22.0)	-7.1 (19.2)	-11.8 (10.8)
Annual	5.9 (42.6)	0.7 (33.2)	-6.4 (20.4)

[a] Computed from average air temperatures and average wet bulb temperatures measured at CFA, April 1955 through April 1961.

Table 2-10 Hourly Average Windspeeds, CFA[a]

	Average Speed (mph)		Highest Hourly Average Speed (mph)			
			20-ft Level[d]		250-ft Level[e]	
	20-ft[b] Level	250-ft[c] Level	Speed	Direction	Speed	Direction
January	5.6	9.7	48	WSW	65	SW
February	6.9	11.3	36	SW	52	WSW
March	8.7	13.8	51	WSW	67	WSW
April	9.3	14.6	39	WSW	49	WSW-SW
May	9.3	14.3	41	SW	47	WSW-SW
June	8.9	14.2	36	SW	46	WSW
July	8.0	13.5	35	WSW	47	WSW
August	7.7	13.1	40	WSW	54	SW
September	7.2	12.8	42	WSW	56	WSW
October	6.8	12.3	44	WSW	58	WSW
November	6.4	11.6	40	WSW	54	WSW
December	5.1	9.6	43	SW	56	SW
ANNUAL	7.5	12.6	51	WSW	67	WSW

a. Based on CFA data.
b. April 1950 through October 1964.
c. July 1951 through October 1964.
d. April 1950 through October 1983.
e. July 1951 through October 1983.

Table 2-11 Extremes Of Daily Temperatures, CFA

	Highest Daily Maximum[a] (°F)	Lowest Daily Maximum[a] (°F)	Highest Daily Average[b] (°F)	Average Dew Point (°F)
January	51	-40	44	-19
February	58	-32	44	-11
March	70	-28	54	-6
April	82.9	6	60	23
May	91	13	71	30
June	97	23	79	30
July	101	29	80	52
August	99	28	80	52
September	96	12	74	30
October	82	3	64	22
November	67	-24	52	-9
December	51	-40	44	-23
ANNUAL	101	-40	80	-23

a. January 1950 through December 1982.

b. January 1950 through September 1983.

Table 2-12 Mean And Maximum Of Daily Temperature Range, CFA[a]

	Mean Range (°F)	Maximum Range (°F)
January	23	52
February	24	50
March	24	50
April	28	57
May	30	55
June	32	54
July	38	56
August	38	57
September	36	58
October	34	58
November	25	51
December	23	45
ANNUAL	31	58

a. January 1950 through September 1983.

Table 2-13 Freeze And Thaw Cycles, CFA[a]

	Days on which Maximum was above 32°F and Minimum was below 32°F		
	Average Number of Days -- Period of Record	Maximum Number of Days	Minimum Number of Days
January	10	22	1
February	16	28	4
March	25	31	13
April	22	28	15
May	9	18	0
June	1	5	0
July	0	1	0
August	0	3	0
September	7	16	0
October	22	30	11
November	23	28	15
December	14	25	5
ANNUAL	149	183[b]	101[b]

a. January 1950 through September 1983.

b. January 1950 through August 1964.

Table 2-14 Monthly And Annual Degree Days, CFA[a]

	Total Accumulated Degree Days			Daily Degree Days	
	Mean	Highest	Lowest	Highest	Lowest
January	1,504	1,797	1,086	84	22
February	1,220	1,600	864	77	22
March	1,071	1,425	854	71	11
April	711	889	574	43	5
May	432	610	234	35	0
June	190	291	44	25	0
July	28	76	1	24	0
August	56	192	4	20	0
September	285	493	142	36	0
October	657	832	493	44	0
November	1,051	1,232	860	74	14
December	1,411	1,704	1,181	88	21
ANNUAL	8,616				

a. January 1950 through September 1983.

Table 2-15. Peak Gusts, CFA and TAN

Month	CFA				TAN			
	20-Ft Level[a] Direction (quad.)	Speed m/s (mph)	250-Ft Level[b] Direction (quad.)	Speed m/s (mph)	20-Ft Level[c] Direction (quad.)	Speed m/s (mph)	250-Ft Level[d] Direction (quad.)	Speed m/s (mph)
January	SW	34.8 (78)	S	33.4 (75)	S	25.9 (58)	NNW	28.5 (64)
February	WSW	25.7 (60)	SW	29.4 (66)	N&SSW	27.6 (62)	SW	26.3 (59)
March	WSW	34.8 (78)	S	37.5 (84)	N	29.0 (65)	SW	32.5 (73)
April	S	29.9 (67)	SW	27.6 (62)	SSW	26.7 (60)	NW	33.9 (76)
May	SW	27.6 (62)	SSW	29.9 (67)	NNW	26.7 (60)	NNW	29.4 (66)
June	SSW	26.7 (60)	SSW	33.4 (75)	S	29.9 (67)	SW	33.9 (76)
July	N	30.3 (68)	S	29.4 (66)	W	26.7 (60)	W	32.5 (73)
August	WSW	27.6 (62)	SW	32.1 (72)	SSW	28.5 (64)	WSW	30.3 (68)
September	WSW	27.2 (61)	WSW	31.2 (70)	SSW	24.1 (54)	W	32.5 (73)
October	WSW	29.4 (66)	WSW	33.9 (76)	NNW	28.1 (63)	NW	28.5 (64)
November	WSW-SW	26.7 (60)	WSW	31.2 (70)	SW	26.3 (59)	NNW	34.8 (78)
December	SW	28.5 (64)	SSW	35.7 (80)	NNW	27.6 (62)	NNW	30.3 (68)
Period of record	WSW	34.8 (78)	SW	37.5 (84)	S	29.9 (67)	NNW	34.8 (78)

[a] Data period of record spans April 1950 through October 1964
[b] Data period of record spans July 1951 through October 1964
[c] Data period of record spans July 1950 through April 1961
[d] Data period of record spans April 1956 through April 1961

Table 2-16. Summary of highest detected contaminant concentrations in groundwater at the INEL (1985 to 1992).

Parameter	Highest detected recent concentration[a] (year)	Recent boundary concentration (year)	Current maximum contaminant level (MCL)	Derived concentration guide (DCG)
Radionuclides (picocuries per liter)				
Americium-241	0.91[b] (1990)	< detection limit[c] (1988)	15[d,e]	30[f]
Cesium-137	2,050[b] (1988)	< detection limit[c] (1986)	200[g]	3,000[f]
Cobalt-60	890[b] (1987)	< detection limit[c] (1987)	100[g]	10,000[f]
Iodine-129	3.6[b] (1987)	0.00083-background[h] (1992)	1[g]	500[f]
Plutonium-238	1.28[b] (1990)	< detection limit[c] (1988)	15[d,e]	40[f]
Plutonium-239/240	1.08[b] (1990)	< detection limit[c] (1988)	15[d,e]	30[f]
Strontium-90	640[b] (1992)	< detection limit[c] (1988)	8[g,i]	1,000[f]
Tritium	48,000[b] (1988)	background[l] (1988)	20,000[c,g]	2,000,000[f]
Nonradioactive metals (milligrams per liter)				
Cadmium	0.0073[b] (1992)	background[c] (1988)	0.005[d]	not applicable
Chromium (total)	0.21[b] (1988)	background[c] (1988)	0.1[d]	not applicable
Lead	0.009[b] (1987)	background[c] (1987)	0.015[g,k]	not applicable
Mercury	0.0004[b] (1987)	background[c] (1987)	0.002[d]	not applicable
Inorganic salts (milligrams per liter)				
Chloride	200[b] (1991)	-	250[d]	not applicable
Nitrate	5.4[b] (as N) (1988)	background[j] (1988)	10 (as N)[d]	not applicable
Sulfate	140[m] (1985)	background[j] (1985)	250[d]	not applicable
Organic compounds (milligrams per liter)				
Carbon tetrachloride	0.0066[b] (1993)	<detection limit[n] (1988)	0.005[d]	not applicable
Chloroform	0.951[n] (1988)	<detection limit[n] (1988)	0.1[d,o]	not applicable
1,1-dichloroethylene	0.009[b] (1989)	<detection limit[n] (1989)	0.007[d]	not applicable
Cis-1,2-dichloroethylene	3.9[b] (1992)	<detection limit[n] (1988)	0.07[d]	not applicable
Trans-1,2-dichloroethylene	2.6[b] (1988)	<detection limit[n] (1988)	0.1[d]	not applicable
Tetrachloroethylene	0.051[b] (1992)	<detection limit[n] (1988)	0.005[d]	not applicable
1,1,1-trichloroethane	0.012[b] (1989)	<detection limit[n] (1988)	0.2[d]	not applicable
Trichloroethylene	4.6[b] (1992)	<detection limit[n] (1989)	0.005[d]	not applicable
Vinyl chloride	0.027[n] (1989)	<detection limit[n] (1989)	0.002[d]	not applicable

a. Concentrations are generally for the period 1987 to 1992.
b. Values taken from Golder Associates (1994).
c. Values taken from Orr and Cecil (1991).
d. MCL values taken from EPA (1993).
e. Maximum contaminant levels have not been established for plutonium-238, plutonium-239, plutonium-240, and americium-241. However, these radionuclides have not been detected above the established limits for gross alpha particle activity or the proposed adjusted gross alpha activity maximum contaminant limits for drinking water.
f. DCGs for radionuclides taken from DOE Order 5400.5, Radiation Protection of the Public and the Environment (DOE 1993).
g. MCL values taken from 40 CFR 141 (CFR 1993).
h. Values taken from Mann (1994).
i. Calculated value based on total body or organ doses of 4 millirem per year.
j. Value taken from Mann and Cecil (1990).
k. Lead action level.
l. Values taken from Robertson et al. (1974); Edwards et al. (1990).
m. Values taken from Pittman et al. (1988).
n. Values taken fromMann (1990) and Liszewski and Mann (1992).
o. Value is for total trihalomethanes, which is the sum of the concentrations of bromodichloromethane, dibromochloromethane, tribromomethane (bromoform), and trichloromethane (chloroform).

Table 2-17. Plants used by the Shoshone-Bannock that are located on or near the Idaho National Engineering Laboratory site.

Plant Family	Type of use	Location on INEL site	Abundance
Desert Parsley	Medicine, food	Scattered	Common
Milkweed	Food, tools	Roadsides	Scattered uncommon
Sagebrush	Medicine, tools	Throughout	Common, abundant
Balsamroot	Food, medicine	Around buttes	Common but scattered
Thistle	Food	Scattered throughout	Common but scattered
Gumweed	Medicine	Disturbed areas	Common
Sunflower	Medicine, food	Roadside	Common
Dandelion	Food, medicine	Throughout	Common
Beggar's ticks	Food,	Disturbed areas throughout	Common, abundant
Tansymustard	Food, medicine	Disturbed areas	Common
Cactus	Food	Throughout	Common, abundant
Honeysuckle	Food tools	Big Southern Butte	Common on butte
Goosefoot	Food	Throughout	Common, abundant
Russian thistle	Food	Disturbed areas throughout	Common, abundant
Dogwood	Food, medicine, tools	Webb Springs, Birch Creek	Common where found
Juniper	Medicine, tools, food	Throughout	Common to abundant
Gooseberry	Food	Scattered throughout	Common
Mentha arvensis	Medicine	Big Lost River	Uncommon
Wild onion	Food, medicine, dye	Throughout	Common
Calochortus spp.	Food	Buttes	Common
Fireweed	Food	Throughout	Common
Pine	Food, tools, medicine	Big Southern Butte	Common on butte
Douglas fir	Medicine	Big Southern Butte	Common on butte
Plantain	Medicine, food	Throughout	Uncommon
Wildrye	Food, tools	Throughout	Common, abundant
Indian ricegrass	Food	Throughout	Common, abundant
Bluegrass	Food, medicine Food,	Throughout	Common, abundant
Serviceberry	tools, medicine	Buttes	Common where found
Chokecherry	Food, medicine, tools, fuel	Buttes	Common where found
Wood's rose	Food, smoking, medicine, ritual	Big Lost River, Big Southern Butte	Common, abundant
Red raspberry	Food, medicine	Big Southern Butte	Uncommon
Willow	Medicine	Throughout in moist areas	Common
Coyote tobacco	Smoking, medicine	Big Lost River, Webb Springs	Uncommon
Cattail	Food, tools	Sinks, outflow from facilities	Uncommon

a. Source: Anderson et al. (1995).

3. THE DRY STORAGE SYSTEM

3.1 EXTERNAL APPEARANCE

The ISFSI storage area would resemble a light industrial park. The immediate area in the vicinity of the ISFSI, consisting of approximately 2 acres (.81 ha), would be fenced for security purposes and as a radiation control area (Figure 3-1). The fenced area would have sufficient area for receipt and handling of the DSCs. Construction of administrative offices and equipment storage areas is not required for this project as these functions would be provided by the existing ICPP complex. The ISFSI site at ICPP is not readily visible by the pubic due to its remoteness from the nearest public route, Highway 20/26 located approximately 4 miles (6.4 km) to the south.

The external appearance of the ISFSI would be consistent in scale and general appearance as other structures located at ICPP. Inside the fenced boundary would be a large load-bearing pad approximately 110 ft by 200 ft (34 m by 61 m) in size that the horizontal storage modules (HSM) are placed on. The HSMs are rectangular precast reinforced concrete modules with 2-3 ft (.6-.9 m) thick walls, roof, floor and endwalls, and are approximately 18 ft (5.5 m) long and 14 ft (4.3 m) high. The HSM's design and use of construction materials protect the DSC from missiles, earthquakes, tornado, or other natural phenomena and provide principle biological (radiation) shielding during fuel storage.

3.2 REACTOR AND STEAM-ELECTRIC SYSTEM

The ISFSI does not require the use of any reactor or steam electric systems.

3.3 WATER USE

The ISFSI does not require a water system for operation.

3.4 HEAT DISSIPATION SYSTEM

The heat dissipation system is fully passive using natural air flow cooling medium over the HSM. The TMI-2 fuel, knockout, and filter canisters have a maximum heat load of 80 W and an average of 20 W. The TMI-2 DSC would be designed for a maximum of 860 W heat load per storage module, which is the total heat load of the 12 hottest TMI-2 canisters. This heat load is sufficiently low that the DSC and HSM are fully capable of expelling the heat and keeping all internal and external temperatures within the recommended temperature limits of the materials used without the need for HSM air vents. The environmental effects of the operation of this system is provided in Section 5.1.

3.5 RADWASTE SYSTEMS AND SOURCE TERM

3.5.1 SOURCE TERM

Radionuclides may be emitted due to the venting of the TMI-2 canisters during dry storage. Each canister would vent through a HEPA filter to the atmosphere. EPA regulations limit the amount of airborne radionuclides released from any nuclear facility to that which will produce a dose of 10 mrem/yr to any member of the public. These regulations, known as the *National Emission Standards for Hazardous Air Pollutants* (NESHAPs), are found in 40 CFR Part 61, Subpart H. The EPA has specified that the CAP-88 computer code be used to demonstrate compliance unless an alternative method has been approved by the Administrator of EPA.

The source term for the Maximally Exposed Individual (MEI) associated with the operation of the TMI-2 ISFSI would consist of gases and particulate fractions of the materials in the canisters. The source term was developed using the 1984 curie inventory of the TMI fuel (DOE 1993) and decayed to March 1997. Ten percent of the volatile radionuclides in the matrix are assumed released per year (Page 3 of Staley, 1996a). This estimate is conservative as much of the volatile fission products inventory is believed to have been released during the TMI-2 accident. The remainder is entrapped within the fuel matrix and only high temperatures [(>2,900° F (1,600° C)] would release the inventory. Estimated releases of particulates and solids (Table 3-1) were calculated using release fractions from 40 CFR 61, Appendix D of 1E-03 per year for particulates and 1E-06 per year for solids (Staley, 1996a).

EPA's CAP-88 code was used for calculation of the Effective Dose Equivalent (EDE), which includes the 50-year Committed Effective Dose Equivalent (CEDE) from internal exposure through the ingestion and inhalation pathways and the internal EDE from ground deposition and air immersion. Five-Year average meteorological data collected during the period 1987-1991 by NOAA from the 10 m (32.8 ft) level of the Grid III meteorological tower were used for modeling ground-level releases from ICPP. For all data sets, calm wind periods were incorporated into the lowest wind speed class. The dose from ICPP dry storage was calculated by the CAP-88 code to the MEI at Frenchman's cabin, 11.62 miles (18.7 km) SSW of the ICPP, would be 0.0004 mrem/yr (Staley, 1996b)

Section 7.6.3 of the TMI-2 Safety Analysis Report (DOE 1996) evaluated the dose equivalents from effluents using the RSAC-5 computer code. The RSAC-5 model used NOAA air dispersion information with more conservatively located receptors than those identified by CAP-88 to provide a "bounding" analysis for use in the safety report. Due to the differences in the models, the results differ. It is noted that the doses to workers at ICPP or conducting activities associated with the operation of the ISFSI, such as sampling, would not exceed the dose limits of 10 CFR 72.104. Furthermore, the dose

rate from the routine operation of the TMI-2 ISFSI would not exceed the following regulatory limits (Sheffield, 1996):

ISFSI fence	< 2 mrem/hr
100 meters (328.1 ft)	< 25 mrem/yr
4 miles from ISFSI	< 1 mrem/yr

3.5.2 LIQUID RADWASTE SYSTEM

No liquid radioactive wastes would be generated during the operation of the ISFSI.

3.5.3 GASEOUS RADWASTE SYSTEM

Prior to venting, the air from a DSC would be filtered through a HEPA filter with a decontamination factor of 3E-04 (Page 5 of Staley, 1996a). Under NESHAPs, a project with the potential to release radioactivity must be evaluated to determine its impact to the public. There are 2 doses to a MEI for 2 separate purposes to be calculated for NESHAPs: 1) a dose from releases using release fractions and emission factors from Appendix D, 40 CFR 61; and 2) a dose assuming no pollution control equipment is present to clean up emissions. These doses are for purposes of determining permitting and monitoring requirements, respectively, and need to be at or below 0.1 mrem/yr for a project to be exempted from these two requirements. Staley (1996c) identifies that these two doses to the MEI would be below 0.1 mrem/yr (0.00303 mrem/yr and 0.0161 mrem/yr respectively). Therefore, a NESHAPs application to construct and continuous monitoring is not required for the TMI-2 ISFSI.

3.5.4 SOLID RADWASTE SYSTEMS

Approximately 630 yd^3 (485 m^3) of solid low-level radioactive wastes would be generated as a result of the project implementation. This estimate includes operations associated with removal from the TAN Pool, cask transfer, unloading, and decontamination operations; storage and monitoring; and decontamination and decommissioning of the ISFSI and TAN Pool (Section C-2.1, Vol. 2, Part B, DOE 1995). Wastes would include HEPA filters, disposable personal protective equipment (e.g., Anti-C garments), tape, blotter paper, rags, and contaminated system components. This volume of waste generated by these activities would be minimized through work planning. Recyclable or launderable materials would be processed for reuse as practical. Radioactive wastes would be handled and disposed of in accordance with INEL procedures with the incinerable solid waste being sent to the Waste Experimental Reduction Facility (WERF) incinerator and the remainder sent for disposal to the RWMC or an INEL-approved disposal facility.

3.5.5 PROCESS AND EFFLUENT MONITORING

While NESHAPs does not require the continuous monitoring of the HEPA-filtered DSC emissions since the unabated emissions are less than 0.1 mrem/yr, emissions would be calculated on an annual basis and reported in the INEL annual NESHAPs report. As identified in Section 6.2, the INEL operational radiological monitoring programs would be continued through the life of the TMI-2 ISFSI. These programs would also serve as the operational monitoring program for the ISFSI.

3.6 CHEMICAL AND BIOCIDE WASTES

The ISFSI does not require use of any chemicals or biocide.

3.7 SANITARY AND OTHER WASTE SYSTEMS

There are no sanitary or other waste systems required for the operation of the ISFSI since, during operation, personnel would use existing ICPP sanitary facilities. During construction, portable toilets would be available for use by the construction workers as discussed in Chapter 4.0.

3.8 REPORTING OF RADIOACTIVE MATERIAL MOVEMENT

The TMI-2 canisters would be transported from TAN to ICPP, a distance of approximately 25 miles (40 km), which includes 5 miles (8 km) of public road, Highway 33. Transportation would be within the boundaries of the INEL and would require an estimated 29 vehicle trips. The packaging and transportation will be subject to NRC approval and comply with the Atomic Energy Act of 1954 as amended (42 USC § 2011 et seq.) including 10 CFR Part 71 "Packaging and Transportation of Radioactive Material." The applicable requirements of the Hazardous Waste Transportation Act (49 USC § 5101 et seq. would be complied with concerning the placarding and emergency response including 10 CFR 171 "General Information, Regulations, and Definitions." Due to weight limitations on the existing bridge over the Big Lost River near NRF, improvements to the existing bridge or bypass road may be required (see Section 10.0 for discussion of environmental permits). Environmental effects from the transportation would be bounded by the analysis conducted for the FEIS (DOE 1995) including the occupational and general population collective doses and accident analysis.

3.9 TRANSMISSION FACILITIES

During construction, existing retail electrical transmission lines in the immediate vicinity of the site would provide electrical power for construction activities. This system would also supply power for external lighting, canister emission sampling, and security systems.

3.10 FIGURES, TABLES, AND REFERENCES

3.10.1 FIGURES

Figure 3-1. The ISFSI Site, Pad, and HSMs within the ICPP

3.10.2 TABLES

Table 3-1. Calculated Radionuclide Inventory and Releases

3.10.3 REFERENCES

DOE 1993, *NESHAPs Permit to Construct Application for the INEL Test Area North Dry Cask Storage Project,* Appendix A, DOE/ID-10452(93)

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* April

DOE 1996, *The Safety Analysis Report for the TMI-2 Independent Spent Fuel Storage Installation,* October

Sheffield, J., 1996, *TMI-2 Fuel Storage Project Input for Environmental Report,* VECTRA, 219-02-96-045, May 24.

Staley, C.S., 1996a, *Dose to Maximally Exposed Individuals due to Potential Airborne Releases from the INEL Storage of the TMI-2 Fuel Project,* Engineering Design File EMA-96-001, LITCO, February

Staley, C.S., 1996b, Letter to L. C. Tuott, Letter #CSS-08-96, September

Staley, C.S., 1996c, Letter to L. C. Tuott, Letter #CSS-10-96, September

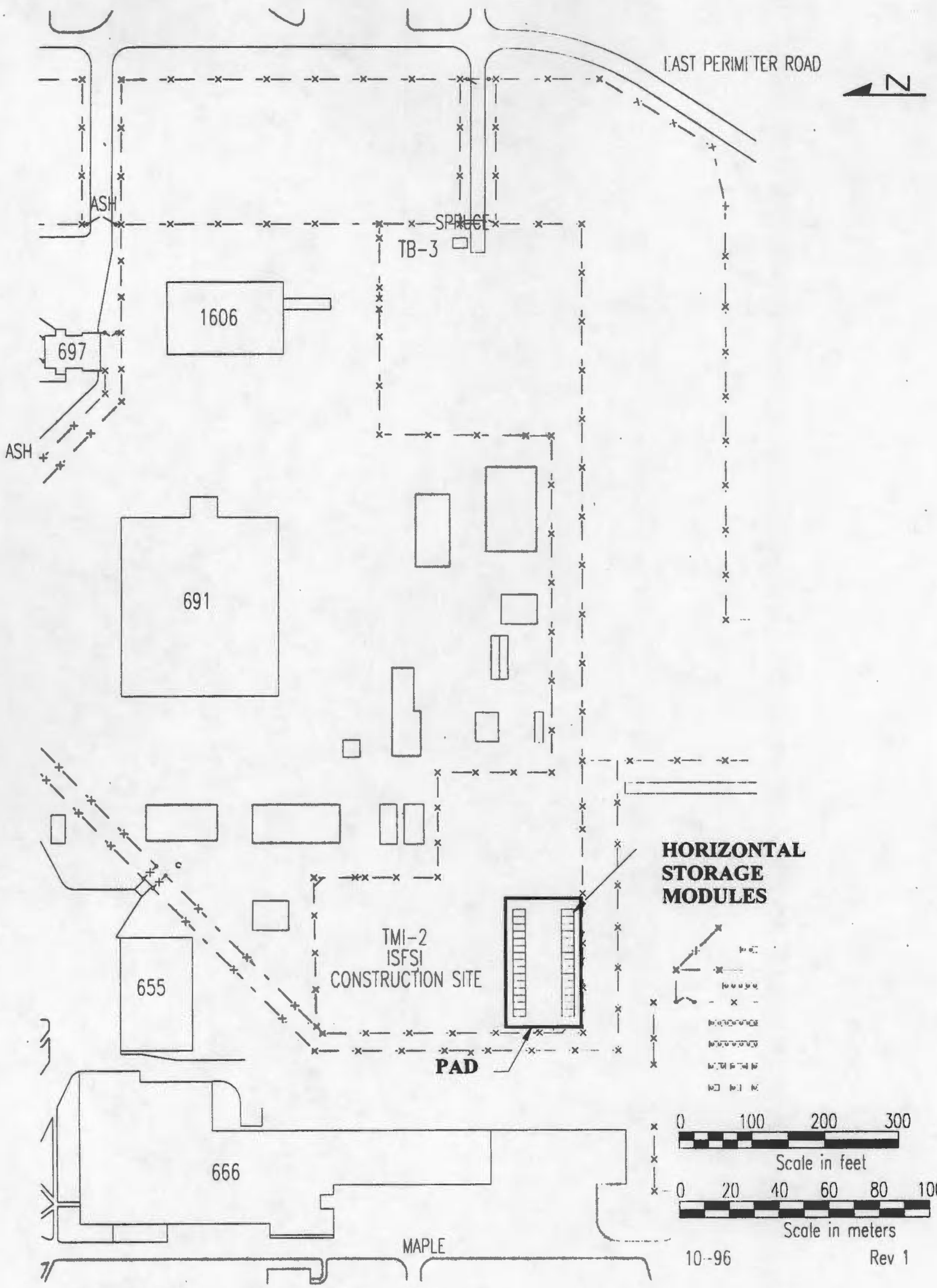


Figure 3-1 The TMI-2 ISFSI site, pad and HSMs within the ICPP.

Table 3-1 Calculated Radionuclide Inventory and Releases

Nuclide	Ci in fuel	ICPP storage Release (Ci/yr)
H-3	7.68E +02	7.68E +01
Co-60	1.13E +04	6.16E -06
Kr-85	1.52E +04	1.52E +03
Sr-90	4.83E +05	2.63E -04
Y-90	4.83E +05	2.63E -04
I-129	1.15E -01	1.15E -02
Cs-134	2.43E +02	1.27E -07
Cs-137	2.82E +05	1.54E -04
Ba-137m	2.67E +05	1.45E -04
Eu-154	2.29E +03	1.25E -06
Pu-238	9.48E +02	5.16E -07
Pu-239	9.34E +03	5.09E -06
Pu-240	2.86E +03	1.56E -06
Pu-241	1.03E +05	5.61E -05
Am-241	4.67E +03	2.54E -06

Staley, 1996a

4. ENVIRONMENTAL EFFECTS OF SITE PREPARATION AND CONSTRUCTION

4.1 SITE PREPARATION AND CONSTRUCTION

4.1.1 EFFECTS ON LAND USE

Site preparation and construction for the ISFSI would occur in previously disturbed areas at ICPP and would not impact offsite land use. The ISFSI site was previously used as an access road and construction staging and parking area for the construction of CPP 691. Construction of the ISFSI would not affect any wetland areas.

Access would be controlled between the ISFSI construction site and ICPP with the installation of fencing and the use of the existing East Perimeter Road and gate to provide access to construction personnel (Figure 4-1). The fenced construction area, approximately 5 acres (2.0 ha) in size (Figure 4-2), would include a laydown area for administrative and storage trailers, equipment, and material storage. Upon completion of the construction, the buildings and equipment would be removed, and a perimeter security fence for the ISFSI would be installed.

Site preparation for ISFSI construction would begin with the pad excavation, grading (leveling), and preparing a suitable base for the ISFSI reinforced concrete foundation. Excavated soil would be stockpiled onsite to be used upon completion of construction to provide the final grades and drainage.

Improvements to the Big Lost River bridge or adjacent bypass road may be required to support the weight of the transport vehicle. Improvements to the bridge could include additional bridge supports or monitors. Improvements to the bypass could include installation of properly sized culverts (or bridging) and road improvements.

Due to the location of the activity and the previously disturbed condition of the property, no loss of biological production is anticipated.

4.1.2 EFFECTS ON WATER BODIES USE

Construction of the ISFSI would have minimal impact to the groundwater used to supply the ICPP water system. Concrete for the slab would arrive at the construction site ready mixed. Bottled drinking water would be brought in from offsite for contractor personnel. Water used for fugitive dust control at the construction site would be provided by the existing ICPP water system. Depending on weather conditions, it is estimated that 10,000 to 100,000 gallons (38 to 380 cubic meters) of water would be used during the construction period. Total consumption of water at the INEL averages 1.94 billion gallons (7.36 million cubic meters) per year (Section 5.8.2.2 of Volume 2, Part A, DOE 1995). The increased water use would represent a minimal increase (less than .01%) in the INEL's average annual water consumption.

A project stormwater pollution prevention plan would be completed prior to any construction. The plan would be prepared in accordance with *the INEL Stormwater Pollution Prevention Plan for Construction Activities* (DOE-ID 1996) and the regulations for "National Pollutant Discharge Elimination System (NPDES) General Permit for Stormwater Discharges Associated with Construction Sites" (40 CFR 122 et. seq.) The purpose of a storm water pollution prevention plan is to prevent erosion products, sediment, or other pollutants from running off the site during construction and impacting water bodies.

Improvements to the Big Lost River bridge or adjacent bypass would be designed, permitted (See Section 10.0), and constructed so as to not adversely impact potential flows or wetlands on the Big Lost River.

4.1.3 IMPACT OF WORK FORCE

Project construction is anticipated to begin with excavation in the Spring of 1997 and is anticipated to be completed in 12 months. The is project would require an average of 8 to 20 workers including laborers, equipment operators, and management (Section C-2.1, Vol. 2, Part B, DOE 1995 and Section 4.1.2.4, DOE 1996). Based on information provided by construction contractors, 85% of the construction workforce would be hired from the existing labor force in the INEL region of influence (Section F-1.3.1, Vol. 2, Part B, DOE 1995). This workforce would be approximately 2-8% of the projected 1997 INEL construction workforce. A workforce of this size would be within normal fluctuations in INEL employment and would not adversely impact housing, transportation systems, or public services such as schools or police departments.

4.1.4 IMPACT OF CONSTRUCTION GENERATED FUGITIVE DUST

As identified in Section 4.1.2, water may be used to reduce the generation of fugitive dust from construction. The generation of fugitive dust is anticipated to be negligible due to the dust-control watering, the availability of existing paved roads that provide access to the construction site, and the small [5 acre (2 ha)] TMI-2 ISFSI construction support area.

4.1.5 IMPACT ON WILDLIFE

The construction of the TMI-2 ISFSI would occur within the developed area of ICPP and impact to threatened or endangered species of plants or animals is anticipated to be negligible (Reynolds, 1993). Impacts to wildlife associated with improvements to the existing bridge or bypass road are anticipated to be negligible.

4.1.6 CONSTRUCTION NOISE

Activities associated with ISFSI construction such as site preparation and facility construction would generate noise. This noise would not be expected to adversely impact threatened or endangered species (Reynolds, 1993). Impact to workers would be minimal as construction activities would be in conducted in compliance with Occupational Safety and Health Administration's (OSHA) requirements for worker occupational noise exposure. The noise generated at the INEL site is not propagated at detectable levels offsite, since all public areas are at least 5 miles (8 km) away from site areas. Previous studies of the effects of noise on wildlife indicate that even very high intermittent noise levels at the INEL (over 100 dBA) would have no deleterious effect on wildlife productivity (Section 4.10, Vol. 2, Part A, DOE 1995).

4.2 TRANSMISSION FACILITIES CONSTRUCTION

New transmission facilities are not anticipated to be required for the construction or operation of the TMI-2 ISFSI.

4.3 RESOURCES COMMITTED

Irreversible and irretrievable commitments of resources associated with site preparation and construction would potentially include land, groundwater, aggregate (sand and gravel), and energy resources (Section 5.18, Vol. 2, Part A, DOE 1995). Following removal of the SNF, the components of the ISFSI would be surveyed, decontaminated if necessary, and disposed of or reused using methods available at the time of decommissioning (See Section 5.7). It is anticipated that the site preparation and construction would not cause an irreversible commitment of the land or groundwater as the site would be decontaminated and made available for alternative future uses consistent with the mission of ICPP. The irreversible and irretrievable commitment of aggregate would be dependent on the ability (and cost-effectiveness) to recycle the concrete. Energy resources such as diesel fuel used for construction equipment or electricity for tools would be irreversibly used and committed.

4.3.1 LAND

The fenced construction support area for the ISFSI would encumber approximately 5 acres (2 ha) or approximately 2% of the ICPP area.

4.3.2 WATER

There would be no irretrievable or irreversible commitments of water or waterways for the construction of the ISFSI.

4.3.3 AIR

No local or site air resources would be irretrievably committed to the construction of the ISFSI.

4.3.4 BIOTA

Due to the limited area of disturbance and the disturbance being within previously developed (and disturbed) areas, the effects of site preparation and construction on the biota are expected to be minimal.

4.3.5 MATERIALS

Scarce or strategic material would not be used for the construction of the ISFSI. Concrete, reinforcing steel, and a small amount of miscellaneous construction materials would be needed for construction of the ISFSI. The dry shielded canisters would be shipped to an offsite facility.

4.3.6 SUMMARY OF RESOURCES COMMITTED

As identified in the previous sections, relatively small amounts of resources would be required for the construction of the ISFSI. This commitment of resources would not alter or affect their availability either locally or regionally.

4.4 RADIOACTIVITY

Section 4.7.3.2.1 Vol. 2, Part A, DOE 1995 evaluated onsite doses at the INEL using air dispersion models to assess the radiation dose to workers at major INEL site facility areas as a result of cumulative emissions from existing facilities and those expected to become operational before June 1, 1995. Results of this assessment indicate that the maximum dose at any onsite area is currently about 0.2 mrem per year. If only permanent facility emissions are considered, the baseline worker dose could increase to 0.32 mrem per year. The actual and projected dose is compared to the occupational dose limit of 5,000 mrem per year.

No exposure to construction personnel in excess of normal background radiation levels is expected during site preparation and construction. During DSC transfer to the HSM, it is anticipated that there would be occupational exposure to personnel from exposure to direct radiation. Occupational radiation exposure would not exceed the limits identified in 10 CFR 20.1201 [annual total EDE less than 5,000 mrem (0.05 Sievert)].

Radiation exposure to the public from the transfer, while not anticipated, would not exceed the regulatory limits identified in 10 CFR 20.1301 [annual total EDE less than 100 mrem (0.001 Sievert)] and EPA's environmental radiation standards in 40 CFR part 190 (annual dose equivalent to public being less than 25 mrem to whole body). A radiation protection program with procedures and engineering controls based on sound radiation protection principles will be in place to ensure that occupational doses and doses to members of the public would be maintained as low as reasonably achievable (ALARA).

4.5 CONSTRUCTION IMPACT CONTROL PROGRAM

Every reasonable means to minimize or mitigate environmental impacts identified in Section 4.1 would be taken during construction of the ISFSI.

4.5.1 CONSTRUCTION TRAFFIC CONTROL

Improvements to the bridge or bypass would require proper traffic control and signage to ensure worker and traffic safety. Construction traffic and access to the ISFSI site would use existing public highways or site roadways. Increased traffic resulting from these construction activities and existing and planned INEL activities would not adversely impact the road system in the vicinity of the INEL (Section 5.11.2.6, Vol. 2, Part A, DOE 1995). Construction personnel would have the use of existing parking areas in a previously developed area located outside the ICPP fence near the ISFSI. The use of these existing roads and parking areas would be conducted in a manner so as to not conflict with existing ICPP traffic patterns or the ISFSI construction.

4.5.2 DUST AND PARTICULATE EMISSION CONTROL

Existing roads that would be used for access to ICPP or the Big Lost River crossing are paved. During site preparation, grading and construction operations, cleared areas and exposed soils would be managed in accordance with the INEL Stormwater Pollution Prevention Plan for Construction Activities (DOE-ID 1996) so as to minimize soil erosion and dust and particulate emissions.

4.5.3 NOISE CONTROL

Noise impacts would be minimized by using trucks and equipment with standard noise control devices.

4.5.4 CHEMICAL WASTE MANAGEMENT

During site preparation and construction, the generation of chemical or petroleum wastes at the ISFSI site is not anticipated.

4.5.5 SOLID WASTE MANAGEMENT

The generation of construction scrap and wastes associated with the TMI-2 ISFSI project is estimated to be 11 yd^3 (8.5 m^3) (Section C-2.1, Vol. 2, Part B, DOE 1995). The generation of waste associated with bridge or bypass improvements is estimated to be less than 3 yd^3 (2.3 m^3). Waste generation would be minimized in accordance with the INEL waste minimization program. Wastes that can not be recycled or reused will be collected in designated onsite areas for disposal in the INEL Landfill Complex.

4.5.6 SITE CLEARING

The ISFSI site and bridge/bypass have been extensively disturbed from previous development activities. The ISFSI site will have soil removed to a depth of approximately 6 to 24 inches (15-61 cm) to prepare for ISFSI construction. Vegetation in the bridge/bypass construction area would be removed to facilitate construction, as necessary. Erosion in the construction area would be controlled (DOE-ID 1996). Typical methods of erosion control would include drainage intercept and berm ditches, seeding, graveling, and use of mats and straw.

4.5.7 EXCAVATION AND SOIL DISPOSITION

The construction site and stockpile of soil removed from the site would be stabilized as necessary to minimize erosion (DOE-ID 1996). Temporary drainage from the construction site after construction would be designed to use the existing ICPP drainage patterns and minimize disturbance of existing land. Following construction, the TMI-2 ISFSI construction site would be graded using the stockpiled soil (as necessary) so as to drain potential site runoff away from the ISFSI to the existing ICPP drainage system.

4.6 FIGURES AND REFERENCES

4.6.1 FIGURES

4.6.2 REFERENCES

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April

DOE, 1996, *Department of Energy Environmental Assessment of the Test Area North Pool Stabilization Project,* DOE/EA-1050, May,

DOE-ID 1996, *INEL Stormwater Pollution Prevention Plan for Construction Activities.* DOE/ID-10425

Reynolds, T. L., 1993, Memorandum to S. K. Gray, Subject: *"Pool Stabilization Project"* July 9

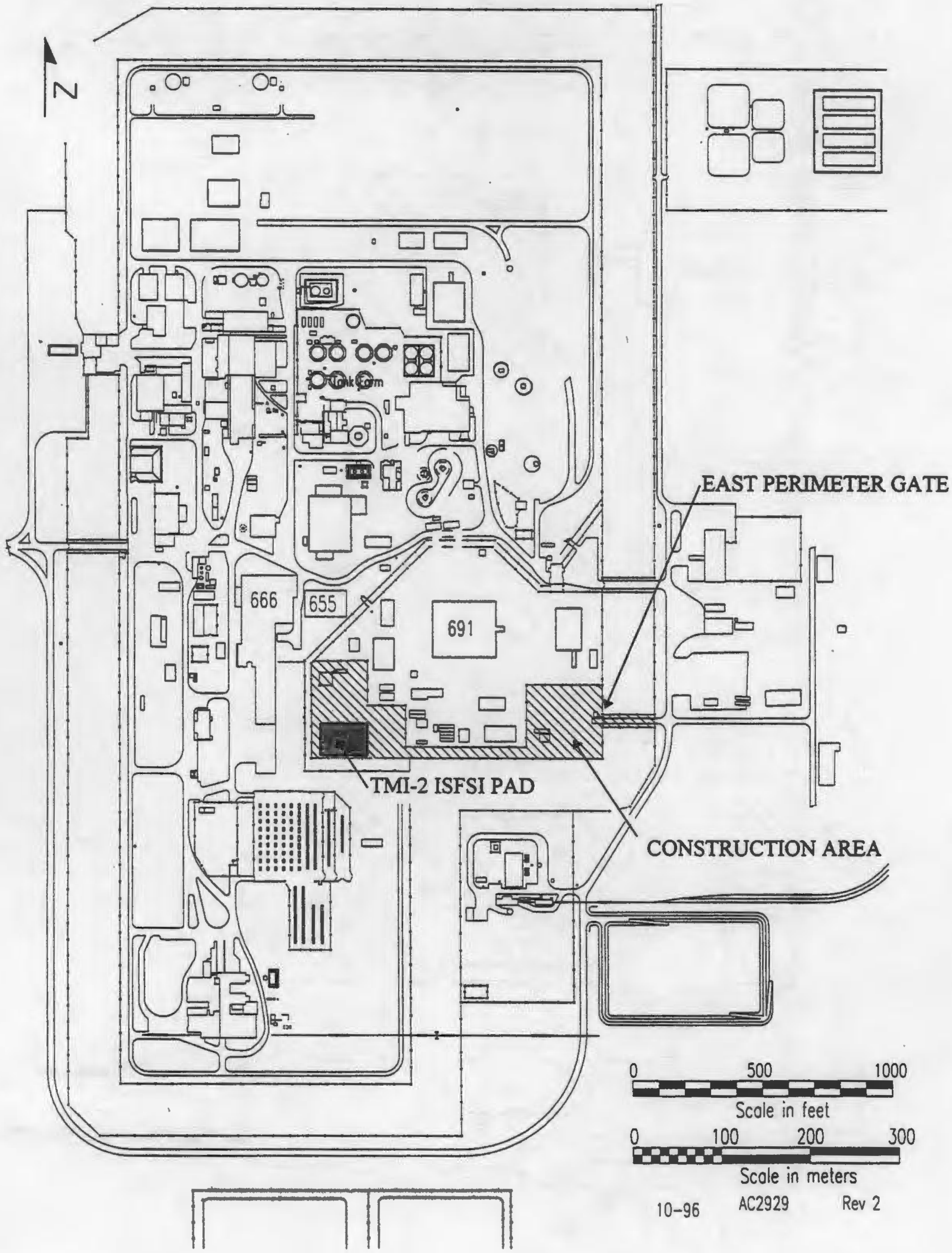


Figure 4-1. ISFSI construction and staging area at ICPP

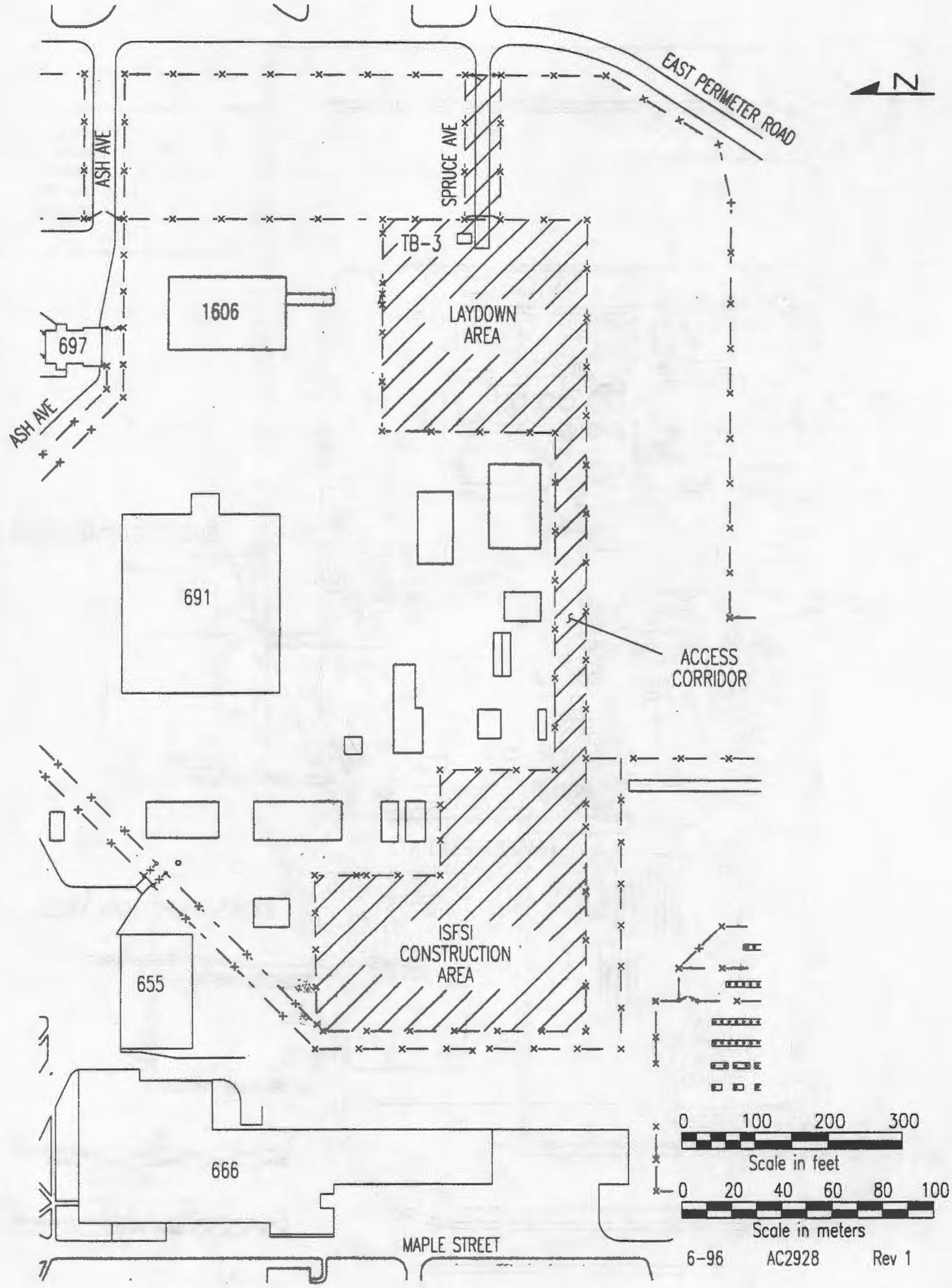


Figure 4-2. Detail of the ISFSI construction site and staging area

5. ENVIRONMENTAL AFFECTS OF ISFSI OPERATION

5.1 EFFECTS OF OPERATION OF HEAT DISSIPATION SYSTEM

The operation of the TMI-2 ISFSI requires no active heat dissipation system. Decay heat is removed from the DSC by convection, conduction, and thermal radiation to the atmosphere in the immediate vicinity of the ISFSI. The maximum HSM outer surface temperature would be less than 150°F (65.6°C) during normal operations and less than 200°F (93.3°C) during potential off-normal and accident conditions (Section 8, DOE 1996a). Due to the low heat loads of the TMI-2 debris and the system's design to remove heat by natural convection in the air, there would be no release of heat to water and no impacts on water quality or biological growth.

5.2 RADIOLOGICAL IMPACT FROM ROUTINE OPERATION

5.2.1 ANALYSIS OF ISFSI CONTRIBUTION

The ISFSI design incorporates multiple confinement barriers to ensure that during normal operations there would be no releases to the environment of liquid radioactive material and airborne releases would be controlled through the use of the HEPA filtration system. Sections 7.4 and 7.5 of the Safety Analysis Report (SAR) (DOE 1996a) have analyzed the radiological impact of the operation of the TMI-2 ISFSI. Based on the conservative assumptions used in the SAR, the radiological dose attributable to the ISFSI are well below regulatory limits of 10 CFR 72.104.

5.2.2 ANALYSIS OF MULTIPLE CONTRIBUTION

In 1995, radiation from INEL operations was not detected by offsite environmental surveillance methods (DOE-ID 1996a). Because the doses to the public from INEL operations are generally too small to be measured, computer models are used to estimate annual radiation doses from the INEL. Using the EPA approved CAP-88 model, the hypothetical maximum dose from INEL activities in 1995 was 0.018 mrem for the MEI located at "Frenchman's Cabin" located at the foot of Big Southern Butte (DOE-ID 1996b). This dose estimate can be compared to the average annual dose of 360 mrem in southeast Idaho.

The maximum annual dose to the nearest permanent resident, i.e., the maximally exposed individual (MEI), and the site worker resulting from INEL activities from 1995 to 2005, has been calculated (Section 5.7.3, Vol. 2, Part A, DOE 1995). This estimate projects that the MEI would receive an incremental ten-year dose of 5.8 mrem (0.58 mrem/yr) for this period that would result in a cumulative ten-year dose of 6.3 mrem (0.63 mrem/yr). On an annual basis, this dose rate is well below the 25 mrem/year limit specified in 10 CFR 72.104. An INEL worker at a location of highest dose from airborne emissions is estimated to receive an incremental ten-year dose of 1.4 mrem (0.14 mrem/yr) for this period that would result in a cumulative ten-year dose of 4.6 mrem (0.46 mrem/yr). This is a small fraction of the occupational dose limit of 5,000 mrem/yr. (Note: the offsite dose can be higher than the worker dose since the workers may not receive any dose by the food ingestion pathway.)

5.3 EFFECTS OF CHEMICAL AND BIOCIDE DISCHARGES

As discussed in Section 3.6, the ISFSI would not generate any chemical or biocide wastes. Commercially available herbicides (weed-killers) or ground sterilants may be used to control vegetation at the ISFSI site. The use of these products would be in accordance with manufacturer's guidelines and INEL procedures with any potential runoff being controlled in accordance with the ICPP Industrial Stormwater Pollution Prevention Plan. Therefore, there would be no chemical and biocide discharges.

5.4 EFFECTS OF OPERATION AND MAINTENANCE OF THE TRANSMISSION SYSTEM

The ICPP is supplied with electrical power from two separate INEL feeds and includes standby emergency systems. Power requirements during construction would be supplied by tapping the electrical supply system's feeder transmission lines located adjacent to the ISFSI site. This system would also supply power for operational and maintenance activities such as canister emission sampling activities and the external lighting and security system that would be added in accordance with the TMI-2 ISFSI Security Plan.

Operation and maintenance of this tap would result in minimal environmental effects due to the short distance from the point of origin to the construction area, previously disturbed nature of the site, and relatively low voltage demands of this equipment.

5.5 OTHER EFFECTS

5.5.1 NOISE IMPACT

Noise would result from the DSC transfer from the transport vehicles to the ISFSI. Noise from this activity is expected to be within the range of that typically produced by ongoing activities at ICPP and no adverse impacts would be anticipated.

5.5.2 CLIMATOLOGICAL IMPACT

Radioactive decay would cause heat to be generated within the canisters and the temperature inside the HSM would be below 200° F (93.3° C). The HSM contains no air vents as they are not required to remove the decay heat generated by the TMI-2 canisters. The cooling air flows around the DSC to the top of the HSM. Air warmed by the DSC transfers heat to the HSM walls and roof slab. Adjacent modules are spaced to provide adequate natural convection flow and shielding. This passive system provides an effective means for spent fuel decay heat removal. The air temperature in the immediate vicinity of the HSM would be slightly higher than the ambient temperature but would return to normal at a short distance from the storage site. Precipitation would not vaporize at the HSM surface and there would be no adverse climatological impacts due to the operation of the ISFSI.

5.5.3 IMPACT ON LOCAL WILDLIFE

Due to the location of the TMI-2 ISFSI (existing highly disturbed site and the presence of ICPP fencing), the local wildlife or any threatened or endangered wildlife or plant species would not be adversely affected by the operation of the TMI-2 ISFSI.

5.5.4 IMPACT FROM RUNOFF

Rainfall runoff from the ISFSI would not be contaminated since the HSM would protect the DSC from direct contact with rainfall. Condensation that may form on the DSC would not be contaminated since the DSC would be decontaminated prior to installation in the ISFSI. Therefore, runoff from the ISFSI would not require any special monitoring or containment capability.

5.6 RESOURCES COMMITTED

The operation of the ISFSI is not anticipated to cause the irreversible and irretrievable commitment of resources. Subject to the use of decontamination technologies as identified in Section 5.7, it is anticipated that the site would be restored and made available for alternative use consistent with future uses of ICPP.

5.7 DECOMMISSONING AND DISMANTLING

Decommissioning and dismantlement of the ISFSI would be performed in a manner consistent with the *Conceptual Plan for Decommissioning TMI-2 Independent Spent Fuel Storage Installation* and INEL procedures that would be in place at that time. Decommissioning would be initiated with the DSCs being prepared for offsite shipment. Decommissioning would provide for removal of the fuel assemblies and source material from the TMI-2 ISFSI site, including radioactive fission and corrosion products and other radioactive materials having activities above release limits. The components of the ISFSI would be surveyed, decontaminated if necessary, and disposed or reused using methods available to the INEL at the time of decommissioning.

5.8 REFERENCES

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April

DOE 1995a, *"Settlement Agreement"* between the State of Idaho, Department of the Navy, and the Department of Energy." Oct. 16

DOE 1996, *Department of Energy Environmental Assessment of the Test Area North Pool Stabilization Project*, DOE/EA-1050, May

DOE 1996a, *The Safety Analysis Report for the TMI-2 Independent Spent Fuel Storage Installation,* October

DOE-ID 1996a, *In Summary: Idaho National Engineering Laboratory Site Environmental Report for Calendar Year 1995,* ESRF-015, September

DOE-ID 1996b, *1995 INEL National Emission Standard for Hazardous Air Pollutants - Radionuclides, Annual Report*, DOE/ID-10342(95), June

Staley, C.S., 1996, *Dose to Maximally Exposed Individuals due to Potential Airborne Releases from the INEL Storage of the TMI-2 Fuel Project,* Engineering Design File EMA-96-001, LITCO, February

6. EFFLUENT AND ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

6.1 APPLICANT'S PREOPERATIONAL ENVIRONMENTAL PROGRAMS

As identified in Section 2.0 of this document, the INEL has a comprehensive environmental monitoring program conducted on and around the INEL. Environmental monitoring associated with the TMI-2 ISFSI would not be a separate program but would be conducted as part of the overall INEL monitoring program. The INEL Environmental Surveillance Program has the following organizations charged with the responsibility for environmental monitoring: National Oceanic and Atmospheric Administration (NOAA) - onsite and offsite meteorological monitoring; Lockheed Martin Idaho Technologies Company (LMITCO) - onsite environmental surveillance; Environmental Science and Research Foundation - offsite environmental surveillance; and the U.S. Geological Survey (USGS) - onsite and offsite groundwater surveillance. These programs provide a comprehensive and timely base for the environmental impact evaluations of the proposed ISFSI including DOE activities such as canister dewatering. The results of this environmental surveillance and monitoring are reported to the public and DOE Headquarters in an annual site environmental report (DOE 1996).

As the operation of the ISFSI would not involve the discharge of liquid effluent, chemical, or sanitary wastes, the existing INEL monitoring programs for surface water, groundwater, air, meteorological conditions, and land (including threatened and endangered flora and fauna) would not be modified. Due to venting of the TMI-2 canisters, there would be gaseous releases of radionuclides. The existing INEL radiological monitoring is identified in the following paragraph and the proposed operational monitoring system in Section 6.2.

To conduct radiological monitoring, the INEL Environmental Surveillance Program includes a network of 23 continuous air samplers that measure ambient radiation exposure rates and airborne radioactivity levels (Section F-3.2.1.2, Volume 2, Part B, of DOE 1995). As depicted on Figure 2-12, 12 of the sampling locations are located within the boundaries of the INEL site; 11 are located offsite, including seven stations near the INEL site boundary and 4 distant stations are located within the communities of Blackfoot, Idaho Falls, and Rexburg, and in Craters of the Moon Wilderness Area. The ICPP air sampler is located approximately 1,100 ft (335 m) northwest of the proposed ISFSI site near the ICPP entrance and West Perimeter Road. The Environmental Surveillance Program also includes direct measurements of ambient (environmental) radiation levels using thermoluminescent dosimeters (TLDs). Figure 6-1 identifies the location of TLDs in the proximity of ICPP. These devices measure ionizing radiation exposure rates due to the combined sources of natural radioactivity in the air and soil, cosmic rays, residual fallout from nuclear weapons tests, and radioactivity from INEL site operations. Dosimeters are also placed at seven distant community locations and six INEL site boundary locations.

6.2 APPLICANT'S PROPOSED OPERATIONAL MONITORING PROGRAMS

The INEL operational meteorological and radiological monitoring programs will be continued through the life of the TMI-2 ISFSI. These programs will also serve as the operational monitoring program of the ISFSI. Periodic and confirmatory measurements of radiological emissions will be conducted, as necessary, for NESHAPs compliance purposes. In addition to the onsite and offsite sampling and monitoring conducted in support of the INEL's annual NESHAPs and environmental reporting, sampling of the DSC internal gases will be made on a frequency sufficient to ensure that hydrogen concentrations are maintained at safe levels. Portable radiological monitoring equipment will be used to detect potential releases from the DSC system.

6.3 RELATED ENVIRONMENTAL MEASUREMENT AND MONITORING PROGRAMS

In January 1994, the State of Idaho's INEL Oversight Program took over the independent verification program operated by the Idaho State University since 1989. The University continued to perform radiological analyses for the State program. Results of this monitoring are made available to the public in the Oversight Program's quarterly progress reports.

6.4 FIGURES AND REFERENCES

6.4.1 FIGURES

Figure 6-1 Location of TLDs at ICPP

6.4.2 REFERENCES

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April

DOE 1996, Environmental Science and Research Foundation, *Idaho National Engineering Laboratory Site Environmental Report for Calendar Year 1995,* ESRF-014, DOE/ID-12082(95), August

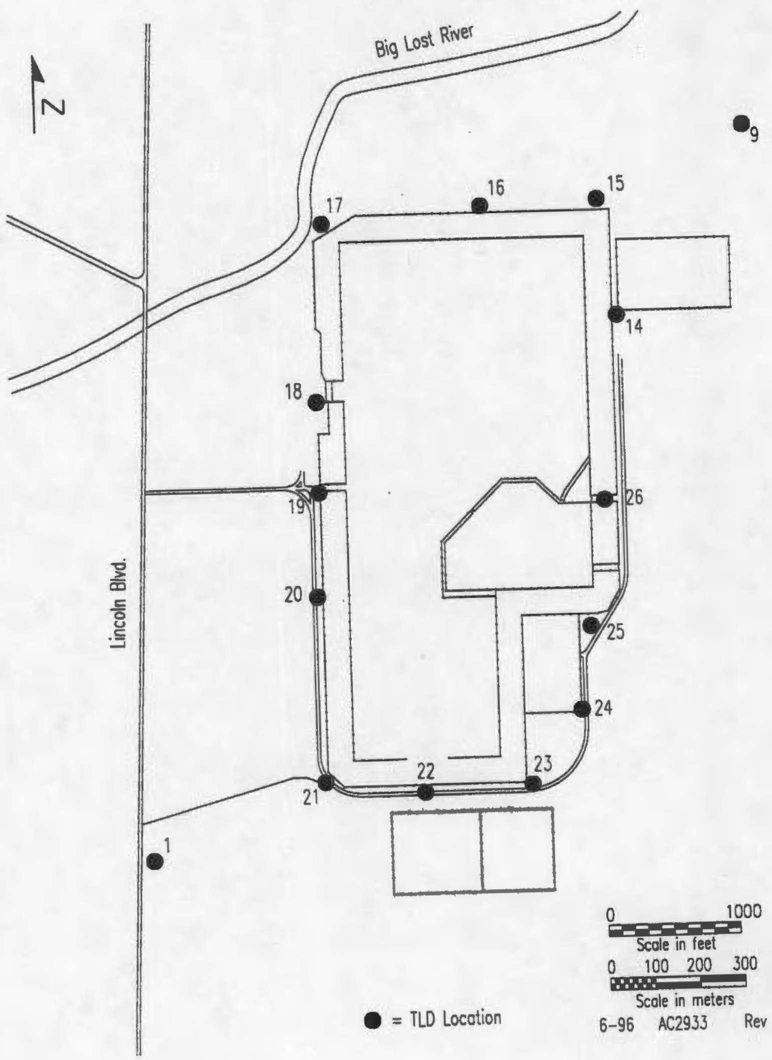


Figure 6-1. Location of TLDs at ICPP

7. ENVIRONMENTAL EFFECTS OF ACCIDENTS

7.1 FACILITY ACCIDENTS INVOLVING RADIOACTIVITY

An evaluation of the safety of the ISFSI with respect to postulated accidents is presented in Chapter 8 of the *Safety Analysis Report for the TMI-2 Independent Spent Fuel Storage Installation* (DOE 1996). For each postulated condition, the accident cause, the structural, thermal, and radiological consequences, and the recovery measures required to mitigate the accident are presented. Calculated doses resulting from these postulated accidents would not exceed the exposure limits identified in 10 CFR 72.104 and 10 CFR 72.106.

7.2 TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVITY

The transportation of the TMI-2 debris would take place totally within the INEL and involve approximately 5 miles (8 km) of public roadway, Idaho Highway 33. A route-specific license from NRC would be obtained for the transport from TAN to ICPP. Potential environmental effects from transportation accidents involving radioactivity would be bounded by this license and the analysis conducted for the FEIS (Vol. 1, App. B, Section 5.11.2.3, DOE 1995) including the occupational and general population collective doses and accident analysis. Table 7-1 summarizes the bounding impacts for onsite transportation of spent nuclear fuel at the INEL. This analysis identified that the maximum reasonably foreseeable onsite spent nuclear fuel transportation accident involves the inadvertent shipment of a short-cooled fuel element (fuel out of the reactor for 10 to 25 days) from the TRA Advanced Test Reactor to ICPP. For this accident to occur, errors must occur to allow loading the wrong fuel element into the shipping cask, and radiation surveys of the loaded cask must fail to detect abnormally high radiation levels. In addition, the transport vehicle must break down or roll over during the short transit between ATR and ICPP. Finally, operators must fail to maintain adequate cooling water inside the case. The probability of this accident is, therefore, extremely unlikely with an annual frequency on the order of one in one million years for neutral meteorology to one in ten million year for stable meteorology. Table 7-1 shows that the fatal cancer risk for the population within 50 miles (80 km) is on the order of one in one million years for a rural population and about one in 90,000 years for a suburban population.

7.3 OTHER ACCIDENTS

Due to the limited volume (or lack of) chemicals and toxic materials associated with the operation of the ISFSI, there are no credible nonradioactive accident scenarios that could be postulated.

7.4 TABLES AND REFERENCES

7.4.1 TABLES

Table 7-1 Maximum reasonably foreseeable accident doses and health effects for onsite transport of spent nuclear fuel (1995-2035)

7.4.2 REFERENCES

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April

DOE 1996, *The ISFSI Safety Analysis Report for the TMI-2 Independent Spent Fuel Storage Installation,* October

Table 7-1. Maximum reasonably foreseeable accident doses and health effects for onsite transport of spent nuclear fuel (1995 to 2035).

Population density category[a]	Meteorology[b]	Accident frequency[c] (events/year)	Dose to MEI[d] (rem)	Offsite population dose (person-rem)	Risk of fatal cancer per year[e]	
					MEI[d]	Population
Rural	Neutral	1×10^{-6}	76	1,500	6.1×10^{-8} (0.061)	7.5×10^{-7} (0.75)
Rural	Stable	1×10^{-7}	250	12,000	2.0×10^{-8} (0.20)	6.0×10^{-7} (6)
Suburban	Neutral	1×10^{-6}	76	21,000	6.1×10^{-8} (0.061)	1.1×10^{-5} (11)
Suburban	Stable	1×10^{-7}	250	170,000	2.0×10^{-8} (0.20)	8.5×10^{-6} (85)

a. Results are presented for generic rural and suburban population densities. The generic rural population density has an average population of 6 persons per square kilometer; the generic suburban population density has an average population of 7.19 persons per hectare. For comparison, the sector with the highest population density within 50 miles (80 kilometers) is due east of the Idaho Chemical Processing Plant-Test Reactor Area at the INEL with an average population density of 0.53 persons per hectare.

b. Neutral meteorology is characterized by Stability Class D, 4 meters (13 feet) per second wind speed, and occurs approximately 50 percent of the time. Stable meteorology is characterized by Stability Class F, 1 meter (3.28 feet) per second wind speed, and occurs approximately 5 percent of the time.

c. Accident frequency includes both the event frequency and the frequency of the meteorology. The frequency of stable meteorology is approximately one-tenth the frequency of neutral meteorology.

d. Maximally Exposed Individual located at the point of maximum exposure to the airborne release approximately 525 to 1,280 feet (160 to 390 meters) downwind, depending on meteorology. For onsite accidents, the MEI is assumed to be an INEL worker.

e. Fatal cancer risk = dose × accident frequency × (ICRP 60 risk factor for fatal cancers). The ICRP 60 risk factor is 5×10^{-4} fatal cancers per rem for the public, 4×10^{-4} fatal cancers per rem for workers. For doses $\geq$20 rem, the ICRP 60 conversion factor is doubled. Numbers in parentheses indicate likelihood of fatal cancer for the MEI or total number of fatal cancers in the population if the accident occurs.

Source: Table 5.11-9, Volume 2, Part A, DOE, 1995

8. ECONOMIC AND SOCIAL EFFECTS OF SYSTEM CONSTRUCTION AND OPERATION

As identified in Section 4.1.3, the construction of the ISFSI would require an average of 8 to 20 personnel over the period of a year. It is projected that the majority of these positions would be filled by the local workforce. The impacts of this workforce would be spread through the seven-county area region of influence surrounding the INEL comprised of Bannock, Bingham, Bonneville, Butte, Jefferson, and Madison Counties (Page F-1-2 of Volume 2, Part B, DOE 1995). The operation of the ISFSI would be conducted by existing INEL employees.

Based on the number of employees required for construction that would be dispersed throughout the seven-county region of influence, the short-term economic and social impacts associated with the ISFSI construction would be negligible. Since the ISFSI would be operated by existing INEL employees, there should be no long-term change to the area employment, population, housing, public services, demographics, or income.

8.1 ENVIRONMENTAL JUSTICE

Environmental justice impacts associated with waste management, environmental restoration, and the programmatic management of SNF at the INEL including construction and operation of ICPP dry storage for the TMI-2 debris was evaluated (Section 5.20, Vol. 2, Part A, DOE 1995). This environmental justice analysis was based on a qualitative assessment of proposed projects and impacts to determine if there were identifiable disproportionately high and adverse human health or environmental impacts on minority populations or low-income populations within a 50 mile (80 km) radius around the site.

The racial and ethnic composition of the minority population residing near the INEL is predominantly Hispanic, American Indian, and Asian and consists of approximately 7% (11,722 persons) of the population within the 50 mile (80 km) radius. The low-income population characteristics within this same area is approximately 14% (23,416 persons). (Section 5.20.2.1, Vol. 2, Part A, DOE 1995).

Because the impacts due to facility operations and reasonably foreseeable accidents present no significant risk and do not constitute a reasonably foreseeable adverse impact to surrounding population, no disproportionately high and adverse impact would be expected for any particular segment of the surrounding population, minority and low-income populations included (Section 5.20.3.1, Vol. 2, Part A, DOE 1995).

Because the impacts due to transportation of waste materials or spent nuclear fuel by either truck or rail under either incident-free or reasonably foreseeable adverse accidents present no significant risk and do not constitute a reasonably foreseeable impact to the surrounding population, no disproportionately high and adverse impact would be expected for any particular segment of the surrounding population, minority and low-income populations included (Section 5.20.3.2, Vol. 2, Part A, DOE 1995).

If transportation associated with INEL activities were to increase wildlife losses because of vehicle collisions with game, there might be a disproportionate impact to minority or low-income communities that rely primarily on hunted game. However, the potential increases in shipments of spent nuclear fuel would be small additions to current traffic, so the overall impact to wildlife would be small. Potential mitigation measures for any resulting adverse impact to low-income or minority populations include distributing the deceased animals to hunters in the vicinity known to partially subsist on game, controlling subsequent hunts, or relocating game if necessary (Section 5.20.3.4, Vol. 2, Part A, DOE 1995).

The review of other technical disciplines did not indicate any significant adverse impacts because of land use, socioeconomics, water and air resources, ecology, cultural resources, or cumulative impacts (Section 5.20.3.5, Vol. 2, Part A, DOE 1995).

In summary, based on the analysis of the impacts for each of the disciplines analyzed in the FEIS (DOE 1995), along with the impact of other past, present, and reasonably foreseeable future activities at the INEL, no reasonably foreseeable cumulative adverse impacts are expected to the surrounding populations, minority populations and low-income populations included (Section 5.20.3.5.3, Vol. 2, Part A, DOE 1995).

8.2 REFERENCES

DOE 1995, *Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement,* DOE/EIS-0203-F, April

9. ALTERNATIVE STORAGE METHODS, SITES, AND SYSTEM DESIGNS

Section 1.2 of this document identifies the DOE documentation of the NEPA analysis and decisions concerning alternative storage methods, sites, and system designs.

10. ENVIRONMENTAL APPROVALS AND CONSULTATION

The TMI-2 ISFSI is subject to NRC approval and licensing (10 CFR 72). The transportation of the TMI-2 debris from TAN to ICPP will be subject to NRC approval and compliance with the Atomic Energy Act of 1954 as amended (42 USC § 2011 et seq.) including 10 CFR Part 71 "Packaging and Transportation of Radioactive Material." Improvements to the existing bridge or bypass on the Big Lost River crossing, if required, would be conducted in accordance with the following: Federal Clean Water Act (CWA) 33 USC 1251-1376, which regulates the discharge of materials into wetlands or waters of the United States, and Executive Order 11990 (10 CFR 1022), which directs Federal agencies to minimize the destruction, loss, and degradation of wetlands; Section 401 of the CWA allows the State of Idaho's Division of Environmental Quality (DEQ) to establish a water quality certification process for any activity located within wetland areas; the Stream Channel Protection Act (Idaho Code, Chapter 38, Title 42); the Endangered Species Act, as amended (16 USC §1531 et seq.); and the Archaeological Resources Protection Act, as amended 42 USC §470aa et seq.).

The State of Idaho Division of Environmental Quality has been contacted concerning the review of a Permit to Construct (PTC) application for the ISFSI. A PTC application evaluates potential emissions associated with the operation of the ISFSI. Upon the PTC application review by the State of Idaho and identification of requirements, any required approvals would be obtained prior to the initiation of ISFSI construction.

The U.S. Fish and Wildlife Service (USFWS) furnishes DOE-ID with a list of threatened and endangered species at the INEL. After review of the proposed action and species list, it was determined that it was unlikely that the proposed activity would impact any threatened or endangered species (Reynolds, 1993).

Ongoing consultation with the State of Idaho and Shoshone-Bannock Tribes will be conducted by DOE-ID.

There are no county construction or zoning permits required for construction at the INEL.

10.1 REFERENCES

Reynolds, T. L., 1993, Memorandum to S. K. Gray, Subject: *"Pool Stabilization Project"* July 9

APPENDIX A - ACRONYMS AND ABBREVIATIONS

ALARA	as low as reasonably achievable
ANL-W	Argonne National Laboratory-West
ARA	Auxiliary Reactor Area
ATR	Advanced Test Reactor
BNCT	Boron Neutron Capture Therapy
C	Centigrade
CFA	Central Facilities Area
CFR	Code of Federal Regulations
Ci	Curies
Co	cobalt
Cs	cesium
CWA	Clean Water Act
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy-Idaho Operations Office
DOT	U.S. Department of Transportation
DSC	dry shielded canister
EA	Environmental Assessment
EBR-1	Experimental Breeder Reactor-1
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
F	Fahrenheit
FEIS	Final Environmental Impact Statement
FONSI	Finding of No Significant Impact
FR	Federal Register
g	acceleration due to gravity at sea level
H-3	tritium
ha	hectares
HEPA	high efficiency particulate air
HSM	horizontal storage module
I	iodine
ICPP	Idaho Chemical Processing Plant
INEL	Idaho National Engineering Laboratory
ISFSI	independent spent fuel storage installation (10 CFR Part 72)

Kr	krypton
LITCO	Lockheed Idaho Technologies Company
LMITCO	Lockheed Martin Idaho Technologies Company
MEI	maximally exposed individual
mrem	millirem
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	U.S. Nuclear Regulatory Commission
NRF	Naval Reactor Facility
OSHA	Occupational Safety and Health Administration
PBF	Power Burst Facility
PTC	Permit to Construct
ROD	Record of Decision
RSAC	Radiological Safety Analysis Computer Program
RWMC	Radioactive Waste Management Complex
SAR	safety analysis report
SDA	Subsurface Disposal Area
SIS	Special Isotope Separation
SNF	spent nuclear fuel
SRPA	Snake River Plain Aquifer
TAN	Test Area North
TLD	Thermoluminescent Dosimeter
TMI-2	Three Mile Island Unit 2
TRA	Test Reactor Area
UTM	Universal Traverse Mercator
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
W	watts
WERF	Waste Experimental Reduction Facility

Quality Assurance Requirements and Description

INFORMATION ONLY

DOE/RW/0333P

Office of Civilian Radioactive Waste Management

Quality Assurance Requirements and Description

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Washington, D.C.

DOE/RW-0333P
Revision [illegible]

U.S. DEPARTMENT OF ENERGY

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

QUALITY ASSURANCE REQUIREMENTS AND DESCRIPTION

FOR THE

CIVILIAN RADIOACTIVE WASTE MANAGEMENT PROGRAM

Donald G. Horton, Director
OCRWM Office of Quality Assurance

9/27/95
Date

Daniel A. Dreyfus, Director
Office of Civilian Radioactive Waste Management

10/2/95
Date

Revision History

REVISION HISTORY

REVISION	REVISION DESCRIPTION
0	Initial issue. This document consolidates the *Quality Assurance Requirements Document* and the *Quality Assurance Program Description Document* into one document.
1	Revised Section 1.0, Organization, to reflect OCRWM reorganization.
2	Revised Section 7.0, Control of Purchased Items and Services, to accommodate the transfer of responsibility for the performance of audits from Affected Organizations to OCRWM OQA.
3	Revised Appendix B, Storage and Transportation to provide an exception to the *Quality Assurance Requirements and Description* for organizations working under the provisions of 10 CFR 71, Subpart C or 10 CFR 72, Subpart L.
4	Revised Appendix B, to reflect editorial change to correct 10 CFR Subpart reference.
5	Revised the following sections to incorporate changes requested by various Affected Organizations.

- Section RevHist, Revision History
- Section TOC, Table of Contents
- Section Policy, Quality Assurance Policy
- Section Intro, Introduction
- Section 1.0, Organization
- Section 2.0, Quality Assurance Program
- Section 3.0, Design Control
- Section 4.0, Procurement Document Control
- Section 5.0, Implementing Documents
- Section 6.0, Document Control
- Section 7.0, Control of Purchased Items and Services
- Section 8.0, Identification and Control of Items
- Section 9.0, Control of Special Processes
- Section 12.0, Control of Measuring and Test Equipment
- Section 14.0, Inspection, Test and Operating Status
- Section 15.0, Nonconformances
- Section 16.0, Corrective Action
- Section 17.0, Quality Assurance Records
- Section 18.0, Audits

- Supplement I, Software
- Supplement II, Sample Control
- Supplement III, Scientific Investigation
- Supplement V, Control of the Electronic Management of Data
- Appendix A, High-Level Waste Form Production
- Appendix C, Mined Geologic Disposal System
- Glossary

New section added to incorporate Supplement V, Control of the Electronic Management of Data

Table of Contents

Quality Assurance Requirements and Description

Policy Statement

Quality Assurance Policy

The U.S. Department of Energy (DOE) is authorized by the Nuclear Waste Policy Act, as amended, to site, construct, and safely operate a geologic repository and a storage facility. The Act also instructs the DOE to provide for the safe transportation of spent fuel to either the storage facility or the geologic repository and transportation of high-level waste to the geologic repository.

The Act established the Office of Civilian Radioactive Waste Management (OCRWM) within the DOE to carry out this mission. Central to our mission is the protection of the health and safety of the public and workers, the quality of the environment and meeting the regulatory basis for the licensing of a storage and/or Mined GeologicDisposal System.

As the Director of OCRWM, I have endorsed the quality assurance requirements necessary to ensure these vital protections. This document, the *Quality Assurance Requirements and Description*, embodies these requirements. These requirements apply to every level of every organization participating in this mission.

The quality assurance provisions described in the *Quality Assurance Requirements and Description* have my unqualified support. All organizations performing work for, or to be accepted by, OCRWM shall comply with the *Quality Assurance Requirements and Description*.

Daniel A. Dreyfus, Director
Office of Civilian Radioactive
Waste Management

Date 10/2/95

Introduction

The *Quality Assurance Requirements and Description* (QARD) is the principal Quality Assurance (QA) document for the Civilian Radioactive Waste Management Program (Program). It establishes the minimum requirements for the QA program. The QARD contains regulatory requirements and program commitments necessary for the development of an effective QA program. Implementing documents must be based on, and be consistent with the QARD.

The QARD applies to the following:

1. Acceptance of spent nuclear fuel and high-level waste.

2. Transport of spent nuclear fuel and high-level waste.

3. Storage of spent nuclear fuel through receipt of storage cask certification or a facility operating license.

4. Mined Geologic Disposal System (MGDS), including the site characterization activities [Exploratory Studies Facility (ESF) and surface based testing], through receipt of an operating license.

5. High-level waste form development through qualification, production, and acceptance.

6. Characterization of DOE spent nuclear fuel, and conditioning through acceptance of DOE spent nuclear fuel.

Section 2.0, Quality Assurance Program, defines in greater detail criteria for determining work subject to the QARD.

The QARD is organized into sections, supplements, appendices, and a glossary. The sections contain requirements that are common to all Program activities. The supplements contain requirements for specialized activities. The appendices contain requirements that are specific to high-level waste form production, storage and transportation, and Mined Geologic Disposal System. The glossary establishes a common vocabulary for the QA program.

The QARD provides for both the achievement and verification of quality. The line organization has total responsibility for meeting the quality requirements, and individuals are responsible for the quality of their work. Therefore the line organization is responsible for the implementation of the QA program. The line organization and the QA organization share responsibility for the verification of quality. The Director, OCRWM retains responsibility for the total QA program; ensures its development, implementation, and verification; and retains ultimate review and approval authority on matters pertaining to the implementation of the QA program.

The line organizations develop implementing documents that translate applicable QARD requirements into work processes. In addition, each Affected Organization must develop a matrix that identifies where QARD requirements are contained in their implementing documents.

QARD requirements are derived from the regulatory and industry documents listed in Figure Intro-1. These source documents fall into one of three categories: regulatory documents, commitment documents, or guidance documents.

A. Regulatory documents define the requirements necessary for obtaining licenses issued by the Nuclear Regulatory Commission. Regulatory documents are reviewed upon revision, and changes are appropriately incorporated into the QARD.

B. Commitment documents are imposed by management because they are necessary for the development and implementation of an effective QA program. Commitment documents are reviewed upon revision, and changes are incorporated into the QARD on a case-by-case basis.

C. Guidance documents provide additional information useful in developing a QA program. Guidance documents are reviewed upon revision, and changes are incorporated into the QARD on a case-by-case basis.

Figure Intro-1
SOURCE DOCUMENTS

Regulatory Documents

10 CFR 50, Appendix B (Current) -	Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
10 CFR 60, Subpart G (Current) -	Quality Assurance
10 CFR 71, Subpart H (Current) -	Quality Assurance
10 CFR 72, Subpart G (Current) -	Quality Assurance
10 CFR 73, (Current) -	Physical Protection of Plants and Materials

Commitment Documents

NQA-1 (1989) -	Quality Assurance Program Requirements for Nuclear Facilities
- Basic Requirements:	1 through 18
- Supplements:	1S-1, 2S-1, 2S-2, 2S-3, 2S-4, 3S-1, 4S-1, 6S-1, 7S-1, 8S-1, 9S-1, 10S-1, 11S-1, 12S-1, 13S-1, 15S-1, 17S-1, and 18S-1
- Appendices:	2A-1 and 2A-3
NRC Review Plan (Revision 2) -	U. S. Nuclear Regulatory Commission Review Plan for High-Level Waste Repository Quality Assurance Program Descriptions
NUREG-1297 (2/88) Staff Position -	Peer Review for High-Level Nuclear Waste Repositories
NUREG-1298 (2/88) Staff Position -	Qualification of Existing Data for High-Level Nuclear Waste Repositories

Guidance Documents

NQA-2 (1989) -	Quality Assurance Requirements for Nuclear Facility Applications
NQA-3 (1989) -	Quality Assurance Program Requirements for the Collection of Scientific and Technical Information for Site Characterization of High-Level Nuclear Waste Repositories
NUREG-0856 (1983) -	Final Technical Position on Documentation of Computer Codes for High-Level Waste Management
NUREG-1318 (1988) Staff Position -	Technical Position on Items and Activities in the High-Level Waste Geologic Repository Program Subject to Quality Assurance Requirements
Regulatory Guide 1.28 (Revision 3) -	Quality Assurance Program Requirements (Design And Construction)
Regulatory Guide 7.10 (Revision 1) -	Establishing Quality Assurance Programs for Packaging Used in the Transportation of Radioactive Material

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1.1 GENERAL

This section establishes requirements for creating and maintaining an organizational structure to implement the Quality Assurance (QA) program for the Civilian Radioactive Waste Management Program. This section also provides a description of the Office of Civilian Radioactive Waste Management (OCRWM) organization and other Affected Organizations.

1.2 REQUIREMENTS

Each Affected Organization shall prepare one or more controlled documents, accepted by the OCRWM Office of Quality Assurance, that describes internal and external organizational interfaces, organizational structures, requirements, and responsibilities for its scope of work.

1.2.1 Line Management

Each Affected Organization shall identify the responsibilities and authorities of those organizations and management positions responsible for achieving and maintaining quality.

1.2.2 Quality Assurance Management

Each Affected Organization shall identify the management position within the organization responsible for performing QA functions. This position shall be occupied by an individual with appropriate knowledge and experience in management and QA. The position shall:

A. Be at the same or higher organization level as the highest line manager directly responsible for performing work subject to the *Quality Assurance Requirements and Description* (QARD).

B. Be sufficiently independent from cost and schedule considerations.

C. Have the organizational freedom to effectively communicate with other senior management positions.

D. Be responsible for interpreting and approving QA program requirements as they apply to the Affected Organization's scope of work.

E. Have no other assigned responsibilities unrelated to the QA program that would prevent full attention to QA matters.

F. Be responsible for identifying quality problems, initiating, recommending, or providing solutions to quality problems, and verifying solutions to quality problems.

G. Be responsible for verifying the proper establishment and execution of the QA program.

H. Have the authority to stop work when significant conditions adverse to quality warrant such action.

1.2.3 Responsibility for Quality

Quality shall be achieved and maintained by those who have been assigned responsibility for performing work. Quality achievement shall be verified by persons or organizations not directly responsible for performing the work.

1.2.4 Delegation of Work

Positions or organizations responsible for establishing and executing the QA program may delegate work to other organizations. The positions or organizations making the delegation shall retain overall responsibility for the delegated work.

1.2.5 Resolution of Quality Disputes

Differences of opinion involving QA program requirements shall be brought to the attention of the appropriate management and, if not resolved, shall be elevated progressively to successively higher levels of management.

1.3 DESCRIPTION

1.3.1 General Description of the Office of Civilian Radioactive Waste Management

A. OCRWM is comprised of the Office of the Director; the Offices of Quality Assurance; Waste Acceptance, Storage and Transportation; Program Management and Integration; Human Resources and Administration; and the Yucca Mountain Site Characterization Office. The Yucca Mountain Site Characterization Office is headed by a Project Manager. The remaining offices are headed by Office Directors. The Project Manager and Office Directors report to the Director, OCRWM. The OCRWM organization is illustrated in Figure 1-1.

B. OCRWM's functions are described in official mission and function statements, approved by the Assistant Secretary, Office of Human Resources and Administration.

1. All references to OCRWM responsibilities and functions in the QARD are intended only as summarizations of those official functions and are in no way intended to replace or supplement the official statements.

2. Any substantial OCRWM reorganization of descriptions or functions of the offices described herein, will require a revision to this document.

1.3.2 Specific Civilian Radioactive Waste Management Offices

A. Office of the Director

The Office of the Director has been delegated overall responsibility for carrying out the functions of the Secretary of Energy as prescribed in the Nuclear Waste Policy Act, as amended.

B. Office of Quality Assurance (OQA)

1. The OQA is responsible for providing guidance and direction to the line organization on QA matters relating to OCRWM activities, developing the OCRWM QA program and managing the OCRWM Concerns Program. The OQA is also responsible for the overview of work subject to the QARD. This overview includes the verification of the OCRWM line organization's achievement and quality of work through audits, surveillances, or other means of verification, as appropriate.

2. The OQA is responsible for reporting the overview findings to senior management.

C. Office of Waste Acceptance, Storage and Transportation (OWAST)

The OWAST is responsible for managing the standard contracts and Memoranda of Understanding (MOU) for disposal of spent nuclear fuel and high-level waste; collection of data to support the acceptance and transportation of spent nuclear fuel and high-level waste; technical studies to determine waste acceptance criteria; environmental assessments; Nuclear Regulatory Commission (NRC) license application for OCRWM managed storage facilities; cask design, testing, certification and acquisition; economic and engineering analysis for transportation system development including multi-purpose canister subsystem; and transportation operations support, including cask maintenance. The OWAST is also responsible for developing and coordinating the implementation of safeguards and security for the OCRWM program.

D. Office of Program Management and Integration (OPMI)

The OPMI is responsible for program control and project management system policy, requirements, and guidance; the overall OCRWM program Work Breakdown Structure; development of overall OCRWM budgets; OCRWM systems engineering activities and technical baselines at the program level; configuration management system and OCRWM Change Control Boards; supporting the system elements/projects in identifying and resolving site suitability and licensing regulatory issues related to the OCRWM managed storage facilities or Mined Geologic Disposal System (MGDS) license application, and cask/canister certifications; integrating the MGDS with the multi-purpose canister and transportation elements of the OCRWM program; and program-wide system to provide reporting on commitments made by or to OCRWM, to or from the NRC.

E. Office of Human Resources and Administration (OHRA)

The OHRA is responsible for the headquarters training program; verification of OCRWM personnel qualifications; programwide Total Quality Management program; coordinating the OCRWM Ombudsman Program; OCRWM Information Systems; OCRWM Headquarters Records Management System, Central Records Facility, and the Quality Records Center. In addition, the OHRA manages the procurement/business activities associated with the management and operating contract and all other OCRWM contracts programwide, and overseeing and administering the award fee process for the Management and Operating Contractor.

F. Yucca Mountain Site Characterization Office (YMSCO)

The YMSCO is responsible for directing the Yucca Mountain Site Characterization Project (YMP); scientific evaluations needed to determine whether the Yucca Mountain candidate site is suitable for a geologic repository; waste-package and repository design and development; integrating the MGDS with the waste acceptance storage and transportation elements of the OCRWM program; MGDS Environmental Impact Statement; and the preparation and submittal to the NRC of a license application for the MGDS should the Yucca Mountain Site be found suitable. The YMSCO is also responsible for YMP information resources management and records management programs; YMP training program; and the YMP radiological program.

1.3.3 Other OCRWM Affected Organizations

A. OCRWM Affected Organizations

OCRWM Affected Organizations perform work subject to the QARD in accordance with the controls established in their respective implementing documents. These organizations include OCRWM, the DOE Office of Environmental Management, U.S. Geological Survey, National Laboratories, other federal agencies, and contractors. The QARD requirements for each OCRWM Affected Organization are identified in the appropriate procurement documents. OCRWM provides overviews of OCRWM Affected Organization work subject to QARD requirements by using appropriate verification methods.

B. OCRWM Direct-Support Organizations

OCRWM Direct-support organizations perform work subject to the QARD in accordance with controls established in OCRWM implementing documents.

C. For OCRWM Affected Organizations performing work in accordance with documents such as Memoranda of Understanding, Memoranda of Agreement or Program Guidance Memoranda rather than in accordance with a contract or Interagency Agreement, appropriate technical and QA requirements shall be incorporated into the document.

OCRWMORG.136/6-27-94

OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

Figure 1-1

2

REFER TO QARD LESSONS LEARNED/PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

NO. 93-001 *QUALITY ASSURANCE PROGRAM*, SPECIFICALLY: *VERIFICATION OF MINIMUM EDUCATION AND EXPERIENCE*, QARD SECTION 2.0

NO. 93-002 *QUALITY ASSURANCE PROGRAM*, SPECIFICALLY: *MANAGEMENT ASSESSMENTS*, QARD SECTION 2.0, AND *AUDITS*, QARD SECTION 18.0

NO. 94-002 *QUALITY ASSURANCE PROGRAM*, SPECIFICALLY: *QUALITY ASSURANCE REQUIREMENTS AND DESCRIPTION (QARD)*, QARD SECTION 2.0, AND *PEER REVIEWS*, QARD SECTION 2.2.8, EXISTING DATA NOT COLLECTED UNDER AN APPROVED QA PROGRAM, AND *SCIENTIFIC INVESTIGATIONS*, QARD SUPPLEMENT III, SPECIFICALLY: *DATA VALIDATION AND QUALIFICATION*, QARD III.2.4

2.1 GENERAL

This section establishes requirements for planning, implementing, and maintaining the Quality Assurance (QA) program. This section also establishes requirements for special topics related to the QA program. The QA program establishes requirements to ensure that work meeting the criteria described in Subsection 2.2.2, Classifying Items, Subsection 2.2.3, Controlling Activities, and Subsection 2.2.4, Applying Quality Assurance Controls, is performed under suitably controlled conditions including the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, and assurance that prerequisites for a given activity have been satisfied.

2.2 REQUIREMENTS

2.2.1 Quality Assurance Program Documents

A. Affected Organizations shall issue a policy statement signed by senior line management directing mandatory compliance with this QA program.

B. Affected Organizations shall establish implementing documents applicable to their scope of work that translate *Quality Assurance Requirements and Description* (QARD) requirements into work processes. The following requirements apply to implementing documents.

   1. Each Affected Organization shall establish a structured system of implementing documents that provides for top down implementation of the QARD or, if stipulated in procurement documents, shall work to the implementing documents of another Affected Organization.

   2. The system shall accommodate the size and location(s) of the organization, the organizational structure, and the nature of the work such that management processes will be carried out efficiently and effectively.

   3. The system shall provide positive control over external interfaces between Affected Organizations and internal interfaces within an organization.

   4. Each Affected Organization shall review revisions to the QARD and incorporate changes into their implementing documents, as appropriate.

C. Each Affected Organization shall complete a QARD requirements matrix for the portion of the QARD which they are implementing.

   1. The matrix shall identify:

      a. Where the QARD requirements are directly addressed.

b. Where QARD requirements are not applicable based on scope of work.

c. Where exceptions to QARD requirements have been taken including justification.

2. Initial QARD requirements matrices shall be reviewed by OQA in accordance with QARD Subsection 2.2.10, Document Review.

3. As changes are made to implementing documents each Affected Organization shall ensure that respective QARD requirements matrices are revised if necessary.

4. Changes to QARD requirements matrices shall be reviewed by the Affected Organization QA organization in accordance with Subsection 2.2.10, Document Review.

5. OQA shall review changes to QARD requirements matrices through audits and surveillances.

2.2.2 Classifying Items

The QA program shall apply to the following, which shall be included on a *Q-List*.

A. Items important to public radiological safety as described in 10 Code of Federal Regulations (CFR) Parts 60, 71, and 72.

B. Items and natural barriers important to waste isolation as described in 10 CFR Part 60.

C. Items required for the control and management of site-generated radioactive waste other than spent fuel and high-level waste.

D. Items required for the protection of items important to safety and waste isolation from the hazards of fire.

E. Items not intended to perform a safety function but whose failure could impair the capability of other items to perform their intended safety or waste isolation function.

F. Items required for physical protection as defined by 10 CFR Part 73.

G. Items required to control occupational radiological exposure.

2.2.3 Controlling Activities

A. The QA program shall apply to site characterization data and samples.

Note: Site characterization for the purpose of QA program applicability includes activities related to sample collection and the collection and analysis of data to support performance confirmation or performance assessments.

B. The QA program shall apply to activities related to the items on a *Q-List* (such as design, procurement, construction, fabrication, production, handling, packaging, shipping, storing, cleaning, assembly, inspection, testing, operation, maintenance, repair, modification, and decontamination).

C. The QA program shall apply to those activities that provide data used to assess the potential dispersion of radioactive materials from the licensed facility.

D. The QA program shall apply to activities related to the high-level waste form development through qualification, production, and acceptance.

E. The QA program shall apply to activities associated with characterization of DOE spent nuclear fuel, and conditioning through acceptance of DOE spent nuclear fuel.

2.2.4 Applying Quality Assurance Controls

QA controls (grading) shall be applied to the degree commensurate with the:

A. Function or end use of the item.

B. Consequence of failure (risk) of the item.

C. Importance of the data being collected or analyzed.

D. Complexity of design or fabrication of the item or design or implementation of the activity.

E. Reliability of the process.

F. Reproducibility of the results.

G. Uniqueness of the item or degree of standardization.

H. History of the item or service quality.

I. Necessity for special controls or processes.

J. Degree to which functional compliance can be demonstrated through inspection or test.

2.2.5 Planning Work

Planning shall be documented to ensure work is accomplished under suitably controlled conditions. Planning elements shall include, as appropriate:

A. Definition of the work scope, objectives, and a listing of the primary tasks involved.

B. Identification of scientific approach or technical methods used to collect, analyze, or study results of applicable work.

C. Identification of applicable standards and criteria.

D. Identification and selective application, or development, of appropriate implementing documents.

E. Identification of field and laboratory testing equipment, or other equipment.

F. Identification of, or provisions for the identification of, required records and the recording of objective evidence of the results of the work performed.

G. Identification of QA program verifications of the work performed.

H. Identification of prerequisites, special controls, environmental conditions, processes, or skills.

I. Identification of computer software.

2.2.6 Surveillances

Surveillances shall be conducted to evaluate the quality of selected work subject to the QARD. Surveillances shall be:

A. Conducted to verify the quality of work in progress; to identify conditions adverse to quality; to ensure that prompt corrective action is taken by management responsible for performing the work; and to verify the timely implementation, adequacy, and effectiveness of corrective action.

B. Performed by personnel who are knowledgeable about, and not directly responsible for, the work under surveillance.

C. Documented in a report to appropriate management.

2.2.7 Management Assessments

The Office of Civilian Radioactive Waste Management shall perform or direct the performance of management assessments of Affected Organizations by personnel outside the QA organization. Management Assessment shall:

A. Be planned and documented, and performed annually.

B. Evaluate the:

1. Adequacy of resources and personnel provided to achieve and assure quality.

2. Adequacy of the QA program.

3. Effectiveness of the QA program.

C. Be documented and results shall be distributed to Affected Organization management.

2.2.8 Readiness Reviews

The need for readiness reviews shall be identified by Affected Organization management for major scheduled or planned work to ensure program objectives are met. Where needed, readiness reviews shall be conducted for the planned scope of work to ensure that objective evidence exists demonstrating that:

A. Work prerequisites have been satisfied.

B. Personnel have been suitably trained and qualified.

C. Detailed implementing documents and management controls are available and approved.

2.2.9 Peer Reviews

A. Peer reviews shall be conducted when the adequacy of information or the suitability of implementing documents and methods essential to meet specified objectives cannot be established through testing, alternate calculations, or reference to previously established standards and practices.

The following conditions are situations for which a peer review shall be considered:

1. Critical interpretations or decisions will be made in the face of significant uncertainty, including the planning for data collection, research, or exploratory testing.

2. Decisions or interpretations having significant impact on performance assessment results will be made.

3. Novel or beyond the state-of-the-art testing, plans and procedures, or analyses will be utilized.

4. Detailed technical criteria or standard industry procedures are not available.

5. Results of tests are not reproducible or repeatable.

6. Data or interpretations are ambiguous.

7. Data adequacy is questionable (e.g., the data may not have been collected in conformance with an established QA program).

B. Management shall determine the need for and, as appropriate, shall initiate peer reviews when the adequacy of a critical body of information can be established by alternate means, but there is significant disagreement regarding the applicability or appropriateness of the alternate means.

C. In conducting a peer review, management shall ensure that the:

1. Number of the peer reviewers is commensurate with the complexity of work to be reviewed, its importance to Program objectives, the number of technical disciplines involved, the degree to which uncertainties in the data or technical approach exist, and the extent to which differing viewpoints are strongly held within the applicable technical and scientific community concerning issues under review.

2. Collective technical expertise and qualifications of the peer reviewers span the technical issues and areas involved in the work to be reviewed, including differing bodies of scientific thought.

3. Technical areas central to the work to be reviewed receive appropriate proportional representation among the peer reviewers.

4. Potential for technical or organizational partiality is minimized.

5. Peer review group chairperson is identified.

D. Peer reviews shall be performed by individuals that have:

1. Technical qualifications in the review area at least equivalent to that needed for the work under review.

2. Technical credentials that are recognized and verifiable.

3. Independence from the work under review. Independence means that the individual was not involved as a participant, supervisor, technical reviewer or advisor in the work under review and is, to the extent practical, free from any funding considerations.

Note: In those cases where total independence cannot be met, the rationale as to why someone of equivalent technical qualification and greater independence was not selected shall be documented in the peer review report.

E. Initiation of the peer review shall require the development of a planning document that:

1. Specifies the work to be reviewed.

2. Identifies the size and spectrum of the peer review group.

3. Describes the expected method and reporting schedule.

4. Establishes review criteria that shall include, as appropriate:

   a. Validity of the assumptions.

   b. Alternate interpretations.

c. Adequacy of requirements and criteria.

d. Appropriateness and limitations of the methods and implementing documents used to complete the work under review.

e. Adequacy of application.

f. Accuracy of calculations.

g. Validity of conclusions.

h. Uncertainty of results and impact if wrong.

F. The peer review chairperson shall provide a report that:

1. Is signed by each peer reviewer or contains information detailing which peer reviewers have chosen not to sign and why.

2. States the work or issue that was reviewed and the conclusions of the review.

3. Includes individual statements by the peer reviewers reflecting dissenting views or additional comments, as appropriate.

4. Includes a listing of the peer reviewers and a statement that the qualifications and experience of each reviewer have been evaluated and are acceptable.

2.2.10 Document Review

Implementing documents and documents that specify technical or quality requirements shall be reviewed to the following requirements and for any additional requirements specified by the applicable section of the QARD.

A. Review criteria shall be established before performing the review. The criteria shall consider applicability, correctness, technical adequacy, completeness, accuracy, and compliance with established requirements.

B. Pertinent background information or data shall be made available to the reviewers by the organization requesting the review if the information is not readily available to the reviewer.

C. The review shall be performed by individuals other than the preparer.

D. Reviewers shall be technically competent for the subject area of the document being reviewed.

E. The scope of the review shall consider all aspects of the document.

1. Each organization or technical discipline affected by the document shall review the document according to the established review criteria. Changes to the document shall be reviewed by those organizations or technical disciplines affected by the change.

2. The Affected Organizations' QA organization shall review implementing documents that translate the QARD into work processes as described in Subsection 2.2.1, Quality Assurance Program Documents. The QA organization shall also review changes to documents if they reviewed the previous version, regardless of whether the QA organization is affected by the change.

F. Mandatory comments resulting from the review shall be documented and resolved before approving the document.

2.2.11 Quality Assurance Program Information Management

Affected Organization management shall on a continuing basis be appraised of the status, adequacy and compliance aspects of the QA Program. Appropriate management shall receive, as a minimum, audit reports, surveillance reports, trend reports and management assessment reports.

2.2.12 Personnel Selection, Indoctrination, Training, and Qualification

Each Affected Organization shall establish a program for the evaluation, selection, indoctrination, training, and qualification of personnel performing work subject to the QARD. The program shall:

A. Evaluate each job position to determine whether the responsibilities of the position include performing work subject to the QARD.

B. Establish descriptions for those positions that include work subject to the QARD.

C. Ensure personnel are indoctrinated and trained, as needed, to achieve initial proficiency; maintain proficiency; and adapt to changes in technology, methods, or job responsibilities.

D. Establish minimum education and experience requirements for each position commensurate with the scope, complexity, and nature of the work.

E. Ensure personnel have the experience, education, training, and proficiency commensurate with the minimum requirements established.

F. Ensure minimum education and experience are verified or, when minimum education and experience cannot be specifically verified, provide a statement and justification for the personnel assignment.

G. Ensure supervisors evaluate and assess the need for additional indoctrination and training as assignments, positions, and implementing documents change.

H. Ensure the required indoctrination and training for a specified task is completed prior to performing the task.

I. Ensure records on individuals generated by training and qualification programs are collected and maintained.

J. Ensure personnel are indoctrinated in the following topics as they relate to a particular function:

1. General criteria, including the QARD, applicable codes, regulations, and standards.

2. Applicable implementing documents.

3. Job responsibilities and authority.

2.2.13 Qualification of Personnel Performing Special Quality Assurance Functions

Personnel performing special QA functions (such as inspecting, examining, testing, and auditing) shall be qualified in accordance with the requirements of the applicable QARD section covering the activity and QARD Subsection 2.2.12, Personnel Selection, Indoctrination, Training and Qualification.

3

3.1 GENERAL

This section provides requirements to ensure that designs are defined, controlled, and verified.

3.2 REQUIREMENTS

3.2.1 Design Input Control

Applicable design inputs (such as design bases, conceptual design reports, performance requirements, regulatory requirements, codes, and standards) shall be controlled by those responsible for the design according to the following requirements:

A. Design inputs shall be identified and documented, and their selection reviewed and approved by those responsible for the design.

B. Design inputs shall be specified and approved on a timely basis and to the level of detail necessary to permit the design work to be carried out in a correct manner that provides a consistent basis for making design decisions, accomplishing design verification, and evaluating design changes.

C. Changes from approved design inputs and reasons for the changes shall be identified, approved, documented, and controlled.

D. Design inputs based on assumptions that require confirmation shall be identified and controlled as the design proceeds.

3.2.2 Design Process

The design process shall be controlled according to the following requirements:

A. Design work shall be prescribed and documented on a timely basis and to the level of detail necessary to permit the design process to be carried out in a correct manner.

B. Design documents shall be adequate to support design, fabrication, construction, and operation.

C. Appropriate standards shall be identified and documented, and their selection reviewed and approved.

D. Changes from specified standards, including the reasons for the change, shall be identified, approved, documented, and controlled.

E. Design methods, materials, parts, equipment, and processes that are essential to the function of an item shall be selected and reviewed for suitability of application.

F. Applicable information derived from experience, as set forth in reports or other documentation, shall be made available to cognizant design personnel.

G. Design documents shall be sufficiently detailed as to purpose, method, assumptions, design input, references, and units such that a person technically qualified in the subject can understand the documents and verify their adequacy without recourse to the originator.

H. The final design shall identify assemblies or components that are part of the item being designed. If a commercial grade assembly or component is modified or selected by special inspection or testing to meet requirements that are more restrictive than the supplier's published product description, then the assembly or component shall be represented as different from the commercial grade item in a manner traceable to a documented description of the difference.

I. Drawings, specifications, and other design output documents shall contain appropriate inspection and testing acceptance criteria.

3.2.3 Design Analyses

A. Design analyses shall be planned, controlled, and documented.

B. Design analysis documents shall be legible and in a form suitable for reproduction, filing, and retrieval.

C. Computer software used to perform design analyses shall be developed or qualified, and used according to the requirements of Supplement I, Software.

D. Documentation of design analyses shall include:

1. Definition of the objective of the analyses.
2. Definition of design inputs and their sources.
3. Results of literature searches or other applicable background data.
4. Identification of assumptions.
5. Identification of any computer calculation, including computer type, computer program (e.g., name), revision identification, inputs, outputs, and the bases (or reference thereto) supporting application of the computer program to the specific physical problem.
6. Identification of the originator, reviewer, and approver.

3.2.4 Design Verification

In addition to reviewing completed design analyses and design output in accordance with QARD Subsection 2.2.10, Document Review, the following design control requirements shall be applied:

A. Design verification shall be performed to determine the adequacy of design by using one or a combination of the following methods:

   1. Design review.

   2. Alternate calculations.

   3. Qualification testing.

B. The particular design verification method shall be identified and its use justified.

C. The results of design verification shall be documented, including the identification of the verifier.

D. Design verification shall be performed by competent individuals or groups other than those who performed the original design but may be from the same organization. If necessary, this verification may be performed by the originator's supervisor provided:

   1. The supervisor did not specify a singular design approach or rule out certain design considerations and did not establish the design inputs used in the design; or

   2. The supervisor is the only individual in the organization competent to perform the verification.

   3. The verification is not hastily and superficially done.

   4. The determination to use the supervisor is documented and approved, in advance, with concurrence of the Affected Organization's Quality Assurance organization.

E. Design verification shall be performed at appropriate times during the design process.

   1. Verification shall be performed before release for procurement, manufacture, or construction or release to another organization for use in other design work. In some cases (such as when insufficient data exists) it may be necessary to release unverified designs to support schedule requirements. Unverified portions of the design shall be clearly identified and controlled

   2. In all cases, design verification shall be completed before relying on the item to perform its function.

F. The extent of the design verification required shall be a function of the importance to safety or waste isolation, complexity of design, degree of standardization, state of the art, and similarity with previously proven designs.

G. Where the design has been subjected to a verification process in accordance with this *Quality Assurance Requirements and Description*, the verification process need not be duplicated for identical designs.

H. Use of previously proven designs shall be controlled according to the following requirements:

1. The applicability of standardized or previously proven designs shall be verified with respect to meeting pertinent design inputs for each application.

2. Known problems affecting standard or previously proven designs and their effects on other features shall be considered.

3. The original design and associated verification measures shall be adequately documented and referenced in the files of subsequent application of the design.

I. Changes in previously verified designs shall require reverification. Such verification shall include the evaluation of the effects of those changes on the overall previously verified design and on any design analysis upon which the design is based.

3.2.5 Design Reviews

Design reviews shall be controlled and performed to ensure:

A. The design inputs were correctly selected and incorporated.

B. Assumptions necessary to perform the design were adequately described, reasonable and where applicable, identified as requiring confirmation as the design proceeds.

C. Appropriate design methods, and computer programs when applicable, were used.

D. The design outputs are reasonable compared to design inputs.

E. The necessary design input for interfacing organizations were specified in the design documents.

3.2.6 Alternate Calculations

The appropriateness of assumptions, input data, and the computer program or other calculation method used shall be reviewed, and the results shall be checked through the use of alternate calculation methods to verify the correctness of the original calculations or analyses.

3.2.7 Qualification Testing

A. If design adequacy is to be verified by qualification tests, the tests shall be in accordance with Section 11.0, Test Control.

B. The test configuration shall be defined and documented.

C. Testing shall demonstrate the adequacy of performance under conditions that simulate the most adverse design conditions. Operating modes and environmental conditions in which the item must perform satisfactorily shall be considered in determining the most adverse conditions.

D. If the tests verify only specific design features, then the other features of the design shall be verified by other means.

E. Test results shall be documented and evaluated to ensure that test requirements have been met.

F. If qualification testing indicates that a modification to an item is necessary to obtain acceptable performance, then the modification shall be documented and the item modified and retested or otherwise verified to ensure satisfactory performance.

G. When tests are being performed on models or mockups, scaling laws shall be established and reviewed and approved.

H. The results of model test work shall be subject to error analysis, where applicable, before using the results in final design work.

3.2.8 Design Change Control

Design changes shall be controlled according to the following requirements:

A. Changes to final designs, field changes, and nonconforming items dispositioned "use-as-is" or "repair" shall be justified and shall be subject to design control measures commensurate with those applied to the original design.

B. Design control measures for changes shall include provisions to assess the effect of the changes on the overall previously verified design and ensure that the design analyses for the item are still valid.

C. Changes shall be approved by the same affected groups or organizations that approved the original design documents:

1. If an organization that originally was responsible for approving a particular design document is no longer responsible, then a new responsible organization shall be designated; and

2. The designated approving organization shall have demonstrated competence in the specific design area of interest and have an adequate understanding of the requirements and intent of the original design.

D. The design process and design verification methods and implementing documents shall be reviewed and modified, as necessary, when a significant design change is necessary because of an incorrect design. These design deficiencies shall be documented in accordance with Section 16.0, Corrective Action. Additionally, if the incorrect design causes constructed or partially constructed systems, structures, or components to be nonconforming, the affected items shall be controlled in accordance with Section 15.0, Nonconformances.

E. Field changes shall be incorporated into affected design documents when such incorporation is appropriate, and when a field change is approved other than by revision to the affected design documents.

F. Design changes that impact related implementing documents or training programs shall be communicated to organizations affected by the change.

3.2.9 Design Interface Control

A. Design interfaces shall be identified and controlled.

B. Design efforts shall be coordinated among participating organizations and groups.

C. Interface controls shall include the assignment of responsibility and the establishment of implementing documents among participating design organizations and groups for the review, approval, release, distribution, and revision of documents involving design interfaces.

D. Design information transmitted across interfaces shall be documented and controlled.

E. The status of the design information or document provided shall be identified in transmittals. Designs or portions of designs that require further development, analysis, review, or approval shall be identified.

F. When it is necessary to initially transmit design information orally or by other informal means, the design information shall be promptly confirmed with formal documentation initiated in accordance with the initiating organizations approved implementing document.

4

REFER TO QARD LESSONS LEARNED/PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

NO. 92-001 *PROCUREMENT AND THE CLASSIFICATION OF DOCUMENTS*, QARD SECTION 4.0

4.1 GENERAL

This section establishes requirements to ensure that procurement documents, and any changes thereto, contain appropriate technical and quality assurance requirements.

4.2 REQUIREMENTS

4.2.1 Procurement Document Preparation

Procurement documents issued by each Affected Organization shall include the following provisions, as applicable to the item or service being procured:

A. A statement of the scope of work to be performed by the supplier.

B. Technical requirements including:

1. Design bases shall be identified or referenced.

2. Specific documents (such as drawings, codes, standards, regulations, procedures, or instructions) that describe the technical requirements of the items or services to be furnished shall be specified. The revision level or change status of these documents shall also be identified.

3. Tests, inspections, and acceptance requirements that the purchaser will use to monitor and evaluate the performance of the supplier shall be specified.

C. Quality Assurance Program Requirements including:

1. A requirement for the supplier to have a documented Quality Assurance (QA) program that implements applicable *Quality Assurance Requirements and Description*, (QARD) requirements prior to the initiation of work. The extent of the QA program shall depend on the scope, nature, or complexity of the item or service being procured.

2. A requirement for the supplier to incorporate the appropriate QARD requirements into any subtier supplier-issued procurement document.

3. When deemed appropriate, the purchaser shall permit some or all supplier work to be performed under the purchaser's or another Affected Organization's QA program provided the work is adequately addressed. In these cases, procurement documents shall specify that the purchaser's or another Affected Organization's implementing documents are applicable to the supplier and that the purchaser shall provide these applicable documents to them.

D. Right of access to supplier facilities and records for inspection or audit by the purchaser, OCRWM, or other designee authorized by the purchaser.

E. Provisions for establishing hold points beyond which work cannot proceed without purchaser authorization.

F. Documentation required to be submitted to the purchaser for information, review, or acceptance:

1. The document submittal schedule shall be identified.

2. If the purchaser requires the supplier to maintain documentation that will become QA records, the retention times and disposition requirements shall be identified.

G. Purchaser requirements for the supplier to report nonconformances and the purchaser approval of the disposition of nonconformances.

H. Identification of any spare and replacement parts or assemblies and the appropriate technical and QA data required for ordering.

4.2.2 Procurement Document Review and Approval

A. Procurement document reviews in accordance with Subsection 2.2.10, Document Review, shall be performed and documented prior to issuance of the procurement documents to the supplier.

B. A review of the procurement documents and any changes thereto shall be made to verify that documents include appropriate provisions to ensure that items or services will meet the governing requirements.

C. Reviews shall ensure that all applicable technical and QA program requirements are included.

D. Reviews shall be performed by personnel who have access to pertinent information and who have an adequate understanding of the requirements and scope of the procurement.

E. Procurement document reviewers shall include representatives from the technical and QA organizations.

F. Procurement documents shall be approved.

4.2.3 Procurement Document Change

A. Changes to the scope of work, technical requirements, QA program requirements, right of access, documentation requirements, nonconformances, hold points, and lists of spare and replacement parts delineated in procurement documents shall be subject to the same degree of control as used in the preparation of the original documents.

B. Changes made as a result of proposal/bid evaluations or precontract negotiations shall be incorporated into the procurement documents. The evaluation of these changes and the resulting impact shall be completed before the contract is awarded. This evaluation shall consider:

1. Appropriate requirements as specified in this section.

2. Additional or modified design criteria.

3. Analysis of exceptions or changes requested or specified by the supplier and a determination of the impact such changes have on the intent of the procurement documents or quality of the item or service to be furnished.

5

5.1 GENERAL

This section establishes the requirements to ensure that work is prescribed by, and performed in accordance with, written implementing documents.

5.2 REQUIREMENTS

Work shall be performed in accordance with controlled implementing documents.

5.2.1 Types of Implementing Documents

The type of document to be used to perform work shall be appropriate to the nature and circumstances of the work being performed. Implementing documents include documents such as procedures, instructions, and drawings, with the exception of drawings governed by Section 3.0, Design Control.

5.2.2 Content of Implementing Documents

Implementing documents shall include the following information as appropriate to the work to be performed:

A. Responsibilities and organizational interfaces of the organizations affected by the document.

B. Technical and regulatory requirements.

C. A sequential description of the work to be performed including controls for altering the sequence of required inspections, tests, and other operations. The organization responsible for preparing the document shall determine the appropriate level of detail.

D. Quantitative or qualitative acceptance criteria sufficient for determining that activities were satisfactorily accomplished.

E. Prerequisites, limits, precautions, process parameters, and environmental conditions.

F. Quality verification points and hold points.

G. Methods for demonstrating that the work was performed as required (such as provisions for recording inspection and test results, checkoff lists, or signoff blocks).

H. Identification of the lifetime and nonpermanent quality assurance records generated by the implementing document.

I. Identification of associated items and activities.

5.2.3 Review and Approval of Implementing Documents

Implementing documents shall be reviewed, approved, and controlled in accordance with Section 6.0, Document Control.

5.2.4 Compliance with Implementing Documents

Individuals shall comply with implementing documents, however:

A. When work cannot be accomplished as described in the implementing document, or accomplishment of such work would result in an undesirable situation, the work shall be stopped.

B. Work shall not resume until the implementing document is changed (in accordance with Section 6.0, Document Control) to reflect the correct work practices.

6

6.1 GENERAL

This section establishes requirements to ensure documents, including changes thereto, are reviewed for adequacy, approved for release, and distributed to and used at the location where the work is being performed.

6.2 REQUIREMENTS

6.2.1 Types of Documents

Implementing documents and documents that specify technical requirements or quality requirements shall be controlled in accordance with this section.

6.2.2 Preparing Documents

The responsibility for preparing and maintaining documents shall be assigned to the appropriate organization.

6.2.3 Reviewing Documents

Documents shall be reviewed for adequacy, correctness, and completeness, in accordance with the requirements of Subsection 2.2.10, Document Review.

6.2.4 Approving Documents

The organizational position responsible for approving the document for release shall be identified.

6.2.5 Distribution and Use of Documents

The distribution and use of documents, including changes and editorial corrections to documents, shall include the following:

A. Documents, either in hardcopy or electronic media, used to perform work shall be distributed to, or made available to, and used at, the work location.

B. Effective dates shall be established for approved implementing documents.

C. The disposition of obsolete or superseded documents shall be controlled to ensure that they are not used to perform work.

D. A method shall be established to identify the current status of each document that is required to be controlled in accordance with this section.

6.2.6 Changes to Documents

A. Changes to documents shall be reviewed in accordance with the requirements of Subsection 2.2.10, Document Review, prior to approval for release.

B Changes shall be approved for release by the designated organizational position that is responsible for the document.

C. Implementing documents shall define the method used to incorporate changes. If the defined method is other than reissue of the entire controlled document, the implementing document shall define the maximum number of changes permitted prior to requiring reissue of the entire controlled document.

D. Implementing documents shall require that a history of changes to QA program documents, including the reasons for the changes, be documented and maintained. This document history shall be reviewed each time additional changes to the document are proposed.

6.2.7 Expedited Changes

If an activity cannot be performed as listed in a document, and the change process would cause unreasonable delays, then an expedited change may be made at the work location by responsible management.

A. After the expedited change has been authorized, the changes shall be processed through the normal change process. This processing shall occur in a timely manner consistent with the type and nature of the document being changed.

B. Implementing documents shall describe the process to control expedited changes according to the following requirements.

1. The level of management with the authority to make expedited changes shall be identified.

2. The time limits for processing expedited changes through the normal change process shall be specified.

3. An evaluation of the work shall be performed if the normal review process results in a change that is different from the expedited change.

6.2.8 Editorial Corrections

Editorial corrections may be made to documents without being subject to review requirements, but such corrections shall be distributed as a revision or change to the document.

A. The following items are considered editorial corrections:

1. Correcting grammar or spelling.

2. Renumbering sections or attachments which do not affect the chronological sequence of work.

3. Changing the title or number of the document.

4. Updating organizational titles.

   Note: A change in an organizational title accompanied by a change in responsibilities is not considered an editorial correction.

B. The organizational position responsible for approving the document for release shall approve editorial corrections.

7

7.1 GENERAL

This section establishes requirements for planning and executing procurements to ensure that purchased items and services meet specified requirements. This section does not apply to direct-support services used for staff augmentation. The supplier selection and bid/proposal evaluation requirements of this section do not apply to situations where the Office of Civilian Radioactive Waste Management obtains the services of other Department of Energy offices or Federal agencies through Memoranda of Understanding, Memoranda of Agreement, Program Guidance Memoranda, Interagency Agreement or other documents containing appropriate technical and Quality Assurance (QA) requirements. Technical and QA requirements specified in these documents shall be verified to be satisfactorily incorporated into the applicable program prior to starting work subject to the Quality Assurance Requirements and Description (QARD).

7.2 REQUIREMENTS

7.2.1 Procurement Planning

Procurements shall be planned and documented to ensure a systematic approach to the procurement process. Procurement planning shall:

A. Identify procurement methods and organizational responsibilities.

B. Identify what is to be accomplished, who is to accomplish it, how it is to be accomplished, and when it is to be accomplished.

C. Identify and document the sequence of actions and milestones needed to effectively complete the procurement.

D. Provide for the integration of the following activities:

1. Procurement document preparation, review, and change control according to the requirements of Section 4.0, Procurement Document Control.
2. Selection of procurement sources.
3. Proposal/bid evaluation and award.
4. Evaluation of supplier performance.
5. Verifications including any hold and witness point notifications.
6. Control of nonconformances.

7. Corrective action.

8. Acceptance of the item or service.

9. Identification of QA records.

E. Be accomplished as early as possible, and no later than at the start of those procurement activities which are required to be controlled.

F. Be performed relative to the level of importance, complexity, and quantity of the item or service being procured and the supplier's quality performance.

G. Include the involvement of the QA organization.

7.2.2 Source Evaluation and Selection

A. Supplier selection shall be based on an evaluation, performed before the contract is awarded, of the supplier's capability to provide items or services in accordance with procurement document requirements.

B. The organizational responsibilities for source evaluation and selection shall be identified and shall include the QA organization. If a source evaluation board is established, then the QA organization shall have a voting member.

C. Measures for evaluating and selecting procurement sources shall include one or more of the following elements:

1. Evaluation of the supplier's history for providing an identical or similar product which performs satisfactorily in actual use.

2. Evaluation of supplier's current QA records supported by any documented qualitative and quantitative information.

3. Evaluation of the supplier's technical and quality capability based on an evaluation of supplier facilities, personnel, and QA program implementation.

D. The results of procurement source evaluation and selection shall be documented.

7.2.3 Proposal/Bid Evaluation

A. The proposal/bid evaluation process shall include a determination of the extent of conformance to the procurement document requirements. This evaluation shall be performed by designated, technically qualified organizations including the QA organization.

B. The evaluation shall include the following subjects consistent with the importance, complexity, and quantity of items or services being procured:

1. Technical considerations.

2. QA program requirements.

3. Supplier personnel.

4. Supplier production capability.

5. Supplier past performance.

6. Alternatives.

7. Exceptions.

C. Before the contract is awarded, the purchaser shall resolve, or obtain commitments to resolve, unacceptable quality conditions identified during the proposal/bid evaluation.

D. Supplier QA programs shall be evaluated either before or after contract placement, and any deficiencies that would affect quality shall be corrected before starting work subject to the QARD.

E. Supplier QA programs shall be accepted by the purchaser before the supplier starts work subject to the QARD.

7.2.4 Supplier Performance Evaluation

A. The purchaser of items and services shall establish measures to interface with the supplier and to verify supplier's performance. The measures shall include:

1. Establishing an understanding between the purchaser and supplier of the requirements and specifications identified in the procurement documents.

2. Requiring the supplier to identify planning techniques and processes to be used in fulfilling procurement document requirements.

3. Reviewing supplier documents that are prepared or processed during work performed to fulfill procurement document requirements.

4. Identifying and processing necessary change information.

5. Establishing the method to be used to document information exchanges between purchaser and supplier.

6. Establishing the extent of source surveillance and inspection.

B. The extent of verifications shall be a function of the relative importance, complexity, and quantity of items or services being procured, and the supplier's quality performance.

C. Verifications shall be conducted as early as practical and shall not relieve the supplier of the responsibility for the verification of quality achievement. Verifications shall include supplier audits used as a method of evaluating the supplier's performance, and evaluation of purchaser's documentation to aid in the determination of the effectiveness of the supplier's QA program.

7.2.5 Control of Supplier Generated Documents

A. Supplier generated documents shall be controlled, processed, and accepted in accordance with the requirements established in the procurement documents.

B. Measures shall be implemented to ensure that the submittal of these documents is accomplished in accordance with the procurement document requirements. These measures shall provide for the acquisition, processing, and recorded evaluation of technical, inspection, and test data compared against the acceptance criteria.

7.2.6 Acceptance of Items or Services

A. The supplier shall verify that furnished items or services comply with the purchaser's procurement document requirements before offering the items or services for acceptance.

B. The supplier shall provide the purchaser objective evidence that items or services conform to procurement documents. The documentation shall be available at the purchaser's facility before the item is installed or before the service is accepted.

C. Methods for accepting supplier furnished items or services shall include one or more of the following, as appropriate to the items or services being procured:

1. Evaluating the supplier certificate of conformance.
2. Performing one or a combination of source verification, receiving inspection, or post-installation test.
3. Technical verification of the item or service.
4. Surveillance or audit of the work.
5. Review of objective evidence (such as certifications, stress reports, or personnel qualifications) for conformance to the procurement document requirements.

7.2.7 Certificate of Conformance

When a certificate of conformance is used to accept an item or service:

A. The certificate shall identify the purchased item or service to the specific procurement document.

B. The certificate shall identify the specific procurement document requirements met by the purchased item or service. The procurement document requirements identified shall include any approved changes, waivers, or deviations applicable to the item or service.

C. The certificate shall identify any procurement document requirements that have not been met together with an explanation and the means for resolving the nonconformances.

D. The certificate shall be signed or otherwise authenticated by a person who is responsible for this QA function and whose responsibilities and position are described in the supplier's QA program.

E. The certification process, including the implementing documents to be followed in filling out a certificate and the administrative implementing documents for review and approval of the certificates, shall be described in the supplier's QA program.

F. Measures shall be identified to verify the validity of supplier certificates and the effectiveness of the certification process (such as by audit of the supplier or by an independent inspection or test of the item). Verifications shall be conducted at intervals commensurate with the past quality performance of the supplier.

7.2.8 Source Verification

The purchaser may accept an item or service by monitoring, witnessing, or observing activities performed by the supplier. This method of acceptance is called source verification.

A. Source verification shall be implemented consistent with the supplier's planned inspections, examinations, or tests at predetermined points and performed at intervals consistent with the importance and complexity of the item.

B. Documented evidence of acceptance of source verified items or services shall be furnished to the receiving destination of the item, to the purchaser, and to the supplier.

C. Source verification shall be performed by personnel qualified in accordance with Section 2.0, Quality Assurance Program.

7.2.9 Receiving Inspection

When receiving inspection is used to accept an item:

A. The inspection shall consider the results of source verifications and audits and the demonstrated quality performance of the supplier.

B. The inspection shall be performed in accordance with established inspection implementing documents.

C. The inspection shall verify, as applicable, proper configuration; identification; dimensional, physical, and other characteristics; freedom from shipping damage; and cleanliness.

D. The inspection shall be planned and executed according to the requirements of Section 10.0, Inspection.

E. Receiving inspection shall be coordinated with a review for adequacy and completeness of any required supplier documentation submittals.

7.2.10 Post-installation Testing

A. When post-installation testing is used as a method of acceptance, the post-installation test requirements and acceptance documentation shall be mutually established by the purchaser and supplier.

B. The test shall be in accordance with the requirements of Section 11.0, Test Control.

7.2.11 Control of Supplier Nonconformances

The purchaser and supplier shall establish and document the process for disposition of items that do not meet procurement document requirements according to the following requirements.

A. The supplier shall evaluate nonconforming items according to the requirements of Section 15.0, Nonconformances.

B. The supplier shall submit a report of nonconformance to the purchaser including supplier recommended disposition (e.g., use-as-is or repair) and technical justification. Reports of nonconformances related to procurement document requirements, or documents approved by the purchaser, shall be submitted to the purchaser for approval whenever one of the following conditions exists:

1. Technical or material requirements are violated.

2. A requirement in supplier documents, which have been approved by the purchaser, is violated.

3. The nonconformance cannot be corrected by continuation of the original manufacturing process or by rework.

4. The item does not conform to the original requirement even though the item can be restored to a condition such that the capability of the item to function is unimpaired.

C. The purchaser shall disposition the supplier's recommendation.

D. The purchaser shall verify implementation of the disposition.

7.2.12 Commercial Grade Items

Where design specifies the use of commercial grade items, the following requirements are an acceptable alternative to other requirements of this section.

A. The commercial grade item shall be identified in an approved design output document. An alternate commercial grade item may be applied, provided the responsible design organization provides verification that the alternate commercial grade item will perform the intended function and will meet design requirements applicable to both the replaced item and the application.

B. Supplier evaluation and selection, when determined necessary by the purchaser based on the complexity and importance to safety, shall be in accordance with the requirements of the Subsection 7.2.2, Source Evaluation and Selection.

C. Commercial grade items shall be identified in the procurement document by the manufacturer's published product description.

D. After receipt of a commercial grade item, the purchaser shall ensure that:

1. Damage was not sustained during shipment.

2. The item received was the item ordered.

3. Inspection or testing is accomplished, to the extent determined by the purchaser, to ensure conformance with the manufacturer's published requirements.

4. Documentation, as applicable to the item, was received and is acceptable.

8

8.1 GENERAL

This section establishes requirements to ensure that only correct and accepted items are used or installed.

8.2 REQUIREMENTS

8.2.1 Identification

A. Identification shall be maintained on the items or in a manner which ensures that identification is established and maintained.

B. Items shall be identified from the time of initial fabrication, or receipt, up to and including installation or end use.

C. Identification shall relate an item to an applicable design or other pertinent specifying document.

8.2.2 Physical Markings

A. Item identification methods shall include use of physical markings. If physical markings are either impractical or insufficient, other appropriate means shall be employed (such as physical separation, labels or tags attached to containers, or procedural control).

B. Physical markings, when used, shall:

1. Be applied using materials and methods that provide a clear and legible identification.

2. Not detrimentally affect the function or service life of the item.

3. Be transferred to each part of an identified item when the item is subdivided.

4. Not be obliterated or hidden by surface treatments or coatings, or after installation unless other means of identification are substituted.

8.2.3 Traceability

A. Item identification methods shall ensure that traceability is established and maintained in a manner that allows an item to be traced to applicable design or other specifying documents.

B. Item traceability documentation shall ensure that the item can be traced at all times from its source through installation or end use.

8.2.4 Conditional Requirements

The controls for items shall address the following requirements, as applicable:

A. If codes, or standards include specific identification or traceability requirements (such as identification or traceability of the item to applicable specification or grade of material; heat, batch, lot, part. or serial number; or specified inspection, test, or other records), then identification and traceability methods shall be specified in specifications.

B. If codes or standards do not include specific identification or traceability requirements, specifications shall specify identification and traceability methods appropriate to the item.

C. If items have a limited operating or shelf life specified, then methods shall be established that preclude using the item beyond the shelf or operating life.

D. If item storage is required, then methods shall be established for the control of item identification that are commensurate with the planned duration and conditions of storage. These methods shall provide for, as applicable:

1. Maintenance or replacement of markings and identification tags damaged during handling or aging.

2. Protection of identification markings subject to excessive deterioration resulting from environmental exposure.

3. Updating related documentation.

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9.1 GENERAL

This section establishes the requirements for the control of special processes (such as welding, weld overlay, heat treating, chemical cleaning, and nondestructive examinations).

9.2 REQUIREMENTS

9.2.1 Special Processes

A. Special processes that control or verify quality shall be controlled according to the requirements of this section whether or not they are covered by existing codes and standards, or whether or not the quality requirements specified for an item exceed those of existing codes or standards.

B. Processes to be controlled as special processes shall meet the following criteria:

1. The results are highly dependent on the control of the process; or

2. The results are highly dependent on the skill of the operator; and

3. Quality of the results cannot be readily determined by inspection or test of the item.

C. Based on this criteria, a list of the special processes that each Affected Organization will perform, or be responsible for performing, shall be established and maintained.

9.2.2 Personnel, Implementing Documents, and Equipment Qualifications

Implementing documents shall be used to ensure that process parameters are controlled and that the specified environmental conditions are maintained. Special process implementing documents shall include or reference:

A. Qualification requirements for personnel, implementing documents, and equipment.

B. Conditions necessary for accomplishment of the special process. These conditions shall include proper equipment, controlled parameters of the process, calibration requirements, and traceability between the item or product, and individual performing the special process.

C. Requirements of applicable codes and standards, including acceptance criteria for the special process.

9.2.3 Qualification of Nondestructive Examination Personnel

A. Nondestructive examination shall include radiography, magnetic particle, ultrasonic, liquid penetrant, eddy current, neutron radiography, and leak testing.

B. Personnel that perform nondestructive examinations shall be qualified in accordance with the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A, June 1980 Edition. In lieu of the three year recertification interval specified in SNT-TC-1A, June 1980 edition, Level III Nondestructive examination personnel may be recertified on a five year interval.

C. The Affected Organization shall establish implementing documents for the control and administration for the training, examination, and certification of nondestructive examination personnel.

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REFER TO QARD LESSONS LEARNED/ PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

95-002 QUALITY ASSURANCE PROGRAM, SPECIFICALLY: QUALIFICATION AND CERTIFICATION OF INSPECTION PERSONNEL, QARD SECTION 10.0

10.1 GENERAL

This section establishes requirements for planning and executing inspections.

10.2 REQUIREMENTS

10.2.1 Inspection Planning

Inspection planning shall be performed, documented and include:

A. Identification of each work operation where inspection is necessary to ensure quality and implementing documents that will be used to perform the inspections.

B. Identification of the characteristics to be inspected and the identification of when, during the work process, inspections are to be performed.

C. Identification of inspection or process monitoring methods to be employed.

D. The final inspection shall be planned to arrive at a conclusion regarding conformance of the item to specified requirements.

E. Identification of the functional qualification level (category or class) of personnel performing inspections.

F. Identification of acceptance criteria.

G. Identification of sampling requirements.

H. Methods to record inspection results.

I. Selection and identification of the measuring and test equipment to be used to perform the inspection to ensure that the equipment is calibrated and is of the proper type, range, accuracy, and tolerance to accomplish the intended function.

10.2.2 Selecting Inspection Personnel to Perform Inspections

A. The individual who performs an inspection to verify conformance of an item to specified acceptance criteria shall be qualified to the requirements of this Section.

B. Data recorders, equipment operators, or other inspection team members who are supervised by a qualified inspector shall not be required to be a qualified inspector.

C. The inspections shall be performed by personnel other than those who performed or directly supervised the item being inspected and are independent of the organization directly responsible for that item. These personnel shall not report directly to the immediate supervisor responsible for the item being examined.

10.2.3 Inspection Hold Points

A. When mandatory hold points are used to control work that shall not proceed without the specific consent of the organization placing the hold point, then the specific hold points shall be indicated in implementing documents.

B. Consent to waive specified hold points shall be documented before continuing work beyond the designated hold point.

10.2.4 Statistical Sampling

When statistical sampling is used to verify the acceptability of a group of items, the statistical sampling method shall be based on recognized standard practices.

10.2.5 In-Process Inspections and Monitoring

A. Items in-process shall be inspected when necessary to verify quality. If inspection of processed items is impossible or disadvantageous, indirect control by monitoring of processing methods, equipment, and personnel shall be provided.

B. Inspection and process monitoring both shall be conducted when control is inadequate with only one method.

C. A combination of inspection and process monitoring methods, when used, shall be performed in a systematic manner to ensure that the specified requirements for control of the process and the quality of the item are met throughout the duration of the process.

D. Controls shall be established and documented for the coordination and sequencing of the work at established inspection points during successive stages of the process.

10.2.6 Final Inspection

A. Finished items shall be inspected for completeness, markings, calibration, adjustments, protection from damage, or other characteristics as required to verify the quality and conformance of the item to specified requirements.

B. Documentation not previously examined shall be examined for adequacy and completeness.

C. Final inspections shall include a review of the results and resolution of nonconformances identified by earlier inspections.

D. Modifications, repairs, or replacements of items performed subsequent to final inspection shall require reinspection or retest, as appropriate, to verify acceptability.

10.2.7 Accepting Items

A. The acceptance of an item shall be documented and approved by qualified and authorized personnel.

B. The inspection status of an item shall be identified according to Section 14.0.

10.2.8 Inspection Documentation

Inspection documentation shall identify:

A. The item inspected.

B. The date of inspection.

C. The name of the inspector, or the inspector's unique identifier, who documented, evaluated, and determined acceptability.

D. The name of the data recorder, as applicable.

E. The type of observation or method of inspection.

F. The inspection criteria, sampling plan, or reference documents (including revision levels) used to determine acceptance.

G. Results indicating acceptability of characteristics inspected.

H. Measuring and test equipment used during the inspection including the identification number and the most recent calibration date.

I. Reference to information on actions taken in connection with nonconformances, as applicable.

10.2.9 Qualifications of Inspection and Test Personnel

A. Qualifications

Personnel performing inspections as described in this section and personnel performing tests as described in Section 11.0 shall be qualified according to the indoctrination and training, education and experience, and physical requirements of this Section. These personnel shall have experience or training commensurate with the scope, complexity, or special nature of the inspections or tests.

B. Determination of Initial Capabilities

The capabilities of a candidate for certification shall be initially determined by an evaluation of the candidate's education, experience, and training; and either examination results or capability demonstration. The evaluation shall be performed to the requirements of the applicable functional level, and education and experience requirements of this Section.

C. Indoctrination and Training of Inspection and Test Personnel

1. Inspection and test personnel shall be indoctrinated to the technical objectives and requirements of the applicable codes and standards and the quality assurance program requirements that are to be employed in executing their responsibilities.

2. The need for formal training shall be determined, and training shall be conducted as required to qualify personnel for performing inspections and tests.

3. On-the-job training, with emphasis on hands-on experience gained through actual performance of inspections and test, shall be included in the training program.

   a. On-the-job training for personnel qualification shall be performed under the direct observation and supervision of a qualified person.

   b. The documented verification of conformance shall be performed by the qualified person and not by the person being administered on-the-job training.

D. Functional Qualification Levels of Inspection and Test Personnel

Three levels of functional qualification shall be used depending on the complexity of the functions involved. The criteria for each level are not limiting with regard to organizational position or professional status but, rather, are limiting with regard to functional work.

1. Level I Personnel Capabilities

   Level I personnel shall be capable of performing and documenting the results of designated inspections or tests.

2. Level II Personnel Capabilities

Level II personnel shall have Level I capabilities for the corresponding category or class. Additionally, Level II personnel shall have demonstrated capabilities in:

a. Inspection or test planning.

b. Advanced preparation, including the preparation and setup of related equipment, as appropriate.

c. Supervising or monitoring the inspections or tests.

d. Supervising and certifying lower-level personnel.

e. Evaluating the validity and acceptability of results.

3. Level III Personnel Capabilities

Level III personnel shall have Level II capabilities for the corresponding category or class. In addition, Level III personnel shall also be capable of evaluating the adequacy of specific programs used to train, qualify, and certify the personnel.

E. Education and Experience Requirements for Inspection and Test Personnel

The requirements for education and experience shall be considered with recognition that other factors commensurate with the scope, complexity, or special nature of the inspections or tests affect the assurance that a person can competently perform a particular task. Other factors that demonstrate capability in a given job and the basis for their equivalency shall be documented.

1. Level I Inspection Personnel shall meet the following education and experience requirements:

a. Two years of related experience in equivalent inspections or tests; or

b. High school graduation and six months of related experience in equivalent inspections or tests; or

c. Completion of college level work leading to an associate degree in a related discipline plus three months of related experience in equivalent inspections or tests.

2. Level II Inspection personnel shall meet the following education and experience requirements:

   a. One year of satisfactory performance as a Level I in the corresponding category or class; or

   b. High school graduation plus three years of related experience in equivalent inspections or tests; or

   c. Completion of college level work leading to an associate degree in a related discipline plus one year of related experience in equivalent inspections or tests; or

   d. Graduation from a four-year college plus six months of related experience in equivalent inspections or tests.

3. Level III Inspection personnel shall meet the following education and experience requirements:

   a. Six years of satisfactory performance as a Level II in the corresponding category or class; or

   b. High school graduation plus ten years of related experience in equivalent inspections or tests; or high school graduation plus eight years of experience in equivalent inspections or tests with at least two years as a Level II and with at least two years associated with nuclear facilities; or, if not, at least sufficient training to be acquainted with the relevant quality assurance program aspects of a nuclear-related facility; or

   c. Completion of college-level work leading to an associate degree and seven years of related experience in equivalent inspections or tests with at least two years of this experience associated with nuclear facilities -- or, if not, at least sufficient training to be acquainted with the relevant quality assurance program aspects of a nuclear-related facility; or

   d. Graduation from a four-year college plus five years of related experience in equivalent inspections or tests with at least two years of this experience associated with nuclear facilities -- or, if not, at least sufficient training to be acquainted with the relevant quality assurance program aspects of a nuclear-related facility.

F. Physical Requirements for Inspection and Test Personnel

The responsible organization shall identify any special physical characteristics needed for performance in each functional level (categories or class) including identifying the need for initial and subsequent visual acuity and other physical examinations.

G. Certifying the Qualifications of Inspection and Test Personnel

The qualifications of inspection and test personnel shall be certified in writing by the responsible organization. The certification shall document the:

1. Name of the certifying organization.
2. Identification of the person being certified.
3. Qualified inspection and test categories or class the individual is certified to perform.
4. Basis for certification (such as education, experience, indoctrination, training, examination results, and results of capability demonstration).
5. Results of periodic evaluations.
6. Results of visual acuity and physical examination when required.
7. Date of certification and date of certification expiration.
8. Signature of the organization's designated representative responsible for certification.

H. Periodic Evaluation of Qualification for Inspection and Test Personnel

1. The job performance of inspection and test personnel shall be reevaluated at periodic intervals not to exceed three years to ensure qualifications have been maintained.
    a. Reevaluation shall be by evidence of continued satisfactory performance or redetermination of required capability in accordance with the qualification requirements specified for the job as described in this section.
    b. If during this evaluation or at any other time the responsible organization determines that the capabilities of an individual are not in accordance with the qualification requirements specified for the job, that person shall be removed from the inspection or test until the required capability has been demonstrated.
2. Any person who has not performed inspections or tests in their qualified area for a period of one year shall be reevaluated by a redetermination of required capability in accordance with this section.

I. Maintaining Qualification Documentation for Inspection and Test Personnel

1. Documentation of personnel qualification shall be established, kept current, and maintained by the responsible organization. This documentation shall contain the information required for the initial qualification and the maintenance of qualification.

2. Documentation for each person shall be maintained and updated according to the following requirements:

   a. Removal of a person from performing in an area of certification when the responsible organization determines that the capabilities of the individual are not in accordance with the qualification requirements specified for the job as described in this section. This shall be documented at the time of removal.

   b. Reinstatement of certifications for the qualified area when the required capability has been demonstrated as described in this section. This shall be documented at the time of reinstatement.

   c. Continued performance in each certified area or redetermination of required capability as described in this section for each certified area shall be updated annually.

   d. Reevaluation of job performance by evidence of continued satisfactory performance or redetermination of capability as described in this section. This shall be updated every three years.

11.1 GENERAL

This section establishes requirements for planning and executing tests that are used to verify conformance of an item to specified requirements, or to demonstrate satisfactory performance for service. Examples of such tests include prototype qualification tests, production tests, proof tests prior to installation, construction tests, and pre-operational tests.

Testing of computer software is performed in accordance with Supplement I.

Activities required to collect data (such as for siting or design input) are performed in accordance with Supplement III.

11.2 REQUIREMENTS

11.2.1 Test Planning

Test planning shall include:

A. Identification of the implementing documents to be developed to control and perform tests.

B. Identification of item to be tested and the test requirements and acceptance limits, including required levels of precision and accuracy.

C. Identification of test methods to be employed and instructions for performing the test.

D. Test prerequisites that address calibrated instrumentation, appropriate and adequate test equipment and instrumentation, trained personnel, condition of test equipment and the item to be tested, suitably controlled environmental conditions, and provisions for data acquisition.

E. Mandatory hold points.

F. Methods to record data and results.

G. Provisions for ensuring that prerequisites for the given test have been met.

H. Selection and identification of the measuring and test equipment to be used to perform the test to ensure that the equipment is of the proper type, range, accuracy, and tolerance to accomplish the intended function.

I. Identification of the functional qualification level of personnel performing tests.

11.2.2 Performing Tests

Tests shall be performed in accordance with implementing documents that address the following requirements as applicable:

A. Provisions for determining when a test is required, describing how tests are performed, and ensuring that testing is conducted by trained and appropriately qualified personnel.

B. Include or reference test objectives and provisions for ensuring that prerequisites for the given test have been met, adequate calibrated instrumentation is available and used, necessary monitoring is performed, and suitable environmental conditions are maintained.

C. Test requirements and acceptance criteria provided or approved by the organization responsible for the design of the item to be tested unless otherwise designated.

D. Test requirements and acceptance criteria based upon specified requirements contained in applicable design or other pertinent technical documents.

E. Potential sources of uncertainty and error. Test parameters affected by potential sources of uncertainty and error shall be identified and controlled.

11.2.3 Use of Other Testing Documents

A. Other testing documents (such as American Society for Testing and Materials (ASTM) specifications, supplier manuals, or other related documents containing acceptance criteria) may be used instead of preparing special test implementing documents. If used, then they snall incorporate the information directly into the approved test implementing document, or shall be incorporated by reference in the approved test implementing document.

B. Implementing documents shall include adequate supplemental instructions as required to ensure the required quality of the testing work.

11.2.4 Test Results

A. Test results shall be documented and their conformance with acceptance criteria shall be evaluated by a qualified individual within the responsible organization to ensure that test requirements have been satisfied.

B. The test status of an item shall be identified in accordance with Section 14.0.

11.2.5 Test Documentation

Test documentation shall identify the:

A. Item or work product tested.

B. Date of test.

C. Name of the tester and data recorders.

D. Type of observation and method of testing.

E. Identification of test criteria or reference documents used to determine acceptance.

F. Results and acceptability of the test.

G. Actions taken in connection with any nonconformances noted.

H. Name of the person evaluating the test results.

I. Identification of the measuring and test equipment used during the test including the identification number and the most recent calibrated date.

11.2.6 Qualification of Test Personnel

Personnel who perform testing shall be qualified according to the requirements of Section 10.0.

12.1 GENERAL

This section establishes requirements to ensure measuring and test equipment is properly controlled, calibrated, and maintained.

12.2 REQUIREMENTS

12.2.1 Calibration

A. Measuring and test equipment including equipment that contains software or programmable hardware, shall be calibrated, adjusted, and maintained as a unit at prescribed intervals, or prior to use, against reference calibration standards having traceability to nationally recognized standards. Software developed or modified by the user shall be controlled in accordance with Supplement I, Software. If no nationally recognized standards or physical constants exist, the basis for calibration shall be documented.

B. Calibration standards shall have a greater accuracy than the required accuracy of the measuring and test equipment being calibrated.

1. If calibration standards with a greater accuracy than required of the measuring and test equipment being calibrated do not exist or are unavailable, calibration standards with accuracy equal to the required calibration accuracy may be used if they can be shown to be adequate for the requirements.

2. The basis for the calibration acceptance shall be documented and authorized by responsible management. The level of management authorized to perform this function shall be identified.

C. The method and interval of calibration for each device shall be defined, based on the type of equipment, stability characteristics, required accuracy, intended use, and other conditions affecting measurement control. For measuring and test equipment used in one-time-only applications, the calibration shall be done both before and after use.

D. A calibration or calibration check shall be performed when the accuracy of calibrated measuring and test equipment is suspect.

E. Calibrated measuring and test equipment shall be labeled, tagged, or otherwise suitably marked or documented to indicate due date or interval of the next calibration.

F. Calibrated measuring and test equipment shall be uniquely identified to provide traceability to its calibration data.

G. Updates to software contained in measuring and test equipment that effect calibration, require recalibration of the equipment prior to use.

12.2.2 Documenting the Use of Measuring and Test Equipment

The use of measuring and test equipment shall be documented. As appropriate to equipment use and its calibration schedule, the documentation shall identify the processes monitored, data collected, or items inspected or tested since the last calibration.

12.2.3 Out-of-Calibration Measuring and Test Equipment

A. Measuring and test equipment shall be considered to be out-of-calibration and not be used until calibrated if any of the following conditions exist:

1. The calibration due date or interval has passed without recalibration.

2. The device produces results known to be in error.

B. Out-of-Calibration measuring and test equipment shall be controlled. The controls shall include the following requirements:

1. Out-of-Calibration measuring and test equipment shall be tagged, segregated, or otherwise controlled to prevent use until they have been recalibrated.

2. When measuring and test equipment is found out-of-calibration during recalibration, the validity of results obtained using that equipment since its last valid calibration shall be evaluated.

   a. The evaluation shall include the determination of acceptability for previously collected data, processes monitored, or items previously inspected or tested.

   b. The evaluation shall be documented.

C. If any measuring and test equipment is consistently found to be out-of-calibration during the recalibration process, it shall be repaired or replaced.

12.2.4 Lost Measuring and Test Equipment

When measuring and test equipment is lost, the validity of results obtained using that equipment since its last valid calibration shall be evaluated.

A. The evaluation shall include the determination of acceptability for previously collected data, processes monitored, or items previously inspected or tested.

B. The evaluation shall be documented.

12.2.5 Handling and Storage

Measuring and test equipment shall be properly handled and stored to maintain accuracy.

12.2.6 Commercial Devices

Calibration and control shall not be required for rulers, tape measures, levels, and other normal commercial equipment that provides adequate accuracy.

12.2.7 Measuring and Test Equipment Documentation

Measuring and test equipment calibration documentation shall include the following information:

A. Identification of the measuring or test equipment calibrated.

B. Traceability to the calibration standard used for calibration.

C. Calibration data.

D. Identification of the individual performing the calibration.

E. Identification of the date of calibration and the recalibration due date or interval, as appropriate.

F. Results of the calibration and statement of acceptability.

G. Reference to any actions taken in connection with out-of-calibration or nonconforming measuring and test equipment including evaluation results, as appropriate.

H. Identification of the implementing document (including revision level) used in performing the calibration.

13.1 GENERAL

This section establishes requirements for the handling, storage, cleaning, packaging, shipping, and preservation of items to prevent damage or loss and to minimize deterioration.

13.2 REQUIREMENTS

13.2.1 Controls

A. Handling, storage, cleaning, packaging, shipping, and preservation of items shall be conducted in accordance with established work and inspection implementing documents, shipping instructions, or other specified documents.

B. If required for critical, sensitive, perishable, or high-value articles, specific implementing documents for handling, storage, cleaning, packaging, shipping, and preservation shall be prepared and used.

13.2.2 Special Equipment, Tools, and Environments

A. If required for particular items, special equipment (such as containers, shock absorbers, and accelerometers) and special protective environments (such as inert gas and specific moisture and temperature levels) shall be specified and provided.

B. If special equipment and environments are used, provisions shall be made for their verification.

C. Special handling tools and equipment shall be used and controlled as necessary to ensure safe and adequate handling.

D. Special handling tools and equipment shall be inspected and tested at specified time intervals and in accordance with implementing documents to verify that the tools and equipment are adequately maintained.

E. Operators of special handling and lifting equipment shall be experienced or trained to use the equipment.

13.2.3 Marking and Labeling

A. Measures shall be established for marking and labeling for the packaging, shipping, handling, and storage of items as necessary to adequately identify, maintain, and preserve the item.

B. Markings and labels shall indicate the presence of special environments or the need for special controls if necessary.

14.1 GENERAL

This section establishes requirements to identify the inspection, test, and operating status of items.

14.2 REQUIREMENTS

14.2.1 Identifying Items

A. Items that have satisfactorily passed required inspections and tests shall be identified.

B. The identification methods shall preclude the inadvertent installation, use, or operation of items that have not passed required inspections and tests.

14.2.2 Indicating Status

A. The status of required inspection and tests of items shall be indicated when necessary to preclude inadvertent by-passing of such inspections and tests.

B. The status of inspections and tests shall be identified either on the items or in documents traceable to the items.

C. Status shall be maintained through the use of legible and easily recognizable status indicators (such as tags, markings, labels, and stamps), or other means (such as travelers, inspection, or test records).

D. The authority for applying and removing status indicators shall be specified.

E. Status indicators shall be used to provide an indication of the test or operating status of items or facilities to prevent inadvertent changes in operating status.

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15.1 GENERAL

This section establishes requirements for the control of items that do not conform to requirements in order to prevent inadvertent installation or use of the item.

15.2 REQUIREMENTS

15.2.1 Documenting and Evaluating Nonconforming Items

A. Nonconformance documentation shall clearly identify and describe the characteristics that do not conform to specified criteria.

B. Nonconformance documentation shall be reviewed, and recommended dispositions of nonconforming items shall be proposed. The review shall include determining the need for corrective action according to the requirements of Section 16.0, Corrective Action. In addition, organizations affected by the nonconformance shall be notified.

C. Recommended dispositions shall be evaluated and approved.

D. Personnel performing evaluations of recommended dispositions shall have demonstrated competence in the specific area they are evaluating, an adequate understanding of the requirements, and access to pertinent background information.

E. The responsibility and authority for reviewing, evaluating, approving the disposition, and closing nonconformances shall be specified.

F. Further processing, delivery, installation, or use of a nonconforming item shall be controlled pending the evaluation and approval of the disposition.

15.2.2 Identifying Nonconforming Items

A. Nonconforming items shall be identified by marking, tagging, or other methods that do not adversely affect their end use. The identification shall be legible and easily recognizable.

B. If the identification of a nonconforming item is not practical, then the container, package, or segregated storage area, as appropriate, shall be identified.

15.2.3 Segregating Nonconforming Items

A. Nonconforming items shall be segregated, when practical, by placing them in a clearly identified and designated hold area until properly dispositioned.

B. If segregation is impractical or impossible due to physical conditions, then other precautions shall be employed to preclude inadvertent use.

15.2.4 Disposition of Nonconforming Items

A. The disposition of "use-as-is," "reject," "repair," or "rework" for nonconforming items shall be identified and documented.

B. The technical justification for the acceptability of a nonconforming item that has been dispositioned "repair" or "use-as-is" shall be documented.

C. Items that do not meet original design requirements that are dispositioned "use-as-is" or "repair" shall be subject to design control measures commensurate with those applied to the original design.

1. If changes to the specifying document are required to reflect the as-built condition, then the disposition shall require action to change the specifying document to reflect the accepted nonconformance.

2. Any document or Quality Assurance record change required by the disposition of the nonconformance shall be identified in the nonconformance documentation; and, when each document or record is changed, the justification for the change shall identify the nonconformance documentation.

D. The disposition of an item to be reworked, or repaired shall contain a requirement to reexamine (inspect, test, or nondestructive examination) the item to verify acceptability. Repaired or reworked items shall be reexamined using the original process and acceptance criteria unless the nonconforming item disposition has established alternate acceptance criteria.

15.2.5 Quality Trending

Nonconformance documentation shall be periodically analyzed by the Quality Assurance organization to identify quality trends in accordance with Section 16.0, Corrective Action.

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16.1 GENERAL

This section establishes requirements to ensure conditions adverse to quality are promptly identified and corrected as soon as practical.

16.2 REQUIREMENTS

16.2.1 Identifying Conditions Adverse to Quality

A condition adverse to quality shall be identified when the *Quality Assurance Requirements and Description* (QARD), or an implementing document requirement is not met.

16.2.2 Classification of Conditions Adverse to Quality

A. Conditions adverse to quality shall be classified in regard to their significance, and corrective actions shall be taken accordingly.

B. Two categories of classification shall be established:

1. Conditions adverse to quality.

2. Significant conditions adverse to quality.

16.2.3 Conditions Adverse to Quality

A. Conditions adverse to quality shall be documented and reported to the appropriate levels of management responsible for the conditions and to the Quality Assurance (QA) organization for tracking.

B. Responsible management shall determine the extent of the adverse condition and complete remedial action as soon as practical.

C. The QA organization shall concur with the proposed remedial action to ensure that QA program requirements are satisfied.

16.2.4 Significant Conditions Adverse to Quality

A. Criteria for determining a significant condition adverse to quality shall be established.

B. Significant conditions adverse to quality shall be documented and reported to management responsible for the condition, their upper management, and to the QA organization for tracking.

C. Significant conditions adverse to quality shall be evaluated for a stop work condition by the QA organization to determine if stopping work is warranted.

1. QA management shall issue stop work orders to responsible management after a stop work condition has been identified.

2. QA management shall take appropriate action to lift and close (in part or total) the stop work issued by the QA organization based on the resolution of the related significant condition adverse to quality.

D. Responsible management shall perform investigative action to determine the extent and impact of the condition, and document the results.

E. Responsible management shall determine, document, and complete remedial action. Responsible management shall also determine the root cause of the problem and take corrective action to prevent recurrence as soon as practical.

F. The QA organization shall concur with the proposed corrective action including remedial action, the root cause, and actions taken to prevent recurrence to ensure that QA program requirements are satisfied.

16.2.5 Follow-up and Closure Action

The QA organization shall verify implementation of corrective actions taken for all reported conditions adverse to quality and close the related corrective action documentation in a timely manner when actions are complete.

16.2.6 Quality Trending

A. The QA organization shall establish criteria for determining adverse quality trends.

B. Reports of nonconformances and conditions adverse to quality shall be evaluated to identify adverse quality trends and help identify root causes.

C. Trend evaluation shall be performed in a manner and at a frequency that provides for prompt identification of adverse quality trends.

D. Trend evaluations shall be distributed to Affected Organization management.

E. Identified adverse trends shall be reported to the management of the organization responsible for corrective action.

REFER TO QARD LESSONS LEARNED/PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

95-001 *QUALITY ASSURANCE RECORDS*, SPECIFICALLY: *CLASSIFICATION AND RETENTION OF QUALITY ASSURANCE RECORDS*, QARD SECTION 17.0

17.1 GENERAL

This section establishes requirements to ensure that Quality Assurance (QA) records are specified, prepared and maintained.

17.2 REQUIREMENTS

17.2.1 Classifying Quality Assurance Records

QA records shall be classified as lifetime or nonpermanent.

A. Documents that meet the following requirements shall be classified as lifetime QA records:

1. Documents that provide evidence of the quality of items on a *Q-List*.

2. Documents that provide evidence of the quality of activities related to items on a *Q-List*.

3. Documents that provide evidence of the quality of site characterization data and samples.

4. Documents that provide evidence of those activities that provide data used to assess the potential dispersion of radioactive materials from the licensed facility.

5. Documents that provide evidence of the quality of the production process for the high-level waste form and acceptance of the high-level waste form itself.

6. Documents that provide evidence of the quality of those activities associated with the characterization of DOE spent fuel, and conditioning through acceptance of DOE spent fuel.

7. Personnel training and qualification documents for individuals executing QA program requirements.

8. Documents which are implementing documents as described in Section 5.0, Implementing Documents.

B. Documents that do not meet the requirements for lifetime QA records, but provide objective evidence that the QA program has been properly executed shall be classified as nonpermanent QA records.

17.2.2 Creating Valid Quality Assurance Records

A. Implementing documents shall:

1. Identify those documents that will become QA records.

2. Identify the organization responsible for submitting the QA records to the records management system.

B. Individuals creating QA records shall ensure that the QA records are legible, accurate, complete appropriate to the work accomplished, and identifiable to the item(s) or activity(s) to which they apply.

C. Individuals handling QA records shall protect them from damage or loss until the records are submitted to the records management system.

D. Records shall be considered QA records when stamped, initialed, or signed and dated as complete. If the nature of the record (such as magnetic or optical media) precludes stamping, initialing or signing, then other means of authentication by authorized personnel are permitted.

E. QA records may be originals or copies.

17.2.3 Receiving and Indexing Quality Assurance Records

A receipt control system shall be established for QA records according to the following requirements:

A. An individual or organization shall be assigned the responsibility for receiving QA records.

B. A method for verifying that the QA records are those designated.

C. QA records shall be protected from damage, deterioration, or loss when received.

D. Legibility and completeness of QA records shall be verified.

E. The receipt control system shall permit a current and accurate assessment of the status of QA records during processing.

F. QA records shall be indexed to ensure retrievability. The indexing system shall include:

1. The location of the QA records within the records management system.

2. Identification of the item or related activity to which the QA records pertain.

3. The classification of the QA record.

G. QA records shall be submitted to storage after processing has been completed.

17.2.4 Correcting Information in Quality Assurance Records

A. Corrections to QA records including documents which will become QA records shall include the initials or signature of the person authorized to make the correction and the date the correction was made.

B. Corrections to QA records shall be approved by the originating organization. If an organization that was originally responsible for approving a particular document is no longer responsible, the new responsible organization shall be identified.

17.2.5 Storing and Preserving Quality Assurance Records

A. QA records shall be stored and preserved in predetermined storage facilities in accordance with an approved implementing document that provides:

1. A description of the storage facility.
2. A description of the filing system to be used.
3. A method for verifying that the QA records received are in agreement with the transmittal document.
4. A description of controls governing QA record access, retrieval, and removal.
5. A method for filing supplemental information.
6. A method for disposition of superseded QA records.

B. Storage methods shall be developed to preclude deterioration of QA records in accordance with the following:

1. The storage area shall minimize the risk of damage or destruction by natural disasters, extremes in environmental conditions and infestations of pests or molds.
2. Approved filing methods shall require QA records to be firmly attached in binders, or placed in folders or envelopes, for storage in steel file cabinets or on shelving in containers appropriate for the QA record medium being stored.
3. The storage arrangement shall provide adequate protection of special processed QA records (such as radiographs, photographs, negatives, microform, and magnetic media) to preclude damage from moisture, temperature, excessive light, electromagnetic fields, or stacking, consistent with the type of QA record being stored.
4. The storage area shall be protected from unauthorized entry, larceny, and vandalism.

17.2.6 Retrieval of Quality Assurance Records

A. The records management system shall provide for retrieval of QA records with planned retrieval times based on record type.

B. Access to storage facilities shall be controlled. A list shall be maintained designating personnel who are permitted access to the QA records.

17.2.7 Retention of Quality Assurance Records

A. OCRWM or its designee shall retain and preserve lifetime QA records for the operating life of the item or facility.

B. Nonpermanent QA records shall be retained for a minimum of three years or as specified by procurement documents, whichever is longer. Nonpermanent QA records shall not be disposed of until the following conditions are met:

1. Regulatory requirements are satisfied.

2. Operational status permits.

3. Purchaser's requirements are satisfied.

17.2.8 Turnover of Quality Assurance Records

A. Affected Organizations shall submit, to the Office of Civilian Radioactive Waste Management (OCRWM) or the purchaser, those QA records being temporarily stored by them that are subject to records turnover requirements. The timing of the submittal shall be as records packages become complete, or as items are released for shipment, or as prescribed by the purchaser.

B. The OCRWM records management organization shall inventory the submittal, acknowledge receipt, and process the QA records.

C. The responsible OCRWM line organizations shall identify those QA records in temporary storage to be submitted for long-term storage to the records management system.

17.2.9 Long Term Single Storage Facility

A. OCRWM's single storage facility for the storage of lifetime QA records shall meet the following design and construction requirements:

1. Reinforced concrete, concrete block, masonry, or equal construction.

2. Floor and roof with drainage control. If a floor drain is provided, a check valve or equal shall be included.

3. Doors, structure and frames, and hardware shall be designed to comply with the requirements of a minimum 2-hour fire rating.

4. Sealant applied over walls as a moisture or condensation barrier.

5. Surface sealant on floor providing a hard wear surface to minimize concrete dusting.

6. Foundation sealant and provisions for drainage.

7. Forced air circulation with filter system.

8. Fire protection system.

9. Only those penetrations that are used exclusively for fire protection, communication, lighting, or temperature and humidity control are allowed. All penetrations shall be sealed or dampered to comply with the minimum 2-hour fire protection rating.

B. If the facility is located within a building or structure, the environment and construction of that building can provide a portion or all of these criteria.

C. Construction details shall be reviewed for the adequacy of record protection by a person competent in the technical field of fire protection and fire extinguishing.

17.2.10 Dual Storage Facilities

A. The OCRWM's dual storage facilities for the storage of lifetime QA records shall provide facilities for copies of each record at locations sufficiently remote from each other to eliminate the chance of exposure to a simultaneous hazard.

B. Dual storage facilities are not required to meet the design and construction requirements specific for a long term single storage facility.

17.2.11 Temporary Storage Facility

The OCRWM and Affected Organizations shall provide for temporary storage of QA records during processing, review, or use until turnover to the OCRWM for disposition, according to the following requirements:

A. QA records shall be temporarily stored in a container or facility with a fire rating of 1-hour, or dual storage shall be provided.

B. For single storage, containers or facilities shall bear an Underwriters' Laboratories label (or equivalent) certifying 1-hour fire protection, or be certified by a person competent in the technical field of fire protection.

C. The maximum time limit for keeping QA records in temporary storage shall be specified by the OCRWM or the purchaser consistent with the nature or scope of work.

17.2.12 Replacement of Quality Assurance Records

Organizations originating QA records shall develop implementing documents that identify means for replacement, restoration, or substitution of lost or damaged QA records.

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REFER TO QARD LESSONS LEARNED/PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

NO. 93-002 *QUALITY ASSURANCE PROGRAM*, SPECIFICALLY: *MANAGEMENT ASSESSMENTS*, QARD SECTION 2.0, AND *AUDITS*, QARD SECTION 18.0

18.1 GENERAL

This section establishes requirements for performing internal and external Quality Assurance (QA) audits to verify compliance with, and to determine the effectiveness of, the QA program.

18.2 REQUIREMENTS

18.2.1 Scheduling Internal Audits

A. Internal audits shall be scheduled in a manner to provide coverage, consistency, and coordination with ongoing work.

B. Internal audits shall be scheduled at a frequency commensurate with the status and importance of the work.

C. Internal audits shall be scheduled to begin as early in the life of the work as practical and shall be scheduled to continue at intervals consistent with the schedule for accomplishing the work.

D. Regularly scheduled internal audits shall be supplemented by additional audits of specific subjects when necessary to provide an adequate assessment of compliance or effectiveness.

E. Internal audits of work to verify QA program compliance shall be performed annually or at least once during the life of the work, whichever is shorter.

F. Internal audits to determine QA program effectiveness (performance based audits) shall be performed on selected work.

18.2.2 Scheduling External Audits

A. The need for, and frequency of, external audits shall be determined after a supplier has been selected to perform work for the Office of Civilian Radioactive Waste Management. The determination shall be based on the complexity and nature of the items or services being procured.

B. External audits shall not be required for procured items that are relatively simple and standard in design, manufacturing, and testing, or adaptable to standard or automated inspections or tests of the end item to verify quality characteristics after delivery. Rationale for not performing audits for these items shall be documented.

C. External audits for compliance shall be performed triennially as a minimum with the initial audit to occur as early in the life of the activity as practical.

D. Pre-award surveys, if applicable, may serve as the first triennial audit provided:

1. The supplier is implementing the same QA program for other contracts that is proposed for the purchasers contract, and

2. The pre-award survey satisfies the same audit elements and criteria as those used in the performance of a triennial audit.

E. External audits to determine QA program effectiveness (performance based audits) shall be performed on selected work.

F. Annual performance evaluations shall be performed on each supplier to determine the need to schedule additional audits. This evaluation shall be documented and based on:

1. Review of documentation furnished by the supplier (such as certificates of conformance, nonconformance notices, and corrective actions).

2. Results of previous source verifications, audits, management assessments, and receiving inspections including audits from other sources.

3. Operating experience of identical or similar work furnished by the same supplier.

4. A review of procurement documents to determine what additional work the supplier has received since the initial contract.

G. The need to schedule additional external audits shall also be evaluated when a major change in the contract scope, work methodology, or organization occurs.

18.2.3 Audit Schedule

The audit schedule shall be developed annually and revised periodically to ensure that coverage is maintained current.

18.2.4 Audit Planning

A. The auditing organization shall develop and document an audit plan for each scheduled audit. This plan shall identify the audit scope, requirements for performing the audit, type of audit personnel needed, work to be audited, organizations to be notified, applicable documents, audit schedule, and implementing documents or checklists to be used. Audits shall include technical evaluations of the applicable procedures, instructions, activities and items.

B. The scope of each audit shall be based on evaluation of implementing documents, activities, and items to be audited, the results of previous audits and the impact of significant changes in personnel, organization, or the QA program.

18.2.5 Audit Team Independence

The auditing organization shall select and assign auditors who are independent of any direct responsibility for performing the work being audited. Audit personnel shall have sufficient authority and organizational freedom to make the audit process meaningful and effective.

18.2.6 Audit Team Selection

A. An audit team shall be identified before beginning each audit. The audit team shall include representatives from the QA organization and when appropriate applicable technical organizations.

B. A lead auditor shall be appointed to supervise the team, organize and direct the audit, coordinate the preparation and issuance of the audit report, and evaluate responses.

C. Lead auditors and auditors shall be qualified in accordance with the requirements of this section.

D. Technical specialists may be used by the auditing organization to assist in assessing the adequacy of technical processes. Technical specialists, when used, shall be qualified in accordance with the requirements of this section.

E. In the case of internal audits, personnel having direct responsibility for performing the work being audited shall not be involved in the selection of the audit team.

F. The lead auditor shall, before starting the audit, ensure that the assigned personnel collectively have experience or training commensurate with the scope, complexity, or special nature of the work to be audited.

18.2.7 Performing Audits

A. The audit team leader shall ensure that the audit team is prepared before starting the audit.

B. Audits shall be performed in accordance with written procedures or checklists.

C. Elements that have been selected for audit shall be evaluated against specified requirements.

D. Objective evidence shall be examined to the depth necessary to determine if these elements are being implemented effectively.

E. Audit results shall be documented by auditing personnel and reported to and reviewed by management having responsibility for the area audited. Conditions requiring prompt corrective action shall be reported immediately to management of the audited organization.

F. Identified conditions adverse to quality shall be documented and corrected in accordance with of Section 16.0, Corrective Action.

G. Nonconforming items identified during an audit shall be controlled by the audited organization in accordance with Section 15.0, Nonconformances.

18.2.8 Reporting Audit Results

The audit report shall be prepared and signed by the audit team leader, and issued to management of the audited organization and Affected Organizations. The audit report shall include the following information:

A. A description of the audit scope.

B. Identification of the auditors.

C. Identification of persons contacted during the audit.

D. A summary of the documents reviewed, persons interviewed, and the specific results of the reviews and interviews, that is, a summary of the checklist contents.

E. Statement on the effectiveness of the QA program elements which were audited.

F. A description of each reported condition adverse to quality in sufficient detail to enable corrective action to be taken by the audited organization according to the requirements of Section 16.0, Corrective Action.

18.2.9 Responding to Audits

Management of the audited organization shall investigate conditions adverse to quality; determine and schedule corrective action, including measures to prevent recurrence; and notify the auditing organization in writing of the actions taken or planned in accordance with Section 16.0, Corrective Action.

18.2.10 Evaluating Audit Responses

The adequacy of corrective actions for conditions adverse to quality shall be evaluated by the auditing organization in accordance with the requirements of Section 16.0, Corrective Action.

18.2.11 Follow-up Action

Follow-up action shall be taken by the auditing organization to verify that corrective action is accomplished as scheduled in accordance with the requirements of Section 16.0, Corrective Action.

18.2.12 Technical Specialist Qualifications

Technical specialists selected for auditing assignments shall be indoctrinated and trained in accordance with Section 2.0, Quality Assurance Program, and shall have the level of experience or training commensurate with the scope, complexity, or special nature of the work being audited.

18.2.13 Auditor Qualifications

Auditors shall have appropriate training or orientation to develop their competence for performing audits. Competence of personnel performing various audit functions shall be developed by one or a combination of the following methods:

A. QA program orientation to provide a working knowledge and understanding of the *Quality Assurance Requirements and Description* (QARD), and the implementing documents used to perform audits and report audit results.

B. Training programs to provide general and specialized training in audit performance.

   1. General training shall include the fundamentals, objectives, and techniques of performing audits.

   2. Specialized training shall include methods of examining, questioning, evaluating, and documenting specific audit items and methods of closing out conditions adverse to quality addressed by corrective action documents.

C. On-the-job training, guidance, and counseling under the direct supervision of a lead auditor. Such training shall include planning, performing, reporting, and follow-up action involved in conducting audits.

18.2.14 Lead Auditor Qualifications

A. A lead auditor shall be capable of organizing and directing audits, reporting audit findings, and evaluating planned and taken corrective action.

B. A lead auditor shall be certified as meeting the requirements for education and experience, communication skills, training, audit participation, and passing the examination as provided in this section.

18.2.15 Lead Auditor Education and Experience

The prospective lead auditor shall have verifiable evidence that a minimum of ten credits have been accumulated under the following scoring system:

A. Education (four credits maximum)

   1. An associate degree from an accredited institution: score one credit. If the degree is in engineering, physical sciences, mathematics, or QA: score two credits; or

   2. A bachelor's degree from an accredited institution: score two credits or, if the degree is in engineering, physical sciences, mathematics, or QA: score three credits. In addition, score one credit for a master's degree in engineering, physical sciences, business management, or QA from an accredited institution.

B. Experience (nine credits maximum)

Technical experience in such areas as scientific investigation, site characterization, production, transportation, engineering, manufacturing, construction, operation, maintenance, or experience applicable to the auditing organization's area of responsibility: score one credit for each full year with a maximum of five credits for this aspect of experience.

1. If two years of this experience have been in the nuclear-related field: score one additional credit; or

2. If two years of this experience have been in QA: score two additional credits; or

3. If two years of this experience have been in auditing: score three additional credits; or

4. If two years of this experience have been in nuclear-related QA: score three additional credits; or

5. If two years of this experience have been in nuclear-related QA auditing: score four additional credits.

C. Professional Competence (two credits maximum)

For certification of competency in engineering science or QA specialties issued and approved by a state agency or national professional or technical society: score two credits.

D. Rights of Management (two credits maximum)

When determined appropriate, the auditing organization may grant up to two credits for other performance factors applicable to auditing that are not explicitly called out in this section (such as leadership, sound judgment, maturity, analytical ability, tenacity, past performance, and completed QA training courses).

18.2.16 Lead Auditor Communication Skills

The prospective lead auditor shall have the capability to communicate effectively, both in writing and orally. These skills shall be attested to in writing by the candidate's supervisor.

18.2.17 Lead Auditor Training

A. Prospective lead auditors shall be trained to the extent necessary to ensure their competence in auditing skills as established by the organization responsible for performing audits.

B. Training in the following areas shall be given based upon management evaluation of the particular needs of each prospective lead auditor.

1. Knowledge and understanding of the QARD and other program-related procedures, codes, standards, regulations, and regulatory guides.

2. General structure of QA programs as a whole and the specific elements of the QARD.

3. Auditing techniques of examining, questioning, evaluating, and reporting. Methods of identifying, following up on, and closing corrective action items.

4. Audit planning in functional areas (such as scientific investigation, design, purchasing, construction, fabrication, handling, shipping, storage, cleaning, inspection, testing, statistics, nondestructive examination, maintenance, repair, operation, modification, and safety) of nuclear facilities.

5. On-the-job training to include applicable elements of the audit program.

18.2.18 Lead Auditor Audit Participation

The prospective lead auditor shall have participated in a minimum of five QA audits within a period of time not to exceed three years prior to the date of certification. One audit shall be a nuclear-related QA audit within the year prior to certification.

18.2.19 Lead Auditor Examination

A. The prospective lead auditor shall pass an examination that evaluates the comprehension of and ability to apply the audit knowledge described in this section. The test shall be oral, written, practical, or any combination.

B. The development and administration of the examination for a lead auditor is the responsibility of the auditing organization. The auditing organization shall:

   1. Maintain the integrity of the examination through confidentiality of files and, where applicable, proctoring of examinations.

   2. Develop and maintain objective evidence regarding the type and content of the examination.

18.2.20 Certification of Lead Auditor Qualifications

Each lead auditor shall be certified by the auditing organization as being qualified to lead audits. This certification shall document the:

A. Name of the auditing organization.

B. Name of the lead auditor.

C. Date of certification or recertification.

D. Basis of certification (such as education, experience, communication skills, and training).

E. Signature of the designated representative of the auditing organization responsible for certification.

18.2.21 Maintaining Lead Auditor Proficiency

A. Lead auditors shall maintain their proficiency through one or combination of the following:

1. Regular and active participation in the audit process.

2. Review and study of codes, standards, implementing documents, instructions, and other documents related to the QA program and program auditing.

3. Participation in QA training programs.

B. Management of the auditing organization shall evaluate the proficiency of lead auditors annually. Based on the evaluation, management may choose to extend the qualification, require retraining, or require requalification. Management evaluations shall be documented.

C. Lead auditors who fail to maintain their proficiency for a period of two years or more shall require requalification. Requalification shall include retraining and re-examination in accordance with this section, and participation as an auditor in at least one nuclear QA audit.

Supplement I

I.1 GENERAL

This supplement establishes requirements for the development, modification, control, and use of software. Software that is acquired as an integral part of measuring and test equipment, and has not been developed or modified by the Affected Organization, is controlled by Section 12.0, Control of Measuring and Test Equipment, and is exempt from the requirements of this supplement. Requirements for electronic management of data are addressed in Supplement V, Control of the Electronic Management of Data.

The following types of software are not required to be qualified using this supplement: operating systems; administrative and management systems; system utilities and compilers and their associated libraries; and software that does not generate data such as word processing programs, spreadsheets, database managers, graphing and visual display software, and statistical analysis programs. However, applications written for use within these types of software may need to meet the requirements for the software covered by this supplement or may need Supplement V, Control of the Electronic Management of Data.

I.2 REQUIREMENTS

I.2.1 Software Life Cycles, Baselines, and Controls

A. For developed or modified software, each Affected Organization shall document and approve a specific software life cycle for each software item prior to development or modification of software.

   1. Software life cycles shall be defined by control points at which software baseline elements shall be documented. Software life cycle activities may be performed in an iterative or sequential manner.

   2. When the software life cycle is defined for software development or modification within an Affected Organization, the documentation requirements of Subsections I.2.3, Software Verification, B and C, I.2.4, Software Validation, F and G, and I.2.5, Documentation, A, B, and C shall be established. All other requirements apply subsequent to establishment of the software life cycle.

   3. Reviews of software baselines shall be performed and documented at the software control points.

B. For acquired software the following requirements shall be met:

   1. Perform installation tests to ensure that software performs as required in the operational environment.

2. Perform validation in accordance with Subsection I.2.4, Software Validation, D, E, F, and G using test cases developed independently of the software developer. Additional test cases provided by the developer may be used to supplement this process with justification for their use.

3. Document in accordance with the requirements of Subsection I.2.5, Documentation, A, B, C.2, and C.6 as applicable.

4. Perform and document reviews of software baselines.

5. Place under the configuration controls in accordance with Subsection I.2.6, Software Configuration Management.

6. Implement a defect reporting and resolution system in accordance with Subsection I.2.7, Defect Reporting and Resolution.

7. Control the use of software in accordance with Subsection I.2.8, Control of the Use of Software.

C. Software, including macros, that can be verified by visual inspection and/or hand calculations shall have limited requirements applied as follows:

1. Listing of the baseline version and any subsequent changes to the software.

2. Documentation that the software provides correct results for a specified range of input parameters.

I.2.2 Software Verification and Software Validation

A. Software verification and software validation shall be performed prior to release. In those cases where this requirement cannot be met prior to the release of the software, the portions of software that have not been verified and validated shall be identified and controlled, and written justification of the reason documented.

B. Software verification and software validation activities shall be performed or reviewed by independent individuals or organizations who did not work on the original software development or modification. The person who directed the work may perform these activities with a higher level of management approval and documented justification.

I.2.3 Software Verification

A. The software verification shall be performed and documented to ensure that baseline elements meet the established requirements.

B. The verification documentation shall include a description of the tasks, methods, implementing documents, and acceptance criteria for accomplishing the software verification.

C. A record of the results of the execution of planned software verification shall be generated including the extent to which the results agree with the specified acceptance criteria.

I.2.4 Software Validation

A. Software validation activities (such as the development of test plans and test cases) shall be integrated into the software life cycle.

B. Testing shall be the primary method of software validation.

C. Software validation of modifications to released software items shall include regression testing.

D. Software validation shall be performed to an approved plan or process.

E. The test methods and test cases shall be documented to ensure that software meets the Affected Organization's requirements for its intended use.

F. The validation documentation shall include a description of the tasks, methods, implementing documents, and acceptance criteria for accomplishing the software validation.

G. A record of the results of the execution of planned software validation shall be generated including the extent to which the results agree with the specified acceptance criteria.

I.2.5 Documentation

Software activities shall be documented sufficiently to demonstrate the ability of the software to meet the needs of the Affected Organization and shall include the following:

A. Functional Requirements Information:

1. A description of the overall nature and purpose of the software.

2. Requirements for its intended use.

B. User Information:

1. A description of how to use the software item including:

a. Input and output options.

b. Data files, input and output data, defaults, and file formats.

c. A description of the allowable and tolerable ranges for inputs and outputs.

d. Anticipated errors and how the user can respond.

e. The hardware and software environments.

2. Available sample problems.

3. Installation procedures.

C. Requirements and Design Information:

1. Performance requirements and design constraints.

2. Interfaces with external data, hardware, or other software.

3. Applicable software and hardware operation issues including programming languages and versions, portability, maintainability, reliability, and efficiency.

4. A description of each software item as it relates to the functional requirements.

5. A description of the software structure including software internal interfaces, control logic, and data structure and flow.

6. A description of models and numerical methods.

7. Source code for developed software or software modification.

I.2.6 Software Configuration Management

A software configuration management system shall be established to include configuration identification and configuration control and status accounting. Software shall be placed under configuration management control as each baseline element is approved.

A. Configuration identification shall include:

1. A definition of the baseline elements of each software baseline.

2. A unique identification of each software item to be placed under software configuration management.

   a. Each version or revision of a software item shall be uniquely identified and labeled.

   b. The software version or revision identifier shall be included with the generated output, when feasible.

3. Assignment of unique identifiers that relate baseline documents to their associated software items. Cross-references between baseline documents and associated software shall be maintained.

B. Configuration control shall include:

1. A release and control process for baseline elements.

2. Changes to baseline elements, including retirement and withdrawal, shall be formally controlled and documented. This documentation shall contain a description of the change, the rationale for the change, and the identification of affected baseline elements.

   a. The change shall be formally evaluated and approved by the organization responsible for approving the baseline element.

   b. Only approved changes shall be made to software baselines.

   c. Information concerning approved changes shall be transmitted to all organizations affected by the changes.

   d. Software verifications shall be performed for the changes as necessary to ensure the changes are appropriately reflected in software documentation and to ensure that document traceability is maintained.

   e. Software validation shall be performed as necessary for the change.

C. Configuration status accounting shall include:

1. A listing of the approved baseline elements and unique identifiers.

2. The status of proposed and approved changes to the baseline elements.

3. A brief chronology of the software items, including descriptions of the changes made between versions of software items.

I.2.7 Defect Reporting and Resolution

A software defect reporting and resolution system shall be implemented.

A. The defect reporting and resolution system shall be integrated with the software configuration management system to ensure formal processing of defect resolutions.

B. Software defect reporting and resolution systems shall include the following controls:

1. Defects shall be documented and resolved.

2. Defects shall be assessed for their impact on previous applications.

3. Resolutions shall be reviewed and approved before changes are made to baseline elements.

4. Notification of identified user organizations.

C. If a defect is identified in software that adversely impacts previous applications, then the condition adverse to quality shall be documented and controlled in accordance with Section 16.0, Corrective Action.

I.2.8 Control of the Use of Software

A. Affected Organizations shall control and document the use of released software items such that comparable results can be obtained, with any differences explained, through independent replication of the process.

B. Use of software shall be independently reviewed and approved to ensure that the software selected is suitable to the problem being solved.

C. If use of a software item falls outside the range of validation, further validation shall be performed prior to use.

Supplement II

II.1 GENERAL

This supplement establishes requirements for the control of physical samples.

II.2 REQUIREMENTS

II.2.1 General Requirements

A. Samples shall be controlled and identified in a manner consistent with their intended use.

B. These controls shall identify responsibilities including interfaces between organizations for documenting and tracking sample possession from sample collection and identification through handling, preservation, shipment, transfer, analysis, storage, and final use.

C. Controls shall include specifics on orientation relative to the location that was sampled, as appropriate.

II.2.2 Traceability

A. Sample identification methods shall ensure that traceability is established and maintained from the samples to applicable implementing documents or other specifying documents.

B. Sample traceability shall ensure that the sample can be traced at all times from its collection through final use.

II.2.3 Identification

A. Identification shall be maintained on the samples or in a manner which ensures that identification is established and maintained.

B. Samples shall be identified from their initial collection through final use.

C. Sample identification is documented and checked before released for use.

D. Sample identification methods shall include use of physical markings.

E. If physical markings are either impractical or insufficient, other appropriate means shall be employed (such as physical separation, labels or tags attached to containers, or procedural control).

F. Physical markings, when used, shall:

1. Be applied using materials and methods that provide a clear and legible identification.

2. Not detrimentally affect the sample content or form.

3. Be transferred to each identified sample part when the sample is subdivided.

4. Not be obliterated or hidden by surface treatments or sample preparations unless other means of identification are substituted.

II.2.4 Conditional Requirements

The controls for samples shall address the following requirements, as applicable:

A. If documents (such as the Site Characterization Plan, test plans, study plans, or job packages) contain specific identification or traceability requirements (such as identification or traceability of the sample to applicable study plan, site characterization activity, or other records), those specified controls shall be implemented.

B. If samples have limited use or storage life, then methods shall be established that preclude using the sample beyond its intended use or storage life.

C. If sample storage is required, then methods shall be established for the control of sample identification that are commensurate with the planned duration and conditions of storage. These methods shall provide for, as applicable:

1. Maintenance or replacement of markings and identification tags damaged during handling or aging.

2. Protection of identification markings subject to excessive deterioration resulting from environmental exposure.

3. Updating related documentation.

II.2.5 Archiving Samples

Implementing documents shall specify the representative samples to be archived if the need to archive samples is identified.

II.2.6 Handling, Storage, and Shipping

A. Handling, storage, cleaning, packaging, shipping, and preservation of samples shall be conducted in accordance with established implementing documents or other specified documents.

B. If required for critical, sensitive, perishable, or high-value samples, specific measures for handling, storage, cleaning, packaging, shipping, and preservation shall be identified and used.

C. Measures shall be established for the marking and labeling for packaging, shipping, handling, and storage of samples as necessary to adequately identify, maintain, and preserve the sample.

D. Markings and labels shall indicate the presence of special environments or the need for special controls if necessary.

E. If required for particular samples, special equipment (such as containers) and special protective environments (such as inert gas, and moisture and temperature limits) shall be specified and provided.

F. Special handling tools and equipment shall be used and controlled as necessary to ensure safe and adequate handling.

1. Special handling tools and equipment shall be inspected and tested in accordance with implementing documents and at specified time intervals to verify that the tools and equipment are adequately maintained.

2. Operators of special handling and lifting equipment shall be experienced or trained to use the equipment.

II.2.7 Disposition of Nonconforming Samples

A. Samples that do not meet requirements specified in work controlling documents (such as Job Packages, Travelers, or Work Requests) shall be documented, evaluated, identified, and segregated in accordance with Section 15.0, Nonconformances.

B. The disposition for nonconforming samples shall be identified and documented and shall be limited to "use-as-is," "limited use," or "discard."

Supplement III

REFER TO QARD LESSONS LEARNED/PROGRAM CLARIFICATIONS, LOCATED BEHIND THE QARD SECTION FOR:

NO. 94-002 *QUALITY ASSURANCE PROGRAM*, SPECIFICALLY: *QUALITY ASSURANCE REQUIREMENTS AND DESCRIPTION (QARD)*, QARD SECTION 2.0, AND *PEER REVIEWS*, QARD SECTION 2.2.8, EXISTING DATA NOT COLLECTED UNDER AN APPROVED QA PROGRAM, AND *SCIENTIFIC INVESTIGATIONS*, QARD SUPPLEMENT III, SPECIFICALLY: *DATA VALIDATION AND QUALIFICATION*, QARD III.2.4

III.1 GENERAL

This supplement establishes requirements for scientific investigations.

III.2 REQUIREMENTS

III.2.1 Planning Scientific Investigations

A. Scientific investigations shall be planned in accordance with Section 2.0, Quality Assurance Program.

B. Planning shall be coordinated with organizations providing input to or using the results of the investigation.

C. Planning shall address provisions for determining the accuracy, precision, and representativeness of results.

III.2.2 Performing Scientific Investigations

A. Scientific investigations shall be performed using scientific notebooks, implementing documents, or a combination of both.

B. Scientific notebooks shall contain the following:

1. Statement of objective and description of work to be performed, or reference to an approved planning document or implementing document that addresses those topics.

2. Identification of method(s) and computer programs to be used.

3. Identification of any samples or measuring and test equipment used.

4. Description of the work as it was performed and results obtained, names of individuals performing the work, and dated initials or signature, as appropriate, of individuals making the entries.

5. Description of changes made to methods used, as appropriate.

C. Scientific notebooks shall be reviewed by an independent qualified individual to verify there is sufficient detail to:

1. Retrace the investigations and confirm the results, or

2. Repeat the investigation and achieve comparable results, without recourse to the original investigator.

III.2.3 Data Identification

A. Data shall be identified in a manner that facilitates traceability to associated documentation.

B. Identification and traceability shall be maintained throughout the lifetime of the data.

III.2.4 Data Review

A documented independent review of acquired and developed data shall be performed to confirm technical adequacy.

III.2.5 Data Usage

A. Unqualified data may be used without qualification in scientific investigation and design activities. Traceability to its status as unqualified data shall be maintained.

B. Data reduction shall be described to permit independent reproducibility by another qualified individual.

C. Data considered as established fact by the scientific and engineering community do not require qualification (for example, engineering handbooks, density tables, gravitational laws, etc.).

D. Unqualified data directly relied upon to address safety and waste isolation issues shall be qualified as follows:

1. One or a combination of the following methods shall be used:

   a. Determination that the controls under which the data were generated are similar in scope, requirements and implementation to the *Quality Assurance Requirements and Description*.

   b. Corroborating Data - Rationale for selecting one set of data to corroborate another set of unqualified data shall be clearly explained and justified.

   c. Confirmatory testing.

   d. Peer review in accordance with Section 2.0, Quality Assurance Program.

2. Qualification shall be planned and documented. The documentation shall include the following:

   a. The factors used in arriving at the choice of qualification methods and also the acceptance criteria used to determine if the data are qualified.

b. A documented review to determine application suitability when qualification methods (a), (b), or (c) are used.

III.2.6 Model Development and Use

A. The development of models of natural phenomena shall be documented. Documentation shall identify principal lines of investigation considered.

B. Models of natural phenomena shall be validated to confirm that the mathematical representation appropriately depicts the natural phenomena.

C. Model validation shall be accomplished by comparing analysis results against data acquired from laboratory, field experiments, natural analogue studies, or observations that were not used in the original development of the model.

1. When data are not available from these sources, alternative approaches shall be documented and used for model validation.

2. The need to perform a peer review as an alternative approach shall be consistent with consideration criteria specified for peer review in Section 2.0, Quality Assurance Program.

D. The selection and use of models of natural phenomena shall be documented and justified.

Supplement IV

IV.1 GENERAL

This Supplement establishes requirements for field surveying. Examples of work that have the potential to require field surveying services for location determination include site characterization, explorations, and installations.

IV.2 REQUIREMENTS

IV.2.1 Field Survey System

A. A permanent system of horizontal and vertical controls shall be established and maintained.

B. This system shall be used in accordance with implementing documents to obtain the accurate location and relocation of designated features, including locations of sample or data collection.

IV.2.2 Field Survey Documentation

Pertinent survey documents shall be identified, maintained and verified for completeness as the work progresses.

Supplement V

V.1 GENERAL

This supplement applies to the controls on the electronic management of data used as the controlled source for information used in design analysis, process control, or scientific investigation.

Software that performs functions of analysis or calculation shall be controlled in accordance with Supplement I, Software. The acquisition, development and use of data are controlled by the requirements of Section 3.0, Design Control or Supplement III, Scientific Investigation.

V.2 REQUIREMENTS

V.2.1 Control of the Electronic Management of Data

The Affected Organization shall establish controls to ensure:

A. The completeness and accuracy of the data input.

B. The completeness and accuracy of subsequent changes to data input.

C. The security of the data is maintained including integrity of the data.

D. When data is retrieved using a query language, the query shall be checked to ensure it satisfies the Affected Organization's requirements for its intended use.

V.1 GENERAL

This supplement applies to the controls on the electronic management of data used as the controlled source for information used in design analysis, process control, or scientific investigation.

Software that performs functions of analysis or calculation shall be controlled in accordance with Supplement I, Software. The acquisition, development and use of data are controlled by the requirements of Section 3.0, Design Control or Supplement III, Scientific Investigation.

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V.2.1 Control of the Electronic Management of Data

The Affected Organization shall establish controls to ensure:

A. The completeness and accuracy of the data input.

B. The completeness and accuracy of subsequent changes to data input.

C. The security of the data is maintained including integrity of the data.

D. When data is retrieved using a query language, the query shall be checked to ensure it satisfies the Affected Organization's requirements for its intended use.

Appendix A

A.1 GENERAL

A. This appendix contains amplifications of requirements and descriptions unique to waste form development through qualification, production, and acceptance. Amplifications provided relate to specific sections or supplements. In those cases when a section or supplement requires no amplification, reference to the section or supplement is omitted.

B. The Department of Energy's Office of Environmental Management has overall responsibility for developing, qualifying, and producing an acceptable high-level waste form.

A.2 REQUIREMENTS

A.2.1 Amplification of QARD Section 2.0, Quality Assurance Program

A. Line management shall plan, schedule, and conduct readiness reviews at significant transitional events both leading up to and during waste form production.

B. Line management shall establish measures for controlling technical modifications to the waste form production process. Technical modifications subject to control shall include:

1. Waste form and canistered waste form.

2. Process control plans and other implementing documents.

3. Waste Acceptance Product Specifications, Waste Form Compliance Plans, and Waste Form Qualification Reports.

A.2.2 Amplification of QARD Supplement III, Scientific Investigation

Implementing documents shall contain requirements for evaluating development and qualification results including final results within Waste Form Qualification Reports.

Appendix B

B.1 GENERAL

A. This appendix contains amplifications of requirements and descriptions unique to the work conducted for the storage of spent fuel and the transportation of spent fuel and high-level radioactive waste. Exceptions to the *Quality Assurance Requirements and Description* (QARD) requirements are given for organizations that design or fabricate transportation casks or multi-purpose canisters (MPCs) under the licensing provisions of 10 Code of Federal Regulations (CFR) 71, or design or fabricate storage casks or MPCs under the licensing provisions of 10 CFR 72.

B. Activities associated with storage casks, transportation casks, and MPCs that are required to ensure future compliance with 10 CFR 60 are not covered by this appendix. For example, whereas work on translating Mined Geologic Disposal System design criteria into MPC design criteria would be subject to the applicable sections of this QARD, implementing approved MPC design criteria would only be subject to the requirements of this appendix.

B.2 REQUIREMENTS

B.2.1 General

Organizations that design or fabricate storage casks, transportation casks, or MPCs shall develop Quality Assurance (QA) programs that are accepted by the Nuclear Regulatory Commission and the procuring organization. The QA programs shall meet the following requirements.

B.2.2 Storage Casks, Transportation Casks, and MPCs

A. The QA program shall meet the requirements of 10 CFR 71, Subpart H or 10 CFR 72, Subpart G, as applicable.

B. The requirements of this appendix are the only QARD requirements that apply to organizations designing or fabricating storage casks, transportation casks, or MPCs under 10 CFR 71, Subpart H or 10 CFR 72, Subpart G, QA programs.

Appendix C

C.1 GENERAL

This appendix contains amplifications of requirements and descriptions unique to work conducted for the Mined Geologic Disposal System. Amplifications provided relate to specific sections or supplements. In those cases when a section or supplement requires no amplification, reference to the section or supplement is omitted.

C.2 REQUIREMENTS

C.2.1 Amplification of QARD Section 9.0, Control of Special Processes

Special processes associated with work products specified in work controlling documents (such as job packages or work requests) shall comply with the requirements specified in Section 9.0, Control of Special Processes.

C.2.2 Amplification of QARD Section 10.0, Inspections

If required by work controlling documents (such as job packages or work requests) work products shall be subject to inspection in accordance with Section 10.0 of the QARD.

C.2.3 Amplification of QARD Section 15.0, Nonconformances

Nonconforming products resulting from activities specified in work controlling documents (such as job packages or work requests) shall be documented, evaluated, identified, segregated, and dispositioned in accordance with Section 15.0, Nonconformances, of this QARD.

Acceptance (document): The documented determination by the receiving organization that work is suitable for the intended purpose.

Administrative and Management Software: Software that provides tracking, monitoring, retrieving, sorting, or other function and does not serve as the controlled source of quality information used in design analysis, process control, or scientific investigation. Such software may support activities, subject to the QARD, but does not require the controls of Supplement I.

Affected Organization: An organization performing Program work subject to QARD requirements whose organizational relationships are defined in OCRWM Program documents.

Alternate Calculations: Calculations that are made with alternate methods to verify correctness of the original calculation.

Approval: The documented determination by a responsible organization that work is suitable for the intended purpose and shall be used as required.

Audit: A planned and documented quality assurance program verification performed to determine by investigation of objective evidence the adequacy of and compliance with established implementing documents and the effectiveness of implementation.

Audit Team Leader: A lead auditor who is assigned to direct the efforts of an audit team.

Auditor: An individual who is qualified to perform assigned portions of an audit.

Authentication: The act of attesting that the information contained within a document, that is becoming a quality assurance record, is accurate and completed appropriate to the work accomplished.

Baseline Element (Software): An individual component of a software baseline.

Certificate of Conformance: A document signed or otherwise authenticated by an authorized individual certifying the degree to which items or services meet specified requirements.

Certification: The act of determining, verifying, and attesting in writing to the achievement or compliance with specified requirements.

Characteristic: A property or attribute of an item, process or service that is distinct, describable, and measurable.

Code Listing: An ordered display or printout of program statements.

Commercial Grade Item: An item that is (i) not subject to design or specification criteria unique to the Program or nuclear facilities, (ii) used in applications other than the nuclear industry, and (iii) ordered from the manufacturer or supplier on the basis of specifications set forth in the manufacturer's published product description.

Computer Program: A sequence of instructions suitable for processing by a computer.

Condition Adverse to Quality: A state of noncompliance with quality assurance program requirements.

Confirmatory Testing: An evaluation subject to implementing documents that investigates the properties of interest of data in an attempt to confirm the quality of the data.

Controlled Document: A document that is prepared, reviewed, and approved in accordance with established implementing documents; subject to controlled distribution; and subject to a defined change process.

Corrective Action: Measures taken to rectify conditions adverse to quality and, where necessary, to preclude repetition.

Corroborating Data: Data that is used to support or substantiate other data.

Data: As it pertains to Supplement III, information developed as a result of scientific investigation activities, including information extracted from reference sources, and performance assessment analysis.

Database: A collection of previously distinct data (not created by the database) which have been logically organized to facilitate data access.

Data Reduction: Processes that change the form of expression, quantity of data or values, or the number of data items.

Design Bases: Information that identifies the specific functions to be performed by items and the specific values or ranges of values chosen for controlling parameters as reference bounds for design.

Design Change: Any revision or alteration of the technical requirements defined by approved and issued design output documents and approved and issued changes thereto.

Design Input: Those criteria, parameters, bases, or other design requirements upon which design output documents are based.

Design Output: Drawings, specifications, and other documents resulting from the translation of design input requirements of items.

Design Process: Technical and management process that commences with identification of design input and ends with the issuance of design output documents.

Design Review: A documented evaluation of design output during the design process to determine design adequacy and conformance to specified acceptance criteria.

Document Control: The process for controlling documents that provides for adequacy review, approval for release by authorized personnel, and distribution for use at the prescribed work locations.

Expedited Change: An abbreviated method of revising a document at the work location where the document is used when the normal change process would cause unnecessary delays. The management responsible for the work makes the expedited change.

Field Surveying: The process of determining the boundaries, area, elevation, and location of land, structures, reference points, or other designated features either on, above, or below the earth surface relative to a permanent system of horizontal and vertical controls.

Indoctrination: Method of training designed to familiarize personnel in fundamental criteria, program elements, responsibilities, and authority applicable to assigned tasks.

Inspection: A quality assurance program verification that is used to verify whether an item conforms to specified technical criteria.

Item: An all-inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, structure, subassembly, subsystem, system, or unit that is identified in a design document.

Lead Auditor: An individual who is certified to organize, perform, and direct an audit; report audit results; and evaluate related corrective actions.

Management Assessment: A quality assurance program verification that is conducted by management above or outside the Quality Assurance organization and that evaluates the scope, status, adequacy, programmatic compliance, and implementation effectiveness of the quality assurance program.

Measuring and Test Equipment: Devices or systems used to calibrate, measure, gage, test, or inspect in order to control or acquire data to verify conformance to specified requirements.

Model Validation: The process that demonstrates that the model is an acceptable representation of the process or system for which it is intended.

Nonconformance: A deficiency in characteristic or record that renders the quality of an item or sample unacceptable or indeterminate.

Objective Evidence: Any documented statement of fact, other information, or record, either quantitative or qualitative, pertaining to the quality of an item or activity based on observations, measurements, or test which can be verified.

Organizational Interface: The relationship between organizations when one organization prescribes an activity or requirement to, or shares an activity or requirement with, another organization.

Peer: A person having technical expertise in the subject matter to be reviewed to a degree at least equivalent to that needed for the original work.

Peer Review: A documented, in-depth critique of work by a group of peers independent from the work being reviewed.

Performance Confirmation: The program of tests, experiments and analyses which is conducted to evaluate the accuracy and adequacy of the information used to determine with reasonable assurance that the performance objectives for the period after permanent closure will be met.

Personnel Qualification: See Qualification (Personnel).

Process: A series of actions that achieves an end result or accomplishes work.

Procurement Document: Purchase orders, contracts, specifications, or other document used to define technical and quality assurance requirements for the procurement of items or services.

Qualified Data: Data initially collected or developed under a NRC approved quality assurance program or unqualified data that has been qualified in accordance with the *Quality Assurance Requirements and Description*.

Quality Assurance Record: A completed document (or other medium) that furnishes evidence that items or work comply with requirements.

Qualification (Personnel): The capabilities gained through education, training, or experience that qualify an individual to perform a required function.

Qualification of Data: A formal process that is intended to provide a desired level of confidence that data is suitable for its intended use.

Qualification Testing: A test that is intended to provide a desired level of confidence that an item meets specified criteria.

Quality Assurance: All those planned and systematic actions necessary to provide adequate confidence that an item will perform satisfactorily in service.

Readiness Review: A systematic assessment of the preparedness of an organization to start or continue a process or project phase.

Regression Testing: Selective retesting of a system or component to verify that modifications have not caused unintended effects and that the system or component still complies with its specified requirements.

Release (Software): The formal notification and distribution of approved software.

Remedial Action: The actions taken to correct specifically identified conditions adverse to quality.

Repair: The process of restoring an item to a condition such that the capability of an item to function reliably and safely is unimpaired even though that item still does not conform to the original requirement.

Rework: The process by which an item is restored to original specifications by completion or correction.

Right of Access: The procurement requirement that permits the purchaser or designated representative to enter the premises of a supplier for verification purposes.

Root Cause: The identified cause of a condition adverse to quality that, if corrected, will preclude recurrence or greatly reduce the probability of recurrence of the same or a similar condition adverse to quality.

Sample (Physical): A physical part of a whole whose properties are studied to gain information about the whole.

Scientific Investigation: Any observation, identification, description, experimental study, or analysis and explanation of natural phenomena.

Scientific Notebook: A record of the methodology and results of scientific investigations that is used when the work involves a high degree of professional judgment or trial and error methods or both.

Service: The performance of activities such as design, fabrication, inspection, nondestructive examination, repair or installation.

Significant Condition Adverse to Quality: A condition adverse to quality which, if uncorrected, could have a serious effect on safety, or the ability to isolate waste.

Site Characterization: The program of exploration and research both in the laboratory and the field that is undertaken to establish the geologic conditions and the ranges of parameters of a particular site that are relevant to the implementing documents.

Software: A software item and associated documentation.

Software Baseline: (1) A specification or product that has been formally reviewed and agreed upon, that thereafter is the basis for further development, and that can be changed only through formal change procedures. (2) A document, a set of documents, or a product formally designated and controlled at a specific time during the software life cycle.

Software Control Point: Milestones in the software life cycle when controls are applied to the software baselines.

Software Item: Source code, object code, job control code, control data, or a collection of these items that function as a single unit.

Software Life Cycle: A series of activities that begins when software planning is initiated and ends when the software is no longer available for use.

Software Validation: The process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements.

Software Verification: The process of determining whether the products of a given software life cycle phase satisfy the conditions imposed at the start of that phase.

Special Process: A process, the results of which are highly dependent on the control of the process or the skill of the operators, or both, and in which the specified quality cannot be readily determined by inspection or test of the product.

Stop Work Order: A formal directive issued by management that work must be stopped until resolution of the related significant condition adverse to quality.

Supplier: Any individual or organization who furnishes items or services in accordance with a procurement document. An all-inclusive term used in place of any of the following: vendor, seller, contractor, or subcontractor.

Surveillance: The act of observing real-time activities and/or reviewing documentation to verify conformance with specified requirements and to evaluate their adequacy and effectiveness.

Technical Specialist: An individual who is assigned to an audit team when the scope, complexity, or special nature of the work to be audited warrants assistance from a technical standpoint.

Testing: An element of verification for the determination of the capability of an item to meet specified requirements by subjecting the item to a set of physical, chemical, environmental, or operating conditions.

Traceability: The ability to trace the history, application, or location of an item, data, or sample using recorded documentation.

Training: Systematic process provided to personnel so that they achieve proficiency, maintain proficiency, and adapt to changes in technology, methods, processes, or responsibilities as necessary to perform assigned tasks.

Unqualified Data: Data developed prior to the implementation of an NRC approved quality assurance program that meets Office of Civilian Radioactive Waste Management requirements or data developed outside an approved NRC Quality Assurance Program such as by oil companies, universities, or data published in technical or scientific publications. Unqualified data does not include information accepted by the scientific and engineering community as established fact.

Use-As-Is: A disposition permitted for a nonconforming item when it can be established that the item is satisfactory for its intended use.

Verification: The act of reviewing, inspecting, testing, checking, auditing, or otherwise determining and documenting whether items, processes, services, or documents conform to specified requirements.

Work: Activities that are subject to the *Quality Assurance Requirements and Description*.

LESSONS LEARNED/PROGRAM CLARIFICATION
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CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM
OFFICE OF QUALITY ASSURANCE (OQA)
LESSONS LEARNED/PROGRAM CLARIFICATION NO. 92-001

SUBJECT

Criterion 4, Procurement and the Classification of Procurement documents

CONDITION SUMMARY

During the YMQAD YMP-92-03 of Sandia National Laboratories (SNL), it was noted that PR 87-5104 was being processed as "Quality Affecting" in accordance with QAIP 04-01, Procurement. The Quality Assurance Grading Report (QAGR) and the Specification Work Breakdown Structure WBS 1.2.3.6.2.1.6 identifies the activity as "Quality Affecting." The PR was actually a personal Services Contract for a person acting as direct support, monitoring SNL's contract with the National Center for Atmospheric Research, under the direct supervision of the SNL requestor, and in accordance with SNL's QA program and implementing procedures.

RESOLUTION

The procurement documents should be classified as "QA-NA" on all future procurement orders where the contractor will be performing "Quality Affecting" activities under the direct supervision and QA program of the purchaser.

BASIS FOR RESOLUTION

In this case, Criterion 4, Procurement, does not apply because the contractor is acting as direct support capacity as a staff member of the procuring organization. As a staff member, the contractor is under the direct supervision of the requestor and is subject to the requirements of the requesting organization's QA program when the WBS and QAGR indicate the activities are "Quality Affecting."

Donald G. Horton, Director
Office of Quality Assurance
Office of Civilian Radioactive Waste Management

ENCLOSURE

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM
OFFICE OF QUALITY ASSURANCE (OQA)
LESSONS LEARNED/PROGRAM CLARIFICATION NO. 93-001

SUBJECT

QA Program Element 2.0, Quality Assurance Program, specifically: Verification of Minimum Education and Experience.

CONDITION SUMMARY

Some CRWM affected organizations are unaware of the different methodologies of satisfying the requirement for Verification of Minimum Education and Experience.

RESOLUTION

Education Verification

Preferred Method: On company letterhead, request written verification of the highest level of education the employee (or potential employee) had earned from the school Office of the Registrar. Request verification of degree(s) awarded, (or transcript) education major, and dates attended.

Alternate Method: Telephone the school's Office of the Registrar, identify your company and yourself, and request verification of the highest level of education the employee (or potential employee) had earned. Record the following information:

- Date and time
- Telephone number
- Registrar staff member's name providing information
- Degree(s) awarded
- Education major
- Dates attended
- (units toward degree, if a degree was not awarded)
- The signature and date of the requestor

Note: An employee furnished copy of a diploma or transcript is not satisfactory for use as objective evidence in education verification.

Experience Verification

Preferred Method: On company letterhead, request written verification of work experience from the employee's previous employer(s) for the dates and position descriptions cited on the employee' resume`.

ENCLOSURE

Alternate Method: Telephone the employee's previous company personnel department or previous department manager. Identify your company and yourself and request verification of the employee's work experience. Record the following information:

- Date and time
- Company name, address and telephone number, personnel staff member name or previous department staff member providing the information.
- Dates employed
- Position description
- The signature and date of the requestor,

In the event that the employee's previous company is out of business or personnel records are no longer available, due to time duration since being employed by the company, it is permissible to contact person(s) that have personal knowledge of the employee's work history for a specified time frame. Record the following information:

- Date and time
- Persons name, address and telephone number providing the information
- Confirmation of the dates provided on employee's resume. Record actual time frame being evaluated
- Position description title, or job title
- The signature and date of the requestor.

Note: Objective evidence accumulated or generated for the purpose of education and experience verification is subject to surveillance and audit.

BASIS FOR RESOLUTION

DOE/RW/0333P, Rev.#0 QARD, QA Element 2.0, Quality Assurance Program. Paragraph 2.2.11 Personnel Selection, Indoctrination, Training and Qualification. Item F. states "Ensure minimum education and experience are verified or, when minimum education and experience cannot be specifically verified, provide a statement and justification for the personnel assignment."

5/11/93

Donald G. Horton Date
Director
Office of Quality Assurance

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM

OFFICE OF QUALITY ASSURANCE (OQA)

LESSONS LEARNED/PROGRAM CLARIFICATION NO. 93-002

93--002 Supersedes 92-002

SUBJECT

QA Program Element 2.0, Quality Assurance Program, specifically Management Assessments and, QA Program Element 18.0, Audits, specifically Internal Audits

CONDITION SUMMARY

Condition: Some CRWM affected organizations appear to have a misunderstanding of Lessons Learned/Program Clarification No 92-002, on the QA organizations not requiring Annual Management Assessment.

REQUIREMENT:

DOE/RW/0333P, Rev. 0, Section 2.0 Quality Assurance Program, Paragraph 2.2.6 Management Assessments, "Senior Management of an affected organization shall perform or direct the performance of management assessments by personnel outside the QA organization. A. Management assessments shall be planned and documented, and performed annually".

RESOLUTION:

Annual Management assessments for the QA organization and /or independent internal audits of the QA organization are not required for those years that the CRWM Office of Quality Assurance performs a QA Program Audit for adequacy and effectiveness.

Note: This does not relieve other internal organizations from planning and performing an Annual Management Assessment to determine how well their organizations are performing their QA functions. Personnel performing the management assessment may be either internal company personnel (Non-QA) or external personnel.

BASIS FOR RESOLUTION:

The CRWM Office of Quality Assurance audits determine the adequacy and effectiveness of QA program implementation, including QA organizational activities such as indoctrination, training, planning, procedural controls, management information tracking, implementation of non-conformance and corrective action system and performance of audits. The CRWM Office of Quality Assurance audit organization and QA program are totally independent of the organizations they are auditing and the auditors are knowledgeable of the requirements.

Donald G. Horton 5/10/93
Date

Donald G. Horton
Director
Office of Quality Assurance

ENCLOSURE

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM
OFFICE OF QUALITY ASSURANCE (OQA)
LESSONS LEARNED/PROGRAM CLARIFICATION NO. 94-002

SUBJECT:

Quality Assurance (QA) Program Element 2.0, "Quality Assurance Program," specifically: Quality Assurance Requirements and Description (QARD) 2.2.8, "Peer Reviews," existing data not collected under an approved QA program and QARD Supplement III, "Scientific Investigations," specifically: QARD III.2.4, "Data Validation and Qualification."

CONDITION SUMMARY:

A clarification and interpretation has been requested on the use of existing data not collected under an approved QA program in planning and conducting site characterization activities and related scientific investigations.

The QARD DOE/RW-0333P Glossary defines existing data as "Data developed prior to the implementation of a quality assurance program that meets Office of Civilian Radioactive Waste Management (OCRWM) requirements and data that are not information accepted by the scientific and engineering community as established fact." This definition is consistent with U.S. Nuclear Regulatory Commission (NRC) staff guidance provided in NUREG-1298, "Qualification of Existing Data for High-Level Nuclear Waste Repositories." Examples of existing data are: (1) any data collected by a Project participant prior to OCRWM acceptance of its QA program; (2) data obtained through a literature search of scientific journals; or (3) data obtained from an unpublished thesis or dissertation. Data found in technical handbooks are considered to be ":information accepted by the scientific and engineering community as established fact," and thus are recognized to be acceptable sources of data.

RESOLUTION:

Existing data may be used at any time during the planning and conduct of site characterization investigations and supporting activities. This includes Test Interference Evaluation (TIE),Waste Isolation Evaluation (WIE),and Determination of Importance Evaluation (DIE) evaluations performed during planning of surface-based and underground testing, as well as performance assessment calculations used to support test planning and prioritization. Existing data also may be used as corroborative evidence in support of the license application provided it is not directly relied upon to support conclusions regarding safety or waste isolation. However, Traceability shall be maintained and data indicated accordingly for any existing data used as described herein. In addition existing data must be qualified according to Administrative Procedure AP-5.9Q if it will be directly relied upon to address safety and waste isolation issues (QARD III.2.4.D).

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM

OFFICE OF QUALITY ASSURANCE (OQA)

LESSONS LEARNED/PROGRAM CLARIFICATION NO. 94-002

(continued)

BASES FOR RESOLUTION:

Supplement III of the QARD was intended to provide controls on site characterization and scientific investigations that would be analogous to controls placed on the design process. The controls on scientific investigations were not intended to be more restrictive than Criterion 3, which applies to design control. It is recognized in QARD III.2.4.E.2 that "In some cases (such as when insufficient data exist) it may be necessary to release unverified designs to other organizations to support schedule requirements. Unverified portions of the design shall be clearly identified...." In contrast, Section 2.4.D of Supplement III states that "Existing data relied upon to address safety and waste isolation issues shall be qualified...." Inadvertently, the QARD was silent on the use of existing data in site characterization planning activities such as WIE and TIE and DIE evaluations. This will be remedied in future revisions to the QARD.

It is the intent of the QARD that the traceability requirements applicable for design data should apply to scientific investigations data as well. The QARD defines traceability as "The ability to trace the history, application, or location of an item, data, or sample using recorded documentation." This definition of traceability implies that data must be both traceable backward (trace and history) and forward (trace the use and application). Regardless of the stage at which data are used in quality-affecting activities, all data (existing and qualified) must be traceable (Supplement III, Section 2.3). The QARD criteria states that "Data shall be identified to provide traceability, indicate useability, and document validation status." It further states that "identification and traceability shall be maintained throughout the lifetime of the data." The approach to be followed to meet this requirement is analogous to the use of "to be verified" labels for design input. Regular systematic reviews should then be conducted of the products developed using existing data to establish if earlier results should be changed in light of the most current site data and theories (e.g., conceptual repository design, waste package corrosion, and groundwater travel time). These periodic reviews should consider the cumulative effects of the changes in the input data and current conclusions should be revised and remediation undertaken as needed. Thus, these reviews would verify at different stages that the evaluations are still valid.

12/17/93

Donald G. Horton — Date

Director

Office of Quality Assurance

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM
OFFICE OF QUALITY ASSURANCE (OQA)
LESSONS LEARNED/PROGRAM CLARIFICATION NO. 95-001

SUBJECT:
Quality Assurance Program Element 17.0, Quality Assurance Records, specifically: Classification and Retention of Quality Assurance Records.

CONDITION SUMMARY:
Some CRWM affected organizations do not understand why quality assurance records need to be classified as lifetime or nonpermanent. A need for instructions in identifying quality assurance records and classifying them as lifetime or nonpermanent has been identified.

RESOLUTION:
The purpose of the classification of quality assurance records and associated retention periods is to identify the value or importance of the records from a quality assurance perspective. This perspective focuses on the ability of the record to provide evidence of, and potentially be used to maintain, the quality of items or activities affecting quality from a safety or waste isolation perspective. It is not the intent of the quality assurance classification requirements to address retention requirements that may be required by other federal, state, or agency regulations. The retention of quality assurance records beyond the minimum time frame needed to satisfy the quality assurance value will be governed by the OCRWM Records Inventory and Disposition Schedule approved by the National Archives and Records Administration.

The first step in identifying quality assurance records is determining whether or not the item or activity to which the document pertains is quality-related. Refer to QARD Section 2.2.3, Classifying Items and Applying Quality Assurance Controls, which identifies the applicability of the quality assurance program. If the item or activity is quality-related, the associated document shall be classified as a quality assurance record.

Once the document has been identified as a quality assurance record, the next step is to classify it as a lifetime or nonpermanent record. If the document satisfies one or more of the criteria of QARD Section 17.2.1A. it shall be classified as a lifetime record. If it does not meet any of these criteria but provides evidence that the quality assurance program has been properly executed, it shall be classified as a nonpermanent record. Any document that is generated by a quality-related procedure for a quality-related item or activity and is not classified as a lifetime record is deemed to provide evidence that the quality assurance program has been properly executed and shall be retained as a nonpermanent quality assurance record.

Documents generated as a result of using quality-related procedures for nonquality-related activities or items should not be considered quality assurance records.

Record identification and classification should be done during the development of the implementing document that will generate the record. QARD section 17.2.2A.1. states implementing documents shall "Identify those documents that will become quality assurance records". QARD section 5.2.2, H. states that implementing documents shall include "Identification of the lifetime or nonpermanent quality assurance records generated by the implementing document." It is important to identify, before an activity begins, what records will be generated to provide for the adequate documentation of the activity and to provide for proper record completion, protection, and preservation. QARD section 2.2.4, F. states that work planning elements shall include "Identification of, or provisions for the identification of, required records and the recording of objective evidence of the results of the work performed."

BASIS FOR RESOLUTION:

Lifetime Records:
NQA-1-1989, Supplement 17S-1, addresses the classification of records as lifetime or nonpermanent. Section 2.7.1 of this document identifies that records meeting one or more of the following criteria are lifetime records:

1. Those which would be of significant value in demonstrating capability for safe operation.
2. Those which would be of significant value in maintaining, reworking, repairing, or modifying an item.
3. Those which would be of significant value in determining the cause of an accident or malfunction of an item.
4. Those which provide required baseline data for in-service inspections.

These criteria along with other related record requirements from 10CFR50, 10CRF71, 10CFR72, and the NRC Review Plan were used to develop the OCRWM-specific criteria for the classification of lifetime records in QARD Section 17.2.1.

Nonpermanent Records
NQA-1-1989, Supplement 17S-1, Section 2.7.2 states: "Nonpermanent records are those required to show evidence that an activity was performed in accordance with the applicable requirements but need not be retained for the life of the item because they do not meet the criteria for lifetime records."

NQA-1-1989, Supplement 17S-1, Section 2.8 states: " . . . The retention period for nonpermanent records shall be established in writing."

QARD Section 17.2.7 specifies the minimum retention time and conditions for nonpermanent records. The three years minimum retention time, given that other specified conditions are satisfied, is based on a triennial audit schedule. This would allow the "evidence that an activity was performed in accordance with the applicable requirements" to be reviewed during the audit process.

R.E. Spence For 12/28/94

Donald G. Horton, Director — Date
Office of Quality Assurance

CIVILIAN RADIOACTIVE WASTE MANAGEMENT (CRWM) PROGRAM
OFFICE OF QUALITY ASSURANCE (OQA)
LESSONS LEARNED/PROGRAM CLARIFICATION NO. 95-02

SUBJECT

Quality Assurance Requirements and Description (QARD), DOE/RW/0333P, Element 10.0, Inspection, Specifically, Qualification and Certification of Inspection Personnel.

CONDITION SUMMARY

Provide clarification relative to the certification of inspection personnel based on qualification and certification performed by another affected organization.

RESOLUTION

1. An affected organization (receiving organization) may utilize certified inspection personnel based on qualification and certification performed by another affected organization provided:

   A. The inspector(s) certification is current.

   B. The basis for current certification meet or exceed those of the receiving organization.

   C. Documented evidence exists relative to the verification of education and experience.

   D. The inspector has been trained to the appropriate receiving organization implementing documents.

   E. There are no documented unresolved deficiencies related to the inspectors certification records.

   F. The receiving organization documents acceptance of current certification.

2. The current certification, accepted by the receiving organization, shall remain valid until the periodic evaluation of qualifications date. Qualifications and certifications shall then be in accordance with the receiving organizations implementing documents.

BASIS FOR RESOLUTION

The OCRWM QARD is the overall QA program for <u>all</u> organizations working on the CRWM program. The Office of Quality Assurance audits the organizations working on the CRWM program to verify these organizations meet the QARD requirements, including training and certification of inspectors.

R. E. Spence For 9/28/95

Donald G. Horton Date
Director
Office of Quality Assurance

QUALITY ASSURANCE REQUIREMENTS AND DESCRIPTION

(QARD)

The following number is for OCRWM records management purposes only and should not be used when ordering this publication.

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