Eagle Rock Enrichment Facility

Safety Analysis Report

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 GENERAL INFORMATION

This section contains a general description and purpose of the AREVA Enrichment Services (AES) Eagle Rock Enrichment Facility (EREF). The facility enriches uranium for producing nuclear fuel for use in commercial power plants. This Safety Analysis Report (SAR) follows the format recommended by NUREG-1520, Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility (NRC, 2002). The level of detail provided in this chapter is appropriate for general familiarization and understanding of the facility and processes. The information is to be used as background for the more detailed descriptions provided in other chapters of the license application or the Integrated Safety Analysis (ISA) Summary. This chapter also provides information on the corporate structure and economic qualifications of AES.

Although the EREF will have two times the nominal capacity as that described in the National Enrichment Facility SAR (LES, 2005), the EREF's core processes; type, and form of licensed material; and requested licenses and authorized uses are the same. The primary differences in the material presented in this chapter for the EREF and the material presented in Chapter 1 of the NEF SAR relate to the Facilities Description (Section 1.1.2), Institutional Information (Section 1.2), and the Site Description (Section 1.4).

With respect to facilities, the EREF has four Separations Building Modules each containing two cascade halls. Each cascade hall contains 12 cascades. The NEF has three Separations Building Modules each containing two cascade halls. Each cascade hall contains eight cascades. In addition, the EREF does not intend to install a Fomblin Oil Recovery System. The PFPE oil will, instead, be disposed of as low-level radioactive waste.

1.1 FACILITY AND PROCESS DESCRIPTION

The EREF is located in Bonneville County, Idaho approximately 113 km (70 mi) west of the Idaho/Wyoming state line. This location is approximately 32 km (20 mi) west northwest of the city of Idaho Falls.

The geographic location of the facility is shown on Figures 1.1-1, State Map, and 1.1-2, County Map.

This uranium enrichment plant is based on a highly reliable gas centrifuge process. The plant is designed to separate a feed stream containing the naturally occurring proportions of uranium isotopes into a product stream - enriched in the uranium-235 (^{235}U) isotope and a tails stream - depleted in the ^{235}U isotope. The process, entirely physical in nature, takes advantage of the tendency of materials of differing density to segregate in the force field produced by a centrifuge. The chemical form of the working material of the plant, uranium hexafluoride (UF_6), does not require chemical transformations at any stage of the process. This process enriches natural UF_6, containing approximately 0.711% ^{235}U to a UF_6 product, containing ^{235}U enriched up to 5 $^{w}/_{o}$.

The nominal capacity of the facility is 6 million separative work units (SWU) per year. The plant design capacity is 6.6 million SWU thus allowing for a production margin for centrifuge failures and occasional production losses during the operational lifetime of the facility.

Feed is received at the plant in specially designed cylinders containing up to 12.5 MT (13.8 tons) of UF_6. The cylinders are inspected and weighed in the Cylinder Receipt and Shipping Building (CRSB) and transferred to the main process facility, the Separations Building. Separation operations are divided among four Separations Building Modules, each capable of handling approximately one-quarter of plant capacity. Each Separations Building Module is divided into two Cascade Halls, and each Cascade Hall is comprised of twelve cascades. Therefore, the total plant is comprised of 96 cascades. Each Cascade Hall produces enriched UF_6 at a specified assay ($^{w}/_{o}$ ^{235}U), so up to eight different assays can be produced at one time.

The enrichment process, housed in the Separations Building, is comprised of four major elements: a UF_6 Feed System, a Cascade System, a Product Take-off System, and a Tails Take-off System. Other product related functions include the Product Liquid Sampling and Product Blending Systems. Supporting functions include sample analysis, equipment decontamination and rebuild, liquid effluent treatment, and solid waste management.

The major equipment used in the UF_6 feed process are Solid Feed Stations. Feed cylinders are loaded into Solid Feed Stations; vented for removal of light gases, primarily air and hydrogen fluoride (HF), and heated to sublime the UF_6. The light gases and UF_6 gas generated during feed purification are routed to the Feed Purification Subsystem where the UF_6 is desublimed.

The major pieces of equipment in the Feed Purification Subsystem are UF_6 Cold Traps, a Vacuum Pump/Chemical Trap Set, and a Low Temperature Take-off Station (LTTS). The Feed Purification Subsystem removes any light gases such as air and HF from the UF_6 prior to introduction into the cascades. The UF_6 is captured in UF_6 Cold Traps and ultimately recycled as feed, while HF is captured on chemical traps.

After purification, UF_6 from the Solid Feed Stations is routed to the Cascade System. Pressure in all process lines is subatmospheric.

Gaseous UF_6 from the Solid Feed Stations is routed to the centrifuge cascades. Each centrifuge has a thin-walled, vertical, cylindrically shaped rotor that spins around a central post within an outer casing. Feed, product, and tails streams enter and leave the centrifuge through the central post. Control valves, restrictor orifices, and controllers provide uniform flow of product and tails.

Depleted UF_6 exiting the cascades is transported from the high vacuum of the centrifuge for desublimation into cylinders at subatmospheric pressure. The primary equipment of the Tails Take-off System is the vacuum pumps and the Tails Low Temperature Take-off Stations (LTTS). Chilled air flows over cylinders in the Tails LTTS to effect the desublimation. Filling of the cylinders is monitored with a load cell system, and filled cylinders are transferred outdoors to the Full Tails Cylinder Storage Pad.

Enriched UF_6 from the cascades is desublimed in a Product Take-off System comprised of vacuum pumps, Product Low Temperature Take-off Stations (LTTS), UF_6 Cold Traps, and Vacuum Pump/Chemical Trap Sets. The pumps transport the UF_6 from the cascades to the Product LTTS at subatmospheric pressure. The heat of desublimation of the UF_6 is removed by cooling air routed through the LTTS. The product stream normally contains small amounts of light gases that may have passed through the centrifuges. Therefore, a UF_6 Cold Trap and Vacuum Pump/Trap Set are provided to vent these gases from the product cylinder. Any UF_6 captured in the cold trap is periodically transferred to another product cylinder for use as product or blending stock. Filling of the product cylinders is monitored with a load cell system, and filled cylinders are transferred to the Product Liquid Sampling System for sampling.

The Cylinder Preparation process includes the performance of certain tests and inspections on full or partially full cylinders and cylinders containing heels; evacuation of light gas in full, partially full, and empty cylinders; and reducing the heel quantities in cylinders using the Cylinder Evacuation System. The Cylinder Evacuation System provides conditioning through evacuation of 30B or 48Y cylinders that are new or cleaned empties, that contain a heel of UF_6, and less frequently, that are full or partially full of UF_6. A detailed description of these processes is provided in ISA Summary 3.5.18, Cylinder Preparation Processes.

Sampling is performed to verify product assay level ($^{w}/_{o}$ ^{235}U). The Product Liquid Sampling Autoclave is an electrically heated, closed pressure vessel used to liquefy the UF_6 and allow collection of a sample. The autoclave is fitted with a hydraulic tilting mechanism that elevates one end of the autoclave so that liquid UF_6 pours into a sampling manifold connected to the cylinder valve. After sampling, the autoclave is brought back to the horizontal position and the autoclave and cylinder are cooled down by a chiller unit mounted on the interior of the pressure vessel with the refrigerant compression and heat rejection components on the exterior.

AES customers may require product at enrichment levels other than that produced by a single Cascade Hall. Therefore, the plant has the capability to blend enriched UF_6 from donor cylinders of different assays into a product receiver cylinder. The Product Blending System is comprised of Blending Donor Stations for two donor cylinders and Blending Receiver Stations for the receiver cylinders. The Donor Stations are similar to the Solid Feed Stations described earlier. The Receiver Station is similar to the Low-Temperature Take-off Stations described earlier.

Support functions, including sample analysis, equipment decontamination and rebuild, liquid effluent treatment, and solid waste management are conducted in the Technical Support Building (TSB). Decontamination, primarily of pumps and valves, uses solutions of citric acid. Sampling includes a Mass Spectrometry Laboratory for verifying product UF_6 assay, and an Environmental Sampling, Storage, Preparation and Analysis Room. Liquid effluent is collected and treated using the Liquid Effluent Collection and Treatment System. There are no liquid discharges to the environment from this system.

1.1.1 Facility Location, Site Layout, and Surrounding Characteristics

Site features are well suited for the location of a uranium enrichment facility as evidenced by its favorable conditions of hydrology, geology, seismology, and meteorology as well as good transportation routes for transporting feed and product by truck.

The facility is located on approximately 1,700 ha (4,200 ac) in Bonneville County, Idaho. The Separations Building Modules, Administration Building, Security and Secure Administration Building, Cylinder Receipt and Shipping Building, Centrifuge Assembly Building, Electrical Services Building, Mechanical Services Buildings, Technical Support Building, Operation Support Building, and Cylinder Storage Pads are located approximately in the north central portion of the plot on about 172 ha (426 acres) of developed area. A plot plan of the facility depicting the property and controlled area boundary is shown in Figure 1.1-3, Site Plan with Property and Controlled Area Boundary. The facility layout is shown in Figure 1.1-4, Facility Layout.

The site partly lies along the north side of U.S. Highway 20. A dirt road provides site access from U.S. Highway 20, while other dirt roads provide access throughout the proposed site. The proposed site is comprised mostly of relatively flat and gently sloping surfaces with small ridges and areas of rock outcrop. Elevations at the site range from 1,556 m (5,106 ft) to 1,600 m (5,250 ft). The overall slope direction is to the southwest.

The nearest community is the city of Idaho Falls, approximately 32 km (20 mi) from the site. There are no residences, schools, stores or other population centers within a 1.6 km (1 mi) radius of the site.

Additional details of proximity to nearby populations are provided in the Environmental Report (ER).

1.1.2 Facilities Description

The major structures and areas of the facility are outlined below.

Separations Building Modules

The overall layout of a Separations Building Module with the UF_6 Handling Area is presented in Figures 1.1-5 through 1.1-7A. The facility includes four identical Separations Building Modules. Each module consists of two Cascade Halls, each having twelve cascades with each cascade having hundreds of centrifuges. Each Cascade Hall is capable of producing approximately 825,000 SWU per year. The major functional areas of the Separations Building Modules are:

- Cascade Halls (2)
- Process Service Corridor
- UF_6 Handling Area

Source material and special nuclear material (SNM) are used or produced in this area.

Technical Support Building (TSB)

The overall layout of the Technical Support Building (TSB) is presented in Figures 1.1-8, Technical Support/Operation Support Building First Floor, 1.1-9, Technical Support/Operation Support Building Second Floor, and 1.1-10, Technical Support/Operation Support Building Third Floor. The TSB contains radiological support areas for the facility. It also acts as a secure point of entry to the SBMs and the BSPB. The major functional areas of the TSB are:

- Solid Waste Collection Room

- Valve and Pump Dismantling Workshop
- Decontamination Workshop
- Liquid Effluent Collection and Treatment Room
- Laundry Sorting Room
- TSB Gaseous Effluent Ventilation System (GEVS)
- Laboratory Areas - Mass Spectrometry Laboratory, Analytical Laboratory, Preparation Room, Sample Bottle Storage Room, Uranium Analysis, Physical Analysis, Alpha/Beta/Gamma Counting, IR/CPG (Infrared/Counter Propagation) Room, ICPAES/ICPMS (Inductively Coupled Plasma Atomic Emission Spectroscopy/Inductively Coupled Plasma Mass Spectrometry) Room.
- Radiation Monitoring Room
- Truck Bay/Shipping and Receiving Area – for shipping packaged low-level radioactive wastes and hazardous wastes for transportation offsite and for miscellaneous shipping and receiving.
- Ancillary Areas - The following ancillary areas are located in the TSB: electrical room, HVAC rooms, archive room, offices, stairs, corridors, and elevators.
- Chemical Trap Workshop
- Mobile Unit Disassembly and Reassembly Workshop
- Maintenance Facility for contaminated facility equipment

Source material and SNM are found in this area.

<u>Operation Support Building (OSB)</u>

The OSB is adjacent to the Technical Support Building (TSB) and the Blending, Sampling and Preparation Building (BSPB). The OSB is shown on Figures 1.1-8 through 1.1-10 along with the TSB. The OSB contains non-radiological support areas for the facility. The OSB contains the following functional areas:

- Vacuum Pump Rebuild Workshop
- Mechanical, Electrical and Instrumentation (ME&I) Workshop
- Medical Room
- Locker Rooms
- Cafeteria
- Lobby
- Ancillary Areas - storage areas, heating, ventilation, and air conditioning (HVAC) and electrical rooms, archive areas, conference rooms, offices, stairs, and corridors.
- Control Room
- Training Room and Operation Support
- Security Alarm System Room

- Environmental Laboratory Area - provides rooms and space for various laboratory areas that receive, prepare, and store various samples

Centrifuge Assembly Building (CAB)

This building is used to assemble centrifuges before they are moved into the Separations Building and installed in the cascades. The overall layout of the Centrifuge Assembly Building (CAB) is presented in Figures 1.1-11 and 1.1-12. The major functional areas of the CAB are:

- Centrifuge Component Storage Areas
- Centrifuge Assembly Areas
- Assembled Centrifuge Storage Areas
- Building Office Area
- Centrifuge Test and Post Mortem Facilities.

Source material and SNM are used and produced in this area.

Administration Building

The Administration Building is on the south end of the site near the Security and Secure Administration Building and is shown in Figure 1.1-4. It contains general office areas. Vehicular traffic passes through a security checkpoint before being allowed to park. Parking is located outside of the Controlled Access Area (CAA) security fence. Personnel enter the Administration Building and general office areas via the main lobby.

Security and Secure Administration Building

The Security and Secure Administration Building is on the south end of the site near the Administration Building. It contains secure office areas and the Entry Exit Control Point (EECP) for the facility. All personnel access to inside areas of the plant occurs at this location.

Personnel requiring access to facility areas or the CAA must pass through the EECP. The EECP is designed to facilitate and control the passage of authorized facility personnel and visitors.

Guard House

The main Guard House is located at the entrance to the plant. It functions as a security checkpoint for all incoming and outgoing traffic. Employees, visitors and trucks that have access approval will be screened at the main Guard House.

Cylinder Receipt and Shipping Building

The overall layout of the Cylinder Receipt and Shipping Building (CRSB) is presented in Figure 1.1-13. The CRSB is located near the Cylinder Storage Pads. This building contains equipment to receive, inspect, weigh and temporarily store cylinders of feed UF_6 sent to the plant; temporarily store, inspect, weigh, and ship cylinders of enriched UF_6 to facility customers; receive, inspect, weigh, and temporarily store empty product and depleted uranium tails cylinders prior to being filled in the Separations Building; and inspect, weigh, and transfer filled depleted uranium tails cylinders to the Full Tails Cylinder Storage Pad. The functions of the Cylinder Receipt and Shipping Building are:

- Loading and unloading of cylinders
- Preparation of cylinder overpack protective packaging, as required

Source material and SNM are used in this area.

Blending, Sampling and Preparation Building (BSPB)

The Blending, Sampling, and Preparation Building is adjacent to the UF_6 Handling Areas, Technical Support Building, and the Operation Support Building. The BSPB is shown in Figure 1.1-14.

The primary function of the BSPB is to provide means to fill ANSI N14.1 (ANSI, applicable version) 30B cylinders with UF_6 at a required ^{235}U enrichment level and to liquefy, homogenize and sample 30B cylinders prior to shipment to the customer. Sampling of 48Y cylinders for internal use are also sampled in the BSPB. The area contains the major components associated with the Product Liquid Sampling System and the Product Blending System. Cylinder activities including testing, weighing, conditioning, defrosting and inspection are performed in the BSPB. In addition, Cylinder Preparation and Cylinder Evacuation System processes are performed in the BSPB.

The Ventilated Room is also located within the BSPB. This room provides space for the maintenance of cylinders. The activities carried out within the Ventilated Room include contaminated cylinder pressure testing, cylinder pump out and valve maintenance. The Ventilated Room is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Source material and SNM are used in this area.

Cylinder Storage Pads

The EREF uses several outside areas for storage of full cylinders containing UF_6 and for storage of empty cylinders. Cylinders containing UF_6 that is depleted in ^{235}U are temporarily stored on the Full Tails Cylinder Storage Pads which have the capacity to hold the 25,718 full tail cylinders that are estimated to be generated during the facility's operating life. Full feed cylinders containing natural UF_6 will be temporarily stored on the Full Feed Cylinder Storage Pads prior to use in the facility. The pads are sized to store approximately 712 full feed cylinders. Full feed cylinders will not be stacked. Empty cylinders (feed, product, and tails) will be temporarily stored on the Empty Cylinder Storage Pads. The pads are sized to store approximately 1,840 empty cylinders. Empty cylinders can be stacked two high. The Full Tails, Full Feed, and Empty Cylinder Pads are at the north end of the facility and are adjacent pads. Full product cylinders containing enriched UF_6 will be temporarily stored on the Full Product Cylinder Storage Pad prior to shipment offsite to a fuel fabrication facility. The pad is sized to store approximately 1,032 full product cylinders. Full product cylinders will not be stacked. The Full Product Cylinder Storage Pad is located near the Blending, Sampling, and Preparation Building adjacent to the Cylinder Receipt and Shipping Building.

Source material and SNM are used in this area.

Electrical Services Building (ESB)

The ESB is located immediately north of the SBMs. It houses four standby diesel generators (DGs), which provide the site with standby power. The ESB is shown on Figure 1.1-16.

The building also contains day tanks, switchgear, control panels, and building heating, ventilation, and air conditioning (HVAC) equipment. The rooms housing the standby DGs are constructed independent of each other with adequate provisions made for maintenance, as well as equipment removal and equipment replacement via roll-up and access doors.

Gasoline and Diesel Fueling Station (GDFS)

A Gasoline and Diesel Fueling Station is located to the northeast of the CAB. The GDFS supports vehicle fueling from an adjacent fuel pump island and on-site vehicle repair and maintenance conducted inside the building.

Mechanical Services Buildings (MSBs)

The two MSBs are located south of the SBMs. They house air compressors, the demineralized water system, the centrifuge cooling water system pumps, heat exchangers, and expansion tanks. The MSB is presented in Figure 1.1-15.

Electrical Services Building for the CAB

An Electrical Services Building that supports the CAB (ESB-CAB) is located to the east of the CAB. The ESB-CAB houses four transformers and switchgear, which provide the CAB and the adjacent long term warehouse with power. The ESB-CAB also contains control and lighting panels. The ESB-CAB is presented in Figure 1.1-17.

Visitor Center

A Visitor Center is located outside the security fence area near Highway 20.

1.1.3 Process Descriptions

This section provides a description of the various processes analyzed as part of the Integrated Safety Analysis. A brief overview of the entire enrichment process is provided followed by an overview of each major process system.

1.1.3.1 Process Overview

The enrichment process at the EREF is basically the same process described in the SAR for the National Enrichment Facility (LES, 2005). The Nuclear Regulatory Commission (NRC) staff documented its review of the National Enrichment Center license application and concluded that LES's application provided an adequate basis for safety and safeguards of facility operations and that operation of the National Enrichment Facility would not pose an undue risk to worker and public health and safety (NRC, 2005). The design of the EREF incorporates the latest safety improvements and design enhancements from the enrichment facilities currently operating and under construction in Europe.

The primary function of the facility is to enrich natural uranium hexafluoride (UF_6) by separating a feed stream containing the naturally occurring proportions of uranium isotopes into a product stream enriched in ^{235}U and a tails stream depleted in the ^{235}U isotope. The feed material for the enrichment process is uranium hexafluoride (UF_6) with a natural composition of isotopes ^{234}U, ^{235}U, and ^{238}U. The enrichment process is a mechanical separation of isotopes using a fast rotating cylinder (centrifuge) based on a difference in centrifugal forces due to differences in molecular weight of the uranic isotopes. No chemical changes or nuclear reactions take place. The feed, product, and tails streams are all in the form of UF_6.

1.1.3.2 Process System Descriptions

An overview of the enrichment process systems and the enrichment support systems is discussed below.

Numerous substances associated with the enrichment process could pose hazards if they were released into the environment. Chapter 6, Chemical Process Safety, contains a discussion of the criteria and identification of the chemicals of concern at the EREF and concludes that uranium hexafluoride (UF_6) is the only chemical of concern that will be used at the facility. Chapter 6, Chemical Process Safety, also identifies the locations where UF_6 is stored or used in the facility and includes a detailed discussion and description of the hazardous characteristics of UF_6 as well as a detailed listing of other chemicals that are in use at the facility.

The enrichment process is comprised of the following major systems:

UF_6 Feed System

The first step in the process is the receipt of the feed cylinders and preparation to feed the UF_6 through the enrichment process.

Natural UF_6 feed is received at the EREF in 48Y cylinders from a conversion plant. 48X cylinders are not used at EREF. Pressure in the feed cylinders is below atmospheric (vacuum) and the UF_6 is in solid form.

The function of the UF_6 Feed System is to provide a continuous supply of gaseous UF_6 from the feed cylinders to the cascades. There are six Solid Feed Stations per Cascade Hall; three stations in operation and three on standby.

Cascade System

The function of the Cascade System is to receive gaseous UF_6 from the UF_6 Feed System and enrich the ^{235}U isotope in the UF_6 to a maximum of 5 $^{w}/_{o}$.

Multiple gas centrifuges make up arrays called cascades. The cascades separate gaseous UF_6 feed with a natural uranium isotopic concentration into two process flow streams - product and tails. The product stream is ^{235}U enriched up to 5 $^{w}/_{o}$. The tails stream is UF_6 that has been depleted of ^{235}U isotope to 0.15 - 0.30 $^{w}/_{o}$ ^{235}U.

Product Take-off System

The function of the Product Take-off System is to provide continuous withdrawal of the enriched gaseous UF_6 product from the cascades and to purge and dispose of light gas impurities from the enrichment process.

The product streams leaving the twelve cascades are brought together into one common manifold from the Cascade Hall. The product stream is transported via a train of vacuum pumps to Product LTTS in the UF_6 Handling Area. There are six Product LTTS per Cascade Hall; normally three stations in operation and three stations on standby.

The Product Take-off System also contains a system to purge light gases (typically air and hydrogen fluoride) from the enrichment process. This system consists of UF_6 Cold Traps which capture UF_6 while leaving the light gas in a gaseous state. The cold trap is followed by product vent Vacuum Pump/Trap Sets, each consisting of a carbon trap, an alumina trap, and a vacuum pump. The carbon trap removes small traces of UF_6 and the alumina trap removes any hydrogen fluoride (HF) from the product gas„

Tails Take-off System

The primary function of the Tails Take-off System is to provide continuous withdrawal of the gaseous UF_6 tails from the cascades. A secondary function of this system is to provide a means for removal of UF_6 from the centrifuge cascades under abnormal conditions.

The tails stream exits each Cascade Hall via a primary header, goes through a pumping train, and then to Tails LTTS in the UF_6 Handling Area. There are 11 Tails LTTS per Cascade Hall. Under normal operation, nine of the stations are in operation receiving tails and two are on standby.

In addition to the four primary systems listed above, there are two major support systems:

Product Blending System

The primary function of the Product Blending System is to provide a means to fill 30B cylinders with UF_6 at a specific enrichment of ^{235}U to meet customer requirements. This is accomplished by blending (mixing) UF_6 at two different enrichment levels to one specific enrichment level. The system can also be used to transfer product from a 30B or 48Y cylinder to another 30B cylinder without blending.

This system consists of Blending Donor Stations (which are similar to the Solid Feed Stations) and Blending Receiver Stations (which are similar to the Product LTTS) described under the primary systems.

Product Liquid Sampling System

The function of the Product Liquid Sampling System is to obtain an assay sample from filled product 30B cylinders. The sample is used to validate the exact enrichment level of UF_6 in the filled product cylinders before the cylinders are sent to the fuel processor. Sampling of 48Y cylinders filled for internal use are also conducted through this system.

Cylinder Preparation and Cylinder Evacuation System

The Cylinder Preparation process includes the performance of certain tests and inspections on full or partially full cylinders and cylinders containing heels; evacuating light gas in full, partially full, and empty cylinders; and reducing the heel quantities in cylinders using the cylinder Evacuation System. The Cylinder Evacuation System provides conditioning through evacuation of 30B or 48Y cylinders that are new or cleaned empties, that contain a heel of UF_6, and less frequently, that are full or partially full of UF_6. A detailed description of these processes is provided in ISA Summary 3.5.1.8, Cylinder Preparation Processes.

1.1.3.3 Materials, By-Products, Wastes, and Finished Products

The facility handles Special Nuclear Material of ^{235}U contained in uranium enriched above natural but less than or equal to 5.0 $^{w}/_{o}$ in the ^{235}U isotope. The ^{235}U is in the form of uranium hexafluoride (UF_6). At full capacity, the EREF processes approximately 1,424 feed cylinders (Model 48Y), 1,032 product cylinders (Model 30B), and 1,222 full tails cylinders (Model 48Y) per year.

AES does not propose possession of any reflectors or moderators with special characteristics.

Solid Waste Management

Solid waste generated at the EREF will be grouped into industrial (non-hazardous), radioactive, hazardous, and mixed waste categories. In addition, solid radioactive and mixed waste is further segregated according to the quantity of liquid that is not readily separable from the solid material. The solid waste management systems are comprised of a set of facilities, administrative procedures, and practices that provide for the collection, temporary storage, processing, and transportation for disposal of categorized solid waste in accordance with regulatory requirements. All solid radioactive wastes generated are Class A low-level wastes (LLW) as defined in 10 CFR 61 (CFR, 2008a).

Radioactive waste will be collected in labeled containers in each Restricted Area and transferred to the Solid Waste Collection Room for inspection. As appropriate, waste will be volume-reduced and all radioactive waste disposed of at a licensed low-level waste (LLW) disposal facility.

Hazardous wastes and some mixed wastes will be generated at the facility. These wastes will be collected at the point of generation, transferred to the Solid Waste Collection Room, inspected, and classified. Any mixed waste that may be processed to meet land disposal requirements may be treated in its original collection container and shipped as LLW for disposal.

Industrial waste, including miscellaneous trash, filters, resins, and paper will be shipped offsite for compaction and then sent to a licensed waste landfill.

Effluent Systems

The following EREF systems are used to handle gaseous and liquid wastes and effluent.

- Gaseous Effluent Ventilation System (GEVS)
    - SBM GEVS with Passive IROFS that Contain Safe-by-Design Component Attributes
    - SBM Local Extraction GEVS
    - TSB GEVS
- Ventilated Room HVAC
- TSB HVAC for potentially contaminated areas (Decontamination Workshop, Chemical Trap Workshop, Mobile Unit Disassembly and Reassembly Workshop, Valve and Pump Dismantling Workshop, and Maintenance Facility)
- Liquid Effluent Collection and Treatment System
- Centrifuge Test and Post Mortem Facilities Exhaust Filtration System
- Sanitary Sewage Treatment System
- Solid Waste Collection System
- Decontamination System

Effluent Quantities

Quantities of radioactive and non-radioactive wastes and effluent are estimated and shown in the tables referenced in this section. The tables include quantities and average uranium concentrations. Portions of the waste considered hazardous or mixed are identified.

The following tables address plant effluents:

Table 1.1-1, Estimated Annual Gaseous Effluent

Table 1.1-2, Estimated Annual Radiological and Mixed Wastes

Table 1.1-3, Estimated Annual Liquid Effluent

Table 1.1-4, Estimated Annual Non-Radiological Wastes

Radioactive concentration limits and handling for liquid wastes and effluents are detailed in the Environmental Report.

The waste and effluent estimates described in the tables listed above were developed specifically for the EREF. Each system was analyzed to determine the wastes and effluents generated during operation. These values were analyzed and a waste disposal path was developed for each. AES considered the facility site, facility operation, applicable European experience, applicable regulations, and the existing U.S. waste processing/disposal infrastructure during the development of the paths. The Liquid Effluent Collection and Treatment System and the Solid Waste Collection System were designed to meet these criteria.

Construction Wastes

During construction, efforts are made to minimize the environmental impact. Erosion, sedimentation, dust, smoke, noise, unsightly landscape, and waste disposal are controlled to practical levels and applicable regulatory limits. Wastes generated during site preparation and construction will be varied, depending on the activities in progress. The bulk of the wastes will consist of non-hazardous materials such as packing materials, paper and scrap lumber. These wastes will be transported off site to an approved landfill. It is estimated that the EREF will generate a non-compacted average waste volume of 3,058 m^3 (4,000 yd^3) annually.

Hazardous type wastes that may be generated during construction have been identified and annual quantities estimated are shown in Table 1.1-5, Annual Hazardous Construction Wastes. Any of these wastes that are generated will be handled by approved methods and shipped off site to approved disposal sites.

Management and disposal of all wastes from the EREF site will be performed by personnel trained to properly identify, store, and ship wastes, audit vendors, direct and conduct spill cleanup, provide interface with state agencies, maintain inventories, and provide annual reports.

A Spill Prevention, Control and Countermeasure Plan (SPCC) will be implemented during construction to minimize the possibility of spills of hazardous substances, minimize environmental impacts of any spills, and ensure prompt and appropriate remediation. The SPCC plan will identify sources, locations, and quantities of potential spills and response measures. The plan will identify individuals and their responsibilities for implementation of the plan and provide for prompt notifications of state and local authorities.

1.2 INSTITUTIONAL INFORMATION

This section provides the applicant's corporate identity and location, applicant's ownership organization and financial information. Also, the type, quantity, and form of licensed material to be used at the facility, and the type(s) of license(s) being applied for are discussed.

1.2.1 Corporate Identity

1.2.1.1 Applicant

The Applicant's name, address, and principal office are as follows:

AREVA Enrichment Services, LLC
4800 Hampden Lane
Bethesda, Maryland 20814

1.2.1.2 Organization and Management of Applicant

AREVA Enrichment Services (AES), LLC is a Delaware limited liability company. It has been formed solely to provide uranium enrichment services for commercial nuclear power plants. AES is a wholly owned subsidiary of AREVA NC Inc. AREVA NC Inc. is a wholly owned subsidiary of AREVA NC SA which is part of AREVA SA.

The AREVA SA is a corporation formed under the laws of France ("AREVA"), is governed by the Executive Board, and its principal owners are as follows.

Commissariat à l'Energie Atomique (French Atomic Energy Commission)	73.24%
French State	10.20%
Caisse des dépôts and consignations	3.33%
ERAP	3.74%
Electricité d'France	2.24%
Investment Certificate Holders	2.05%
Framepargne	0.37%
Kuwait Investment Authority	4.83%
TOTAL	100%

AES is a Delaware LLC and is governed by the AES Management Committee. The names and addresses of the AES Management Committee are as follows.

- Mr. Jacques Besnainou
  President and Chief Executive Officer of AREVA NC Inc
  Chief Executive Officer of AREVA Inc
  4800 Hampden Lane, Bethesda MD 20814, USA

  Mr. Besnainou is a citizen of France and a citizen of the United States of America.

- Mr. Michael McMurphy
  Senior Executive Vice President
  Mine, Chemistry and Enrichment Business Group
  33 rue Lafayette, 75009 Paris, France

  Mr. McMurphy is a citizen of the United States of America

- Mr. Joel Pijselman
  Chief Industrial Officer, AREVA
  33 rue Lafayette, 75009 Paris, France

  Mr. Pijselman is a citizen of France

- Mr. Francoix-Xavier Rouxel
  Executive Vice President, Enrichment Business Unit
  33 rue Lafayette, 75009 Paris, France

  Mr. Rouxel is a citizen of France

- Mr. Gary Fox
  Executive Vice President, AREVA NC Inc
  4800 Hampden Lane, Bethesda, MD 20814

  Mr. Fox is a citizen of the United States of America and a citizen of Canada

- Mr. Jean Bernard Ville
  Tour AREVA-1
  place Jean Miller, 92084 Paris La Defense, France

  Mr. Ville is a citizen of France

- Ms. Anne Frisch
  Chief Financial Officer, Enrichment Business Unit
  33 rue Lafayette, 75009 Paris, France

  Ms. Frisch is a citizen of France

- Mr. Michael Rencheck
  President and Chief Executive Officer of AREVA NP Inc
  Chief Operating Officer of AREVA Inc
  4800 Hampden Lane, Bethesda, MD 20814

  Mr. Rencheck is a citizen of the United States of America

The President and Chief Executive Officer (CEO) of AES is Mr. Sam Shakir, a citizen of Canada and a naturalized citizen of the United States of America. Any safety decision related to the operation of the facility will be made by the President of AES.

AES's principal location for business is Bethesda, MD. The facility will be located in Bonneville County near Idaho Falls, Idaho. No other companies will be present or operating on the EREF site other than services specifically contracted by AES.

AES is responsible for the design, quality assurance, construction, operation, and decommissioning of the enrichment facility. The President and CEO of AES report to the AES Management Committee.

Foreign Ownership, Control, and Influence (FOCI) of AES is addressed in the AES Standard Practice Procedures Plan, Appendix 1 - FOCI Package. The NRC, in its letter to Louisiana Energy Services, dated March 24, 2003, has stated "...that while the mere presence of foreign ownership would not preclude grant of the application, any foreign relationship must be examined to determine whether it is inimical to the common defense and security [of the United States]" (NRC, 2003b). The FOCI Package mentioned above provides sufficient information for this examination to be conducted.

1.2.1.3 Address of the Enrichment Plant and Legal Site Description

The EREF is located in Bonneville County, Idaho along State Highway 20 approximately 32 km (20 mi) east southeast from the city of Idaho Falls. The legal description is as follows:

"All of Sections 13, 14 and 15; the Northeast quarter (NE1/4) of Section 21; the North half (N1/2), and Southeast Quarter of the Southeast Quarter (SE1/4 SE1/4) of Section 22; the North Half (N1/2), the Southeast Quarter (SE1/4), the East Half of the Southwest Quarter (E1/2 SW1/4), and the Southwest Quarter of the Southwest Quarter (SW1/4 SW1/4) of Section 23; the West Half (W1/2), and the West Half of the Southeast quarter (W1/2 SE1/4), and the Northeast quarter of the Southeast quarter (NE1/4 SE1/4) and the Northwest quarter of the Northeast quarter (NW1/4 NE1/4) of Section 24; the West 1/2 (W1/2) of Section 25, Less the Highway and that portion of the SW1/4 deeded to the State of Idaho in a Warranty Deed recorded July 25, 1950, in Book 72 of Deeds, at page 565 and the Northeast quarter (NE1/4); the East Half of the Northwest Quarter (E1/2 NW1/4), the Northeast Quarter of the Southwest Quarter (NE1/4 SW1/4), the Northwest Quarter of the Southeast Quarter (NW1/4 SE1/4) and that portion of the South Half of the Southeast Quarter (S1/2 SE1/4) lying north of the centerline of State Highway 20 as surveyed and shown on the official plat of the Twin Buttes F-1422(2) Highway Survey on file in the office of the Department of Highway of the State of Idaho, all in Section 26;

All in Township 3 North, Range 34 East of the Boise Meridian, Bonneville County, Idaho, contains four thousand two hundred and ten (4,210) acres, more or less."

1.2.2 Financial Information

AES estimates the total cost of the EREF to be approximately $4.1 billion (in 2007 dollars), excluding escalation, contingency, interest, tails disposition, decommissioning, and any replacement equipment required during the life of the facility.

Pursuant to 10 CFR 70.23(a)(5), AES is required to demonstrate that it is financially qualified to carry out the activities proposed in its application. AES proposes to satisfy this obligation in a manner consistent with the approach previously accepted by the NRC staff in Section 1.2.3.3.2 of NUREG-1851, Safety Evaluation Report for the American Centrifuge Plant in Piketon, Ohio (NRC, 2006). That approach is as follows:

- Construction of each incremental phase of the EREF shall not commence before funding for that increment is available or committed. Of this funding, AES must have in place before constructing such increments, commitments for one or more of the following: equity contributions from AES or its parents, a commitment from the parent company to provide the necessary funds for the project, and lending and/or lease arrangements that solely or cumulatively are sufficient to ensure funding for the particular increment's construction costs. AES shall make available for NRC inspection, documentation of both the budgeted costs for each incremental phase and the source of funds available or committed to pay those costs.
- Operation of the EREF shall not commence until AES has in place either: (1) long term contracts lasting five years or more that provide sufficient funding for the estimated cost of operating the facility for the five year period; (2) documentation of the availability of one or more alternative sources of funds that provide sufficient funding for the estimated cost of operating the facility for five years; or (3) some combination of (1) and (2).

AES shall in accordance with 10 CFR 140.13b, (CFR, 2008b), prior to and throughout operation, have and maintain nuclear liability insurance in the amount of up to $300 million to cover liability claims arising out of any occurrence within the United States, causing, within or outside the United States, bodily injury, sickness, disease, or death, or loss of or damage to property, or loss of use of property, arising out of or resulting from the radioactive, toxic, explosive, or other hazardous properties of chemical compounds containing source or special nuclear material.

The amounts of nuclear energy liability insurance required may be furnished and maintained in the form of:

An effective facility form (non-indemnified facility) policy of nuclear energy liability insurance from American Nuclear Insurers and/or Mutual Atomic Energy Liability underwriters; or

Such other type of nuclear energy liability insurance as the Commission may approve; or

A combination of the foregoing.

If the form of liability insurance will be other than an effective facility form (non-indemnified facility) policy of nuclear energy liability insurance from American Nuclear Insurers and/or Mutual Atomic Energy Liability Underwriters, such form will be provided to the Nuclear Regulatory Commission by AES. The effective date of this insurance will be no later than the date that AES takes possession of licensed nuclear material.

By letter dated December 22, 2008, American Nuclear Insurers documented its expectation to provide nuclear liability insurance for the EREF at the maximum policy limit of $300M by the time AES takes possession of source or special nuclear material. AES will provide proof of liability insurance of a type and in the amounts to cover liability claims required by 10 CFR 140.13b prior to taking possession of source or special nuclear material.

Information indicating how reasonable assurance will be provided that funds will be available to decommission the facility as required by 10 CFR 70.22(a)(9) (CFR, 2008c), 10 CFR 70.25 (CFR, 2008d), and 10 CFR 40.36 (CFR, 2008e) is described in detail in Chapter 10, Decommissioning.

1.2.3 Type, Quantity and Form of Licensed Material

AES proposes to acquire, deliver, receive, possess, produce, use, transfer, and/or store special nuclear material (SNM) meeting the criteria of special nuclear material of low strategic significance as described in 10 CFR 70.4 (CFR, 2008f). Details of the SNM are provided in Table 1.2-1, Type, Quantity, and Form of Licensed Material. Other source materials and by-product materials will also be used for instrument calibration purposes. These materials will be identified during the design phase, and AES will submit a request to amend the Materials License to incorporate the proposed quantities and types for the sealed and unsealed instrument calibration sources to its possession limits. Subsequently, the SAR will be revised to incorporate the additional sources.

1.2.4 Requested Licenses and Authorized Uses

AES is engaged in providing uranium enrichment services to electric utilities for the purpose of manufacturing fuel to be used to produce electricity in commercial nuclear power plants.

This application is for the necessary licenses issued under 10 CFR 70 (CFR, 2008g), 10 CFR 30 (CFR, 2008h) and 10 CFR 40 (CFR, 2008i) to construct, own, use and operate the facilities described herein as an integral part of the uranium enrichment facility. This includes licenses for source, special nuclear material, and byproduct material. The period of time for which the license is requested is 30 years.

Section 1.1, Facility and Process Description, provides a summary description of the enrichment activities that will occur at the EREF.

1.2.5 Special Exemptions of Special Authorizations

In accordance with 10 CFR 40.14 (CFR, 2008j), "Specific exemptions," and 10 CFR 70.17 (CFR, 2008k), "Specific exemptions," AES requests exemptions from certain provisions of 10 CFR 40.36 (CFR, 2008e), "Financial assurance and recordkeeping for decommissioning," paragraph (d), and 10 CFR 70.25 (CFR, 2008d), "Financial assurance and recordkeeping for decommissioning," paragraph (e). Specifically, 10 CFR 40.36(d) (CFR, 2008e) and 10 CFR 70.25(e) (CFR, 2008d) both state in part that "...the decommissioning funding plan must also contain a certification by the licensee that financial assurance for decommissioning has been provided in the amount of the cost estimate for decommissioning...." As stated in Section 10.2.1, "Decommissioning Funding Mechanism," of the SAR since AES intends to sequentially install and operate modules of the enrichment equipment over time, providing financial assurance for decommissioning during the operating life of the EREF at a rate that is in proportion to the decommissioning liability for these facilities as they are phased in satisfies the requirements of this regulation without imposing the financial burden of maintaining the entire financial coverage for facilities and material that are not yet in existence. The same basis applies to decommissioning funding assurance for depleted uranium tails. As also stated in Section 10.2.1 of the SAR, AES proposes to provide financial assurance for the disposition of depleted uranium tails at a rate in proportion to the amount of accumulated depleted uranium tails onsite up to the maximum amount of the depleted uranium tails produced by the EREF.

The justification for this proposal to provide decommissioning funding assurance on a forward looking incremental basis is AES's commitment to update the decommissioning cost estimates and to provide to the NRC a revised funding instrument for facility decommissioning at a minimum prior to the operation of each facility module. With respect to the depleted uranium tails, AES commits to updating the decommissioning cost estimates on an annual forward looking incremental basis and to providing the NRC revised funding instruments that reflect these projections of depleted uranium tails production. The long-term nature of enrichment contracts allows AES to accurately predict the production of depleted uranium tails. If any adjustments to the funding assurance were determined to be needed during the annual period due to production variations, they would be made promptly and a revised funding instrument would be provided to the NRC.

AES requests that exemptions from the provisions of 10 CFR 40.36(d) (CFR, 2008e) and 10 CFR 70.25(e) (CFR, 2008d) described above be granted. In support of this request, AES provides the following information relative to the criteria in 10 CFR 40.14 (CFR, 2008j) and 10 CFR 70.17 (CFR, 2008k).

<u>Granting the exemption is authorized by law</u>

There is no statutory prohibition to providing decommissioning funding assurance on an incremental basis. In fact, the NRC has previously accepted an incremental approach to decommissioning funding assurance for the United States Enrichment Corporation's (USEC’s) operation of its gaseous diffusion plants (NRC, 2006) and for Louisiana Enrichment Services’ (LES’) operation of the National Enrichment Facility (NEF) (NRC, 2005).

Granting the exemptions will not endanger life or property or the common defense and security

Allowing the decommissioning funding assurance for the EREF to be provided on a forward looking incremental basis continues to ensure that adequate funds are available at any point in time after licensed material is introduced onto the EREF site to decommission the facility and disposition any depleted uranium tails possessed by AES. Accordingly, life, property, or the common defense and security will not be endangered by the EREF once it is permanently shutdown.

Granting the exemptions is otherwise in the public interest

Providing an alternative, diverse, and secure domestic source of enrichment services in support of the nuclear power industry that supplies 20% of the nation's electricity is clearly in the public benefit. Providing decommissioning funding assurance on an incremental basis will ensure that adequate financial assurance is available when required. Imposing the requirement to provide decommissioning funding assurance for the entire facility and all depleted uranium tails that would be produced over the EREF licensed operating period results in a significant unnecessary financial hardship. Accordingly, the granting of these exemptions is in the public interest.

Since the granting of this exemption does not satisfy any of the criteria for categorical exclusion delineated in 10 CFR 51.22 (CFR, 2008m), "Criteria for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," nor the criteria requiring an environmental impact statement in 10 CFR 51.20 (CFR, 2008n), "Criteria for and identification of licensing and regulatory actions requiring environmental impact statements," an environmental assessment is required in accordance with 10 CFR 51.21 (CFR, 2008l), "Criteria for and identification of licensing and regulatory actions requiring environmental assessments." Accordingly, AES proposes that the NRC make a finding of no significant impact based on the following information addressing the provisions of 10 CFR 50.30 (CFR, 2008o), "Environmental assessment."

Need for the proposed action

Granting of the requested exemption will allow AES to satisfy the applicable decommissioning funding assurance requirements for the EREF without imposing an unnecessary financial burden on AES.

Alternatives as required by Section 102(2)(E) of the National Environmental Policy Act (NEPA)

The only alternative to granting the requested exemption is to not grant it. The significant financial burden that would be imposed on AES by not granting the requested exemption is unnecessary.

The environmental impacts of the proposed action and alternatives as appropriate

Granting the requested exemption will not result in environmental impacts in addition to those delineated in the ER for the EREF since adequate funds will continue to be available to decommission the EREF and disposition any depleted uranium tails possessed by AES at any point in time after licensed material is introduced onto the EREF site. The environmental impact of not granting the requested exemption could potentially be the loss of an alternate, diverse, and secure domestic source of enrichment services for the nuclear power industry that supplies 20% of the nation's electricity.

A list of agencies and persons consulted and identification of sources used

The NRC Project Manager for the EREF was contacted. The EREF license application was used as a source.

Based on the above information, AES proposes that, if this exemption request is granted, the NRC reach a finding of no significant impact in accordance with 10 CFR 51.32 (CFR, 2008p), "Finding of no significant impact."

1.2.6 Security of Classified Information

Access to restricted data or national security information will be controlled in accordance with 10 CFR 10 (CFR, 2008q), 25 (CFR, 2008r), and 95 (CFR, 2008s). This license application does contain classified information that is submitted under separate correspondence.

1.3 SITE DESCRIPTION

The proposed site is situated within Bonneville County, Idaho, on the north side of U.S. Highway 20, about 113 km (70 mi) west of the Idaho/Wyoming state line. Portions of Bonneville, Jefferson, and Bingham counties are within 8 km (5 mi) of the proposed site. The approximately 1,700 ha (4,200 ac) property is currently under private ownership by a single landowner. There is a 16-ha (40-ac) parcel within the proposed site, which is administered by the Bureau of Land Management (BLM). The privately held land will be purchased by AES prior to the beginning of construction of the EREF.

There are no right-of-ways on the property with the exception of the right-of-way for U.S. Highway 20, which forms part of the southern boundary of the proposed site. Otherwise, the site is in native rangeland, non-irrigated seeded pasture, and irrigated cropland.

Grazing and cropping are the main land uses within 8 km (5 mi) of the proposed site. State land immediately west of the proposed site and BLM land immediately east of the site are grazed. The Department of Energy's Idaho National Laboratory (INL) eastern boundary is 1.6 km (1 mi) west of the proposed site. The INL property near the site is undeveloped rangeland (Anderson, 1996). The lands north, east, and south of the site are a mixture of private-, State-, and Federal-owned parcels.

The city of Idaho Falls is located about 32 km (20 mi) east southeast from the site. The towns of Rigby and Rexburg are located approximately 23 km (14 mi) and 42 km (26 mi) north of Idaho Falls, respectively. Atomic City is about 32 km (20 mi) west of the site. South of the proposed site are the towns of Blackfoot at 40 km (25 mi) and Pocatello at 76 km (47 mi). The Fort Hall Indian Reservation comprises about 220,150 ha (544,000 ac) and also lies to the south. The nearest boundary of the reservation is about 44 km (27 mi) from the proposed site (Inside Idaho, 2008). The town of Fort Hall is located at a distance of approximately 60 km (37 mi).

Figure 1.3-1, Radial Sectors 5 mi (8 km) Radius, shows the physical features surrounding the facility to an 8 km (5 mi) radius.

1.3.1 Site Geography

Site features are well suited for the location of a uranium enrichment facility as evidenced by the favorable conditions of hydrology, geology, seismology and meteorology as well as good transportation routes for transporting feed, product, and tails by truck.

1.3.1.1 Site Location Specifics

The proposed site is situated in Bonneville County, Idaho, on the north side of U.S. Highway 20, about 113 km (70 mi) west of the Idaho/Wyoming state line. Portions of Bonneville, Jefferson, and Bingham counties are within 8 km (5 mi) of the proposed site. The approximate center of the EREF is located at latitude 43 degrees, 35 minutes, 7.37 seconds North and longitude 112 degrees, 25 minutes, 28.71 seconds West.

Figure 1.1-3, Site Plan With Property and Control Area Boundary, and Figure 1.1-4, Facility Layout, shows the site property boundary, controlled area boundary, and general layout of the buildings.

1.3.1.2 Features of Potential Impact to Accident Analysis

The geologic setting of the proposed site is the Snake River Plain (SRP). The SRP is typically split into western and eastern halves. The proposed site is located in the east-central part of the East Snake River Plain (ESRP), which is bounded on the northern and southern sides by mountain ranges and valleys.

The area of the proposed site is comprised mostly of relatively flat and gently sloping surfaces with small ridges and areas of rock outcrop. Most of the site is semi-arid steppe covered by eolian soils of variable thickness that incompletely cover broad areas of volcanic lava flows. Elevations at the site range from 1,556 m (5,106 ft) to 1,600 m (5,250 ft). Many of the areas with thickest soils and gentle slopes with a minimum of rock outcrop are currently used for crops.

Although most of the areas to the north, east, and south of the ESRP experience earthquake activity along faults related to regional Basin and Range crustal extension, the ESRP is an area of low seismicity.

The ESRP has been structurally and volcanically active since approximately 17 million years ago when this portion of the North American Plate began passing over a feature known as the Yellowstone hotspot. Inundation by basalt lava flows is the most significant volcanic hazard at the proposed site. As a result, a site-specific volcanic hazards analysis has been performed.

There are no underground utilities (industrial gases, natural gas, etc.) other than those required for facility operation on the property.

U.S. Highway 20 forms part of the southern boundary of the proposed site.

The nearest rail lines are several lines and branches of the Union Pacific Railroad that pass through Idaho Falls. The Union Pacific Railroad Aberdeen Branch runs parallel to U.S. Highway 26, about 40 km (25 mi) south of the proposed site, with the Scoville Branch leading onto the Idaho National Laboratory and ending at Scoville Siding. In addition, the Eastern Idaho Rail Road operates short line tracks connecting towns north and east of Idaho Falls to the Union Pacific Line (USCB, 2008).

1.3.2 Demographics

This section provides the census results for the facility site area, and includes specific information about populations, public facilities (schools, hospitals, parks, etc.) and land and water use near the site.

1.3.2.1 Latest Census Results

The combined population of Bonneville, Bingham and Jefferson counties in the EREF vicinity, based on the 2000 U.S. Census, was 143,412. This population represents an average annual increase of 1.4% from the 1990 population of 126,333. This rate of increase is less than experienced by the state of Idaho during the same decade, with a 2.9% average annual increase from the 1990 population of 1,006,749 to the 2000 population of 1,293,953. Over that same 10-year period, Bonneville County had an average annual population increase of 1.4% (from 72,207 to 82,522); Bingham County had an average annual increase of 1.1% (from 37,583 to 41,735); and Jefferson County had an average annual increase of 1.6% (from 16,543 to 19,155).

Based on projections made using historic data, the populations of Bonneville, Bingham and Jefferson counties are likely to grow more slowly than the state of Idaho over the next 30 years (the anticipated license period of the EREF).

Based on US Census Bureau (USCB) data, in 2000 minority populations comprised 7.2% of Bonneville County, 17.6% of Bingham County, and 9.1% of Jefferson County. The percentage for Bonneville County was somewhat lower than the 9.0% for the State of Idaho, Bingham County was significantly greater than the state percentage, and Jefferson County was at about the state level. In 2006, minority populations comprised 5.4% of Bonneville County residents, which was less than the 7.5% of state of Idaho residents. Because of the small population level, the USCB did not provide estimates of minority populations for Bingham County and Jefferson County for 2006.

The term "minority population" is defined for the purposes of the USCB to include the five racial categories of black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or other Pacific Islander, and other races. It also includes those individuals who declared two or more races, an option added as part of the 2000 census. The minority population, therefore, was calculated to be the total population less the white population. In contrast to USCB data, NUREG-1748, Appendix C (NRC, 2003b) defines minority populations to include individuals of Hispanic or Latino origin.

The 10.1% of individuals living below the poverty level in Bonneville County in 2000 was less than the 11.8% in the state of Idaho, but the 12.4% in Bingham County was greater than the state level. In 2006, the percentage of individuals living below the poverty level was 12.3% in Bonneville County, about equal to the 12.6% in the State of Idaho. The percentage of individuals living below the poverty level in Jefferson County was similar to Bonneville County at 10.4%.

1.3.2.2 Description, Distance, and Direction to Nearby Populated Areas

The proposed site is in Bonneville County, Idaho, near the border with Bingham County, Idaho. Jefferson County shares a border with Bonneville County and is linked by Highways 20 and 15. The city of Idaho Falls, Idaho, the closest population center to the site, is at a distance of about 32 km (20 mi). Other population centers are located at about the following driving distances from the site:

- Shelley, Bingham County: 45 km (28 mi) southeast
- Blackfoot, Bingham County: 77 km (48 mi) southeast
- Pocatello, Bannock County: 113 km (70 mi) south
- Rexburg, Madison County: 82 km (51 mi) northeast
- St. Anthony, Freemont County: 101 km (63 mi) northeast

Aside from these communities, the population density around the site and region is generally low. The nearest large population centers (>100,000) are Boise, Idaho which is approximately 306 km (190 mi) to the west and Salt Lake City, Utah which is approximately 316 km (196 mi) to the south.

1.3.2.3 Proximity to Public Facilities – Schools, Hospitals, Parks

The nearest churches are located in Idaho Falls, approximately 32 km (20 mi) east of the proposed site.

There are three hospitals in Bonneville County, all located in Idaho Falls approximately 32 km (20 mi) east of the proposed site. The Eastern Idaho Regional Medical Center is the largest of three hospitals. It is a short-term acute care hospital with 242 beds. The Idaho Falls Recovery Center is a 7-bed acute care facility and the Mountain View Hospital is a 20-bed acute care facility. There are also 4 nursing homes or retirement facilities in the area.

The closest schools in Bonneville County are in Idaho Falls, approximately 32 km (20 mi) east of the proposed site. The Swan Valley School District 92 is also in Bonneville County and is located about 72 km (45 mi) east of Idaho Falls.

Public use areas include a hiking trail south of the proposed site in Hell's Half Acre Wilderness Study Area (WSA) and a small lava tube cave located approximately 8 km (5 mi) east and south (BLM, 2008).

There are four fire departments within about a 48-km (30-mi) radius of the site; the Idaho Falls Fire Department, the Ucon Volunteer Fire Department, the Shelley Firth Rural Fire Department, and the Central Fire District which operates in Jefferson County. Fire support service for Idaho Falls is provided by the Idaho Falls Fire Department, located approximately 32 km (20 mi) from the EREF.

The closest other public use facilities are located in Idaho Falls.

1.3.2.4 Nearby Industrial Facilities (Includes Nuclear Facilities)

Nuclear Facilities

The Department of Energy's Idaho National Laboratory (INL) eastern boundary is 1.6 km (1 mi) west of the proposed site. The INL property near the site is undeveloped rangeland (Anderson, 1996). The closest facility on the INL property is the Materials and Fuels Complex (MFC), located approximately 16 km (10 mi) west of the proposed site boundary.

Non-Nuclear Facilities

The city of Idaho Falls is located about 32 km (20 mi) east southeast from the site. Several lines and branches of the Union Pacific Railroad pass through Idaho Falls. The Union Pacific Railroad Aberdeen Branch runs parallel to U.S. Highway 26, about 40 km (25 mi) south of the proposed site, with the Scoville Branch leading onto the Idaho National Laboratory and ending at Scoville Siding. In addition, the Eastern Idaho Rail Road operates short line tracks connecting towns north and east of Idaho Falls to the Union Pacific Line (USCB, 2008).

There are landfills in Jefferson, Bonneville, and Bingham counties and two waste transfer stations in Bonneville County.

The nearest commercial carrier airport is Fanning Field (Idaho Falls Regional Airport) in Idaho Falls about 32 km (20 miles) from the site. Pocatello Regional Airport is located in Pocatello, about 113 km (70 mi) south of the site.

1.3.2.5 Land Use Within Eight Kilometers (Five Mile) Radius, Uses of Nearby Bodies of Water

Rangeland comprises 53% of the area within an 8 km (5 mi) radius of the proposed site. The rangeland, typical of that found in southeastern Idaho, is composed of shrub and herbaceous vegetation and supports livestock grazing and wildlife.

Non-irrigated seeded pasture comprises 10% of the area within the 8-km (5-mi) radius. Non-irrigated seeded pastures are areas where native rangelands have been cleared to create improved pasture for livestock grazing.

Agricultural land comprises 18% of the area within an 8-km (5-mi) radius of the proposed site. There are no agricultural lands in Bingham County. The agricultural lands are used primarily for production of food and fiber.

Barren land, comprised of bare exposed rock and volcanic flows constitutes the other land use classification in the proposed site vicinity, is 19% of land area.

There are no intermittent or perennial waterbodies or jurisdictional wetlands on the proposed site.

The proposed facility would use groundwater for both process and potable water requirements. No surface water would be used. The collection and storage of runoff from specific site areas would be controlled. No significant adverse changes are expected in site hydrology as a result of construction or operation of the proposed facility. ER Section 4.4.7, Control of Impacts to Water Quality, addresses the potential impacts to water resources as a result of activities on the site.

1.3.3 Meteorology

In this section, data characterizing the meteorology (e.g., winds, precipitation, and severe weather) for the site are presented.

The meteorological conditions at the EREF have been evaluated and summarized in order to characterize the site climatology and to provide a basis for predicting the dispersion of gaseous effluents. Meteorological data was obtained from Idaho Falls 2 ESE and Idaho Falls 46 W, which are cooperative weather stations. Weather station Idaho Falls 46 W is located on the property of the INL, is operated by NOAA staff, and is part of the 33-station meteorological network of the Air Resources Laboratory Field Research Division (ARLFRD) of NOAA. Meteorological data has also been obtained from ARLFRD for two additional stations located closer to the EREF site. These stations are identified as Argonne National Lab-West (EBR) and Kettle Butte (KET).

1.3.3.1 Primary Wind Direction and Average Wind Speeds

The annual average wind speed at Idaho Falls 46W, KET and EBR are 3.4 m/s (7.5 mph), 5.5 m/s (12.2 mph) and 4.2 m/s (9.3 mph), respectively. The highest hourly average wind speed at both Idaho Falls 46W and KET is 23 m/s (51 mph). The highest hourly average wind speed at EBR is 19 m/s (43 mph). The wind directions for all of the highest hourly average wind speeds are from the west-southwest.

These and additional data are discussed and further analyzed in Section 3.6 of the Environment Report.

1.3.3.2 Annual Precipitation – Amounts and Forms

Air masses approaching the EREF location must cross over significant mountain ranges prior to their arrival in southeastern Idaho. In doing so, the majority of the moisture contained in these air masses condenses and precipitates over the mountains. As the air masses descend from the mountains, they warm adiabatically and become relatively dry. As a result, annual precipitation in the vicinity of the EREF is quite light. The data indicate that precipitation occurs infrequently (less than 3% of the time) and that precipitation intensity is predominately less than 0.1 in (2.54 millimeters).

The type of precipitation at the EREF location varies with the seasons. Convective showers and thundershowers occur in the summer. Precipitation during the spring and fall can be characterized as showery or as a steadier rainfall. Winter precipitation is typically in the form of snow which can occur anytime from September through May.

Annual average precipitation at Idaho Falls 2 ESE is 360.93 mm (14.21 in). This precipitation falls fairly evenly throughout the year with the exception of the month of May, which exhibits a significant spike in precipitation. The highest recorded monthly precipitation total is 115.82 mm (4.56 in). There have been several months in the 30-year period of record when no precipitation has been recorded.

Annual average precipitation at Idaho Falls 46 W is considerable less than what occurs at Idaho Falls 2 ESE and measures 224.03 mm (8.82 in). The precipitation pattern of these two locations is somewhat similar in that precipitation falls fairly evenly throughout the year with the exception of a precipitation maximum in May. The highest recorded precipitation total at Idaho Falls 46 W is 117.86 mm (4.64 in).

Over the 30-year period of record, precipitation has always fallen at some time during the months of January, May, June, and August. Over the same period of record, there have been at least ten months when no precipitation has been recorded. The highest daily precipitation event recorded over the 48-year period of record is 41.66 mm (1.64 in).

The annual average snowfall for Idaho Falls 2 ESE is 833.12 mm (32.8 in). The highest daily snowfall at this location is 254 mm (10 in). The highest monthly snowfall is 571.5 mm (22.5 in). The highest daily snow depth is 660.4 mm (26 in).

The annual average snowfall for Idaho Falls 46 W is 637.54 mm (25.1 in). The highest daily snowfall at this location is 218.44 mm (8.6 in). The highest monthly snowfall is 566.42 mm (22.3 in) occurring in December 1971. The highest daily snow depth is 762 mm (30 in).

Additional details on rainfall and snowfall are provided in Section 3.6 of the Environmental Report.

The design basis snow load was developed by combining the "building code" snow load with the additional surcharge from an extreme winter precipitation event. This is consistent with the guidance provided by NRC in the Site Analysis Branch Position for Winter Precipitation Loads (NRC, 1975). The ground "building code" snow load for the EREF was determined to be 44.2 lb/ft^2 (216 kg/m^2).

The ground snow load at 44.2 lb/ft^2 for the EREF was determined as follows:

- Snow depth data (collected from the National Weather Service) at locations within close proximity to the EREF site that had a long period of record with similar climate conditions were used to compute L-moment parameters, were applied to Generalized Extreme Value (GEV) frequency distributions and used to estimate the 50-year return values.

- Snow course data, snow depth and snow water equivalent (SWE) (collected from the National Resources Conservation Service) at two locations near the EREF site that had a long period of record with similar climate conditions were used to create a snow depth/density relationship between snow depth and SWE.
- The 50-year snow depth data was converted into snow loads and spatially distributed to obtain the estimate at the EREF site. The ground snow load was estimated from spatial interpolation of the station snow load values.

This ground snow load will be converted to a roof snow load in accordance with ASCE 7-05 (ASCE, 2006). The extreme winter precipitation event results in a load of 19 lb/ft^2 (93 kg/m^2). This value will be combined with the appropriate building code roof snow load for use as the design basis snow load.

The transport of ash to the EREF from future cascade tephra eruptions was considered. The maximum ash thickness that could be deposited at the EREF is less than 8 cm. The load of ash (8 cm) would range from 8.2 lb/ft^2 (40 kg/m^2) (dry) to 20.5 lb/ft^2 (100 kg/m^2) (wet), which is bounded by both the extreme environmental snow load and normal ground snow load for the EREF.

1.3.3.3 Severe Weather

Tornadoes

The total number of tornadoes in the four-county region encompassing the Eagle Rock Enrichment Facility site for the 58-year (1/1/1950-4/30/2008) period of record is 40. In addition to the tornado activity described above, 12 funnel clouds were sighted during the 58-year period of record in the four-county region.

Tornadoes are commonly classified by their intensity. The F-Scale classification ranks tornadoes based on the level of observable damage, with F0 being the weakest and F5 the strongest. One F2 tornado was sighted in the four-county region during the 58-year period of record. That tornado occurred in Bonneville County on April 7, 1978, causing $2.5 million in damage and one injury. All other tornadoes were either F0 (20 occurrences) or F1 (19 occurrences).

The likelihood of a tornado occurring within any 1,000 square mile area in the vicinity of the EREF site is 0.09 tornadoes per year per 1,000 square miles. The probability of a tornado developing at the Eagle Rock Enrichment Facility site is very small.

Hurricanes

Hurricanes, or tropical cyclones, are low-pressure weather systems that develop over the tropical oceans. Hurricanes are fueled by the relatively warm tropical ocean water and lose their intensity quickly once they make landfall. The EREF is not in the vicinity of any ocean and is protected by mountains; therefore hurricanes are not considered a credible threat.

Thunderstorms and Lightning Strikes

The NCDC Storm Event Database (NOAA, 2008a) was used to obtain information on thunderstorms in the vicinity of the EREF site). The period of record available for review was January 1, 1955 to April 30, 2008. The area of interest was a four-county area surrounding the EREF and included Bonneville, Bingham, Butte and Jefferson counties. Based on a review of the database, there were 228 thunderstorm days during the 53-year period of record or 4.3 thunderstorm days per year. Several individual thunderstorms may occur during each of the thunderstorm days. Thunderstorm days can occur during every month of the year; however, they are most prevalent during the months of March through October.

The lightning data contained in the NCDC Storm Event Database are lightning events that result in fatality, injury and/or property and crop damage. According to the database there were nine lightning strikes in the four-county region encompassing the EREF site between January 1, 1950 and May 31, 2008. According to ARLFRD, the INL is not frequently struck by lightning. The INL is located immediately west of the EREF site.

The current methodology (Marshall, 1973) for estimating lightning strike frequencies includes consideration of the attractive area of structures. This method consists of determining the number of lightning flashes to earth per year per square kilometer and then defining an area over which the structure can be expected to attract a lightning strike.

Using this methodology, the attractive area of the facility structures and the Cylinder Storage Pads has been conservatively determined to be 0.75 km^2 (0.29 mi^2). Using 1 flash to earth per year per square kilometer (2.59 flashes to earth per year per square mile) (NOAA, 2008b), it can be estimated that the EREF will experience approximately 0.75 flashes to earth per year.

Sandstorms

The EREF site is located in a semi-arid environment and, as a result, blowing dust and drifting sand can be a nuisance when the winds are strong in certain areas of the ESRP. Vehicular traffic and construction equipment are also significant contributors to high dust concentrations. These conditions may particularly affect the activities of construction personnel during the spring months after the winter thaw when strong frontal systems pass through the ESRP and during the summer months when thunderstorms are near. During the daylight hours under conditions of strong winds, the concentration of dust sharply decreases with height up to 21 m (70 ft) above grade level.

1.3.4 Hydrology

Much of the information included in this section was obtained from prior studies, including extensive subsurface investigations for the Department of Energy Idaho National Laboratory (INL), which is located immediately west of the proposed site, as well as regional studies conducted by the U.S. Geologic Survey and the State of Idaho. Literature searches were conducted to obtain additional reference material. This information is supplemented by subsurface investigations conducted at the EREF site.

The proposed EREF site contains no surface water bodies. There are a few small drainage features in the southeastern and southwestern areas of the proposed site. These drainages likely originated from natural erosional processes but now primarily conduct minor amounts of water from irrigated areas.

The Snake River is located about 32 km (20 mi) to the east of the proposed facility. The Snake River Plain (SRP) aquifer is the predominant water bearing unit in the area. At the site, groundwater is encountered at depths between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs). This SRP aquifer covers about 26,000 km^2 (10,039 mi^2) with a thickness ranging between 91 m (300 ft) and 396 m (1,299 ft) thick (Smith, 2004). The water volume in the aquifer is estimated at 100 billion m^3 (3.53E+12 ft^3) (Smith, 2004).

1.3.4.1 Characteristics of Nearby Rivers, Streams, and Other Bodies of Water

The proposed facility is located in an area with no surface water bodies. The predominant regional direction of groundwater flow is from the northeast to southwest (Smith, 2004) (Whitehead, 1994). The closest surface water bodies are the Snake River and the Market Lake Wildlife Management Area (WMA). These two surface water bodies are located about 32 km (20 mi) to the east and northeast of the site, respectively.

1.3.4.2 Depth to Groundwater Table

Site-specific subsurface investigations occurred at the proposed EREF site between May and July 2008. Five deep monitoring wells were installed at the proposed site. One shallow well was also completed. These monitoring wells on the proposed site are distributed to allow monitoring of the ground water elevations, evaluation of regional groundwater flow direction, and water quality at the EREF site. The wells are located in areas that are hydrologically upgradient, cross gradient, downgradient of the plant footprint, and within the downgradient edge of the facility footprint. The five deep wells provide adequate site-specific data to define the potentiometric surface of the groundwater, thereby providing data indicative of groundwater flow direction and gradient.

Groundwater was encountered at depths between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs).

1.3.4.3 Groundwater Hydrology

The groundwater system underlying the Snake River Plain (SRP) in the vicinity of the EREF is referred to as the ESRP aquifer. The ESRP Aquifer consists predominantly of flood basalt lava flows with intermittent interbeds of unconsolidated sediments. The geologic units comprising the aquifer are primarily lava flows of the Snake River Group basalts (Qb) and the upper part of the Idaho Group (Bruneau Formation). The basalt units are variable in thickness and generally discontinuous in lateral extent. Sedimentary interbeds exist between some of the basalts and are of variable thickness and lateral extent. At the site, groundwater is encountered at depths between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs).

The ESRP Aquifer is unconfined over nearly all of its area through locally confined conditions may exist. The overlying unsaturated zone or vadose zone is spatially heterogeneous and ranges in thickness from 60 m (200 ft) to greater than 300 m (984 ft) and consists of unconsolidated alluvium and Snake River Group basalts (Qb). The saturated thickness of the aquifer is greatest in the central part of the ESRP and thins substantially to the west. Within the basalts, permeable zones are located mainly in the tops and bottoms of lava flows, which are typically fractured and porous, leading to high horizontal hydraulic conductivity. Vertical joint densities and presence of lower permeability sediment interbeds act to control vertical hydraulic conductivity. The interbeds may also act to locally confine limited portions of the aquifer. Overall, the fractured, porous, and complexly interconnected nature of the basaltic lava flows has resulted in high but heterogeneous and anisotropic horizontal conductivity and much lower vertical conductivity.

1.3.4.4 Characteristics of the Uppermost Aquifer

The SRP aquifer is the predominant water bearing unit in the area. At the site, the groundwater surface is encountered at depths between 199.5 m (654.4 ft) and 219.4 m (719.9 ft) below ground surface (bgs). This SRP aquifer covers about 26,000 km^2 (10,039 mi^2) with a thickness ranging between 91 m (300 ft) and 396 m (1,299 ft) thick (Smith, 2004). The water volume in the aquifer is estimated at 100 billion m^3 (3.53E+12 ft^3) (Smith, 2004). The SRP aquifer is a major economic resource in southern Idaho that is relied upon for both drinking water and irrigation (Garabedian, 1992) (Lindholm, 1996).

The proposed facility would use groundwater for both process and potable water requirements. No surface water would be used. The collection and storage of runoff from specific site areas would be controlled.

1.3.4.5 Design Basis Flood Events Used for Accident Analysis

The EREF site is located above the 100 or 500-year flood elevation (FEMA, 1981). The proposed facility is not located near any reservoirs, levees or surface waters that could cause flooding of the plant site. The proposed site is contained within the Idaho Falls watershed, HUC 17040201, with gradual average slopes of about 1.4%. The Natural Resources Conservation Service soil survey data summary indicates that soils typically have no potential for ponding (NRCS, 2008b). Any onsite precipitation will be subject to evapotranspiration or infiltration. Minor intermittent drainages originating within the site boundary do not connect to off-site resources or larger drainages. The largest surface water body southwest of the proposed site (along the topographical grade) is Lake Wolcott, approximately 120 km (75 mi) from the proposed site and the Snake River about 32 km (20 mi) east of the site. Therefore, no credible sources of river or upstream dam flooding exist at the site. No special design considerations for local intense precipitation are necessary to prevent flooding at the proposed site other than stormwater runoff controls.

Therefore, a flood is not considered to be a design basis event for the EREF site.

1.3.5 Geology

This section provides information about the characteristic geology of the EREF site and its vicinity and design-basis earthquake magnitudes and return periods. AES performed literature searches and conducted subsurface investigations to determine site-specific conditions.

The proposed EREF site lies within the SRP volcanic field of southeast Idaho approximately 32 km (20 mi) west northwest of Idaho Falls, Idaho. The SRP is an arc shaped (convex south) belt of topographically subdued volcanic and sedimentary rocks. Geologists have divided the SRP into eastern (ESRP) and western (WSRP) segments, based on physiographic features described above and tectonic characteristics. The EREF site is located close to the center of the ESRP, near the southeastern corner of the Idaho National Laboratory (INL). The ESRP has been structurally and volcanically active since approximately 17 million years ago (Ma) when this portion of the North American Plate began passing over a feature known as the Yellowstone hotspot.

The surface area of the proposed site is comprised mostly of relatively flat semi-arid steppe covered by eolian soils of variable thickness that incompletely cover broad areas of rock outcrop. The outcrops exist in the form of low irregular ridges, small areas of thin soils mixed with blocky rubble, and as erosional surfaces in intermittent stream drainages. The outcrops at the proposed site are comprised of basaltic lava flows that originated from nearby vent and fissure systems. Elevations at the site range from 1,556 m (5,106 ft) to 1,600 m (5,250 ft). The finished site grade ranges from 1573 m (5,161 ft) to 1585 m (5200 ft).

1.3.5.1 Characteristics of Soil Types and Bedrock

Soil cover in the ESRP is variable, ranging from non-existent in areas of recent volcanism to tens of meters (tens of feet) in thickness in areas of wind-blown loess derived from exposed lava flows, lacustrine deposits, and alluvial fill. Thin soils and basalt outcrops are common along ridge lines and wind-swept areas of the axial volcanic zone, in which the EREF site is location.

The U. S. Department of Agriculture soil survey for Bonneville County, Idaho (NRCS, 2008) categorizes most of the soils at the proposed site as Pancheri silt loams with slopes ranging from 0 to 8 percent (50 to 75% of the area). The Pancheri series consists of deep and very deep, well-drained soils that formed in loess covered lava plains (NRCS, 2008). The taxonomic class for the Pancheri series is coarse-silty, mixed, superactive, frigid Xeric Haplocalcids. This description is consistent with detailed studies of soils at the nearby INL where they are described as falling mostly in the silt-loam textural class with 0 to 27% clay, 55 to 80% silt, and 10 to 35% sand (Nimmo, 2004).

The drainage and permeability of the Pancheri series are described as well-drained, medium or slow runoff, moderate permeability (NRCS, 2008). The remainder of the proposed site is characterized as Polatis-rock outcrop complex, Pancheri-rock outcrop complex, and lava flows.

ESRP stratigraphy is composed of igneous and sedimentary rocks over 3048 m (10,000 ft) thick (Doherty, 1979). The products of rhyolitic, andesitic, and basaltic volcanism, have been interspersed with sedimentary fluvial, lacustrine, and eolian (wind) deposits. The thickness and lateral extent of the volcanic deposits varies greatly in response to the composition, volume, and location of the erupted material. Most of the ESRP is covered with basaltic materials. Deep boreholes on the adjacent INL have intersected nearly 1 km (0.6 mi) of late Tertiary and Quaternary basalt lava flows and interbedded sedimentary deposits overlying older silicic tuffs.

1.3.5.2 Earthquake Magnitudes and Return Periods

The site is situated in a less seismically active region of the ESRP. Introduction and solidification of molten volcanic materials in ESRP fracture zones as they developed in the past is believed to be a possible mechanism responsible for the present low level of seismic activity (Parsons, 1991). Most of the areas to the north, east, and south of the ESRP experience earthquake activity along faults related to regional Basin and Range crustal extension. The ESRP, however, is an area of low present-day seismicity.

The November 11, 1905 Shoshone earthquake is the largest earthquake reported for the eastern Snake River Plain within which the site is located. This earthquake has an estimated magnitude of 5.3 to 5.7. The epicenter is considered to be 180 km (112 mi) west southwest of the EREF site. Due to the occurrence of this earthquake prior to seismograph monitoring in the region, the epicenter could be uncertain by 100 km (62 mi) or more (INL, 2008). The event could have an epicenter in the adjacent Basin and Range province that exhibits higher rates of seismic activity than the ESRP. This earthquake, however, is analyzed in the EREF site-specific probabilistic seismic hazard assessment (PSHA) as being associated with the ESRP.

In site-specific PSHA, seismic ground motion amplitudes in bedrock were determined for annual frequencies of exceedance ranging from of 10^{-2} to 10^{-5}. Uniform hazard response spectra (UHRS) were determined for top of bedrock for annual frequencies of exceedance of 10^{-3}, 10^{-4}, and 10^{-5}. The associated peak horizontal ground motion is 0.063g, 0.150g, and 0.299g, respectively.

1.3.5.3 Other Geologic Hazards

The EREF site is located close to the center of the ESRP, near the southeastern corner of the INL. The ESRP has been structurally and volcanically active since approximately 17 Ma when this portion of the North American Plate began passing over a feature known as the Yellowstone hotspot. Inundation by basalt lava flows is the most significant volcanic hazard at the proposed site. During the past 4.3 Ma, the ESRP has been repeatedly inundated by basaltic lava flows, which today are exposed over about 58 percent of the INL area and are found in subsurface wells and boreholes across most of the ESRP. As a result, a site-specific volcanic hazards analysis was performed. The analysis determined the estimated mean annual probability (preferred value) of lava inundation at the proposed EREF site is 5×10^{-6}. The estimated upper and lower bounds of the annual probability distribution span two orders of magnitude, from 10^{-5} to x 10^{-7} respectively.

There are no other known geologic hazards that would adversely impact the EREF site.

1.4 REFERENCES

Anderson, 1996. Plant communities, Ethoecology, and Flora of the Idaho National Engineering Laboratory (INEL), Environmental Science and Research Foundation Report Series, Number 005, J. E. Anderson, et al., 1996.

ASCE, 2006. Minimum Design Loads for Buildings and Other Structures, ASCE 7-05, American Society of Civil Engineers, 2006.

CFR, 2008a. Title 10, Code of Federal Regulations, Part 61, Licensing Requirements for Land Disposal of Radioactive Waste, 2008.

CFR, 2008b. Title 10, Code of Federal Regulations, Section 140.13b, Amount of liability insurance required for uranium enrichment facilities, 2008.

CFR, 2008c. Title 10, Code of Federal Regulations, Section 70.22, Contents of applications, 2008.

CFR, 2008d. Title 10, Code of Federal Regulations, Section 70.25, Financial assurance and recordkeeping for decommissioning, 2008.

CFR, 2008e. Title 10, Code of federal Regulations, Section 40.36, Financial assurance and recordkeeping for decommissioning, 2008.

CFR, 2008f. Title 10, Code of Federal Regulations, Section 70.4, Definitions, 2008.

CFR, 2008g. Title 10, Code of Federal Regulations, Part 70, Domestic Licensing of Special Nuclear Material, 2008.

CFR, 2008h. Title 10, Code of Federal Regulations, Part 30, Rules of General Applicability to Domestic Licensing of Byproduct Material, 2008.

CFR, 2008i. Title 10, Code of Federal Regulations, Part 40, Domestic Licensing of Source Material, 2008.

CFR, 2008j. Title 10, Code of Federal Regulations, Section 40.14, Specific exemptions, 2008.

CFR, 2008k. Title 10, Code of Federal Regulations, Section 70.17, Specific exemptions, 2008.

CFR, 2008l. Title 10, Code of Federal Regulations, Section 51.21, Criteria for and identification of licensing and regulatory actions requiring environmental assessments, 2008.

CFR, 2008m. Title 10, Code of Federal Regulations, Section 51.22, Criteria for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review, 2008.

CFR, 2008n. Title 10, Code of Federal Regulations, Section 51.20, Criteria for and identification of licensing and regulatory actions requiring environmental impact statements, 2008.

CFR, 2008o. Title 10, Code of Federal Regulations, Section 50.30, Environmental assessment, 2008.

CFR, 2008p. Title 10, Code of Federal Regulations, Section 51.32, Finding of no significant impact, 2008.

CFR, 2008q. Title 10, Code of Federal Regulations, Part 10, Criteria and Procedures for Determining Eligibility for Access to Restricted Data or National Security Information or an Employment Clearance, 2008.

CFR, 2008r. Title 10, Code of Federal Regulations, Part 25, Access Authorization for Licensed Personnel, 2003.

CFR, 2008s. Title 10, Code of Federal Regulations, Part 95, Security Facility Approval and Safeguarding of National Security Information and Restricted Data, 2003.

Doherty, 1979. Preliminary geological interpretation and lithologic log of the exploratory geothermal test well (INEL-1), Idaho National Engineering Laboratory, eastern Snake River Plain, Idaho. United States Geologic Survey Open-File Report. 79-1248.

FEMA, 1981. Flood Map, Bonneville County, Idaho, Map ID: FM1600270025C, Website: http://msc.fema.gov, Date accessed: August 8, 2007.

Garabedian, 1992. Hydrogeology and Digital Simulation of the Regional Aquifer System, Eastern Snake River Plain, Idaho. U.S. Geol. Surv. Prof. Paper PP-1408-F, U.S. Government Printing Office, Washington, D.C., S.P. Garabedian, 1992.

IBC, 2006. International Building Code, International Code Council, Inc., 2006.

INL, 2008. Idaho National Laboratory Seismic Monitoring, Website: http://www.inl.gov/geosciences/earthquakes.shtml, Date accessed: November 17, 2008.

LES, 2005. Louisiana Energy Services (LES). "National Enrichment Facility Safety Analysis Report," Revision 6, 2005.

Lindholm, 1996. Summary of Snake River Plain Regional Aquifer-System Analysis in Idaho and eastern Oregon, U.S. Geol. Surv. Prof. Paper 1408-A., U.S. Government Printing Office, Washington, DC, G. F. Lindholm.

Marshall, 1973. J.L. Marshall, Lightning Protection, 1973

Nimmo, 2004. Hydraulic and Geochemical Framework of the Idaho National Engineering and Environmental Laboratory Vadose Zone. Vadose Zone Journal 3, J.R. Nimmo, J.P. Rousseau, K.S. Perkins, K.G. Stollenwerk, P.D. Glynn, R.C. Bartholomay, and L.L. Knobel, 2004.

NOAA, 2008a. National Oceanic and Atmospheric Administration, Query Results of the Storm Event Database for Bingham, Bonneville, Butte and Jefferson Counties, ID, National Climatic Data Center, Asheville, NC, July 2008.

NOAA, 2008b. Colorado Lightning Resource Center, National Oceanic and Atmospheric Administration, National Weather Service, 2008.

NRC, 1975. Site Analysis Branch Position for Winter Precipitation Loads, U.S. Nuclear Regulatory Commission, March 24, 1975.

NRC, 2002. Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility, NUREG-1520, U.S. Nuclear Regulatory Commission, March 2002.

NRC, 2003a. Louisiana Energy Services Policy Issues, Letter, R. Pierson, USNRC, to R. Krich, LES, dated March 24, 2003.

NRC, 2003b. Environmental Review Guidance for Licensing Actions Associated with NMSS Programs, NUREG-1748, August 2003.

NRC, 2005. Safety Evaluation Report for the National Enrichment Facility in Lea County, New Mexico, NUREG-1827, U.S. Nuclear Regulatory Commission, June 2005.

NRC, 2006. Safety Evaluation Report for the American Centrifuge Plant in Piketon, Ohio, NUREG-1851, U.S. Nuclear Regulatory Commission, September 2006.

NRCS, 2008. Natural Resource Conservation Service, Web Soil Survey, Website: http://websoilsurvey.nrcs.usda.gov/app/, Date accessed: April 10, 2008.

Parsons, 1991. The Role of Magma Overpressure in Suppressing Earthquakes and Topography: Worldwide Examples, Science, 253-5023: 1399-1402, Parsons and Thompson, 1991.

Smith, 2004. Geologic Setting of the Snake River Plain Aquifer and Vadose Zone. Vadose Zone J., 3, R.P. Smith, 2004.

USCB, 2008. U.S. Census Bureau, GIS data depot, 2008, Census TIGER 2006 data, Website: http://data.geocomm.com/, Date accessed: June 16, 2008.

Whitehead, 1994. Ground Water Atlas of the United States, Idaho, Oregon, Washington, HA 730-H, U.S. Geological Survey, R.L. Whitehead, 1994.

TABLES

Table 1.1-1 Estimated Annual Gaseous Effluent
(Page 1 of 1)

Area		Discharge Rate m^3/yr (SCF/yr) (STP)
Gaseous Effluent Vent System	NA	2.6×10^8 (9.18×10^9)
HVAC Systems	NA	
Radiological Areas	NA	1.93×10^9 (max) (6.8×10^{10})
Non-Radiological Areas	NA	2.2×10^9 (max) (7.8×10^{10})
Total Gaseous HVAC Discharge	NA	4.13×10^9 (max) (14.6×10^{10})
Constituents:	**Quantity (yr^1)**	
Helium	880 m^3(STP) (31,080 ft^3)	NA
Nitrogen	104 m^3 (Liquid) (3,672 ft^3)	NA
Ethanol	80 L (21.1 gal)	NA
Laboratory Compounds	Traces (HF)	NA
Argon	380 m^3 (STP) (13,420 ft^3)	NA
Hydrogen Fluoride	<2.0 kg (<4.4 lb)	NA
Uranium	<20 g (<0.0441 lb)	NA
Methylene Chloride	800 L (211 gal)	NA
Thermal Waste:		
Summer Peak	55.2×10^9 J/hr (52.3×10^6 BTU/hr)	NA
Winter Peak	78×10^9 J/hr (74×10^6 BTU/hr)	NA

Table 1.1-2 Estimated Annual Radiological and Mixed Wastes
(Page 1 of 1)

Waste Type	Radiological Waste		Mixed Waste[2]	
	Total Mass kg (lb)	Uranium Content kg (lb)	Total Mass kg (lb)	Uranium Content kg (lb)
Activated Carbon	600 (1,323)	50 (110)	--	--
Activated Alumina	4,320 (9,524)	4.4 (9.7)	--	--
Perfluoropolyether Oil	2,054 (4,528)	10 (22)	--	--
Liquid Waste Treatment Sludge[6]	2,086 (4,599)	114 (251)[4]	--	--
Activated Sodium Fluoride[1]	--	--	--	--
Assorted Materials (paper, packing, clothing, wipes, etc.)	4,200 (9,259)	60 (132)	--	--
Ventilation Filters	92,196(203,259)	11(24)	--	--
Non-Metallic Components	10,000 (22,050)	Trace[5]	--	--
Miscellaneous Mixed Wastes (organic compounds)[2, 3]	--	--	100 (220)	4 (8.8)
Combustible Waste	7,000 (15,436)	Trace[5]	--	--
Scrap Metal	24,000 (52,920)	Trace[5]	--	--

1. No NaF wastes are produced on an annual basis. The Dump System NaF traps are not expected to saturate over the life of the plant.
2. A mixed waste is a radioactive waste containing listed or characteristic hazardous wastes as specified in 40 CFR 261, subparts C and D (CFR, 2008i).
3. Representative organic compounds consist of acetone, toluene, ethanol, and petroleum ether.
4. The value of 114 kg (251 lb) is composed of uranium in the citric acid and degreaser tanks, precipitated aqueous solutions, uranium in precipitated laboratory/miscellaneous effluents, and uranium in sludge from the citric acid and degreaser tanks.
5. Trace is defined as not detectable above naturally-occurring background concentrations.
6. Consists of sludge and evaporator concentrates.

Table 1.1-3 Estimated Annual Liquid Effluent
(Page 1 of 1)

Effluent	Typical Annual Quantities m^3 (gal)	Typical Uranic Content kg (lb)
Contaminated Liquid Process Effluents:		
Laboratory Effluent/Floor Washings/Miscellaneous Condensates	46.28 (12,226)	32 (70.5)[1]
Degreaser Water	7.42 (1,960)	37 (81.6)[1]
Spent Citric Acid	5.44 (1,437)	44 (98)[1]
Total Effluent Discharged[2] to Atmosphere by Evaporation via Liquid Effluent System Evaporator:	59.1(15,625) [2]	N/A [2]
Sanitary Waste:	18,653 (4,927,500)	None
Storm Water Discharge:		
Gross Discharge[3]	420,090 (110,976,000)	None

1. Uranic quantities are before treatment. Volumes for degreaser water and spent citric acid include process tank sludge.
2. Total annual effluents to atmosphere by evaporation via liquid effluent system evaporator is approximately 59,100 L (15,625 gal) with total uranic input approximately 114 kg (251 lb). Effluents are treated to remove uranic content by precipitation, filtration, and evaporation and discharged to atmosphere. The anticipated atmospheric distillate release is expected to be < 0.356 g/yr (1.26E-03 oz/yr) of total uranium. The EREF design precludes operational process discharges from the plant to surface or groundwater.
3. Maximum gross discharge is based on total annual mean precipitation falling on the developed site area associated with runoff to the Site Storm Water Detention Basin and the Cylinder Storage Pads Storm Water Retention Basins, neglecting infiltration into the site soil and evaporation.

Table 1.1-4 Estimated Annual Non-Radiological Wastes
(Page 1 of 1)

Waste	Annual Quantity
Spent Blasting Sand	249.5 kg (550 lbs)
Miscellaneous Combustible Waste	13,472 kg (29,700 lbs)
Cutting Machine Oils	90 L (23.8 gal)
Spent Degreasing Water (from clean workshop)	2 m^3 (528 gal)
Spent Demineralizer Water (from clean workshop)	400 L (106 gal)
Empty Spray Paint Cans*	40 each
Empty Cutting Oil Cans	40 each
Empty Propane Gas Cylinders*	10 each
Acetone*	54 L (14.3 gal)
Toluene*	4 L (1.0 gal)
Degreaser Solvent SS25*	4.8 L (1.3 gal)
Petroleum Ether*	20 L (5.3 gal)
Miscellaneous Scrap Metal	4,183 kg (9,221 lbs)
Motor Oils (for I. C. engines)	3,387 L (895 gal)
Oil Filters	250 each
Air Filters (vehicles)	50 each
Air Filters (building ventilation)	45,359 kg (100,000 lbs)
Hydrocarbon Sludge*	20 kg (44 lbs)
Methylene Chloride*	2,415 L (638 gal)

* Hazardous waste as defined in 40 CFR 261 (in part or whole) (CFR, 2008i)

Table 1.1-5 Annual Hazardous Construction Wastes
(Page 1 of 1)

Item Description	Quantity
Paints, Thinners, Organics	11,360 L (3,000 gal)
Petroleum Products – Oils, Lubricants	11,360 L (3,000 gal)
Sulfuric Acid (Batteries)	379 L (100 gal)
Adhesives, Resins, Sealers, Caulking	910 kg (2,000 lbs)
Lead (Batteries)	91 kg (200 lbs)
Pesticide	379 L (100 gal)

Table 1.2-1 Type, Quantity and Form of Licensed Material
(Page 1 of 1)

Source and/or Special Nuclear Material	Physical and Chemical Form	Maximum Amount to be Possessed at Any One Time
Uranium (natural and depleted) and daughter products	Physical: Solid, Liquid and Gas Chemical: UF_6, UF_4, UO_2F_2, oxides and other compounds	225,000,000 kg
Uranium enriched in isotope ^{235}U up to 5% by weight and uranium daughter products	Physical: Solid, Liquid, and Gas Chemical: UF_6, UF_4, UO_2F_2, oxides and other compounds	1,750,000 kg
^{99}Tc, transuranic isotopes and other contamination	Any	Amount that exists as contamination as a consequence of the historical feed of recycled uranium at other facilities(1)

(1) To minimize potential sources of contamination of UF_6, such as ^{99}Tc, AES will require UF_6 suppliers to provide Commercial Natural UF_6 in accordance with ASTM C787-03, "Standard Specification for Uranium Hexafluoride for Enrichment." In addition, cylinder suppliers will be required to preclude use of cylinders that, in the past, have contained reprocessed UF_6, unless they have been decontaminated. Periodic audits of suppliers will be performed to provide assurance that these requirements are satisfied.

FIGURES

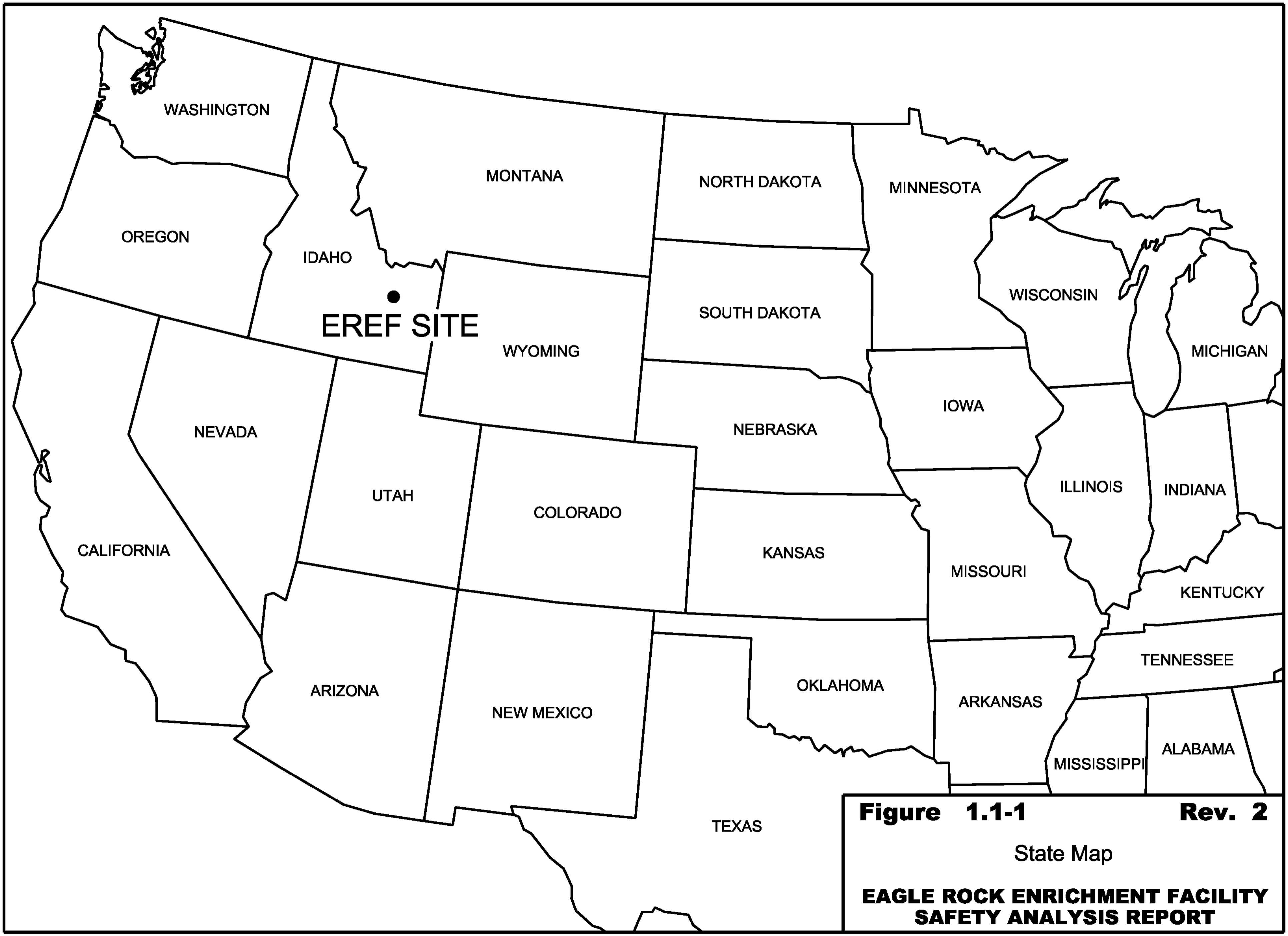


Figure 1.1-1 **Rev. 2**

State Map

EAGLE ROCK ENRICHMENT FACILITY
SAFETY ANALYSIS REPORT

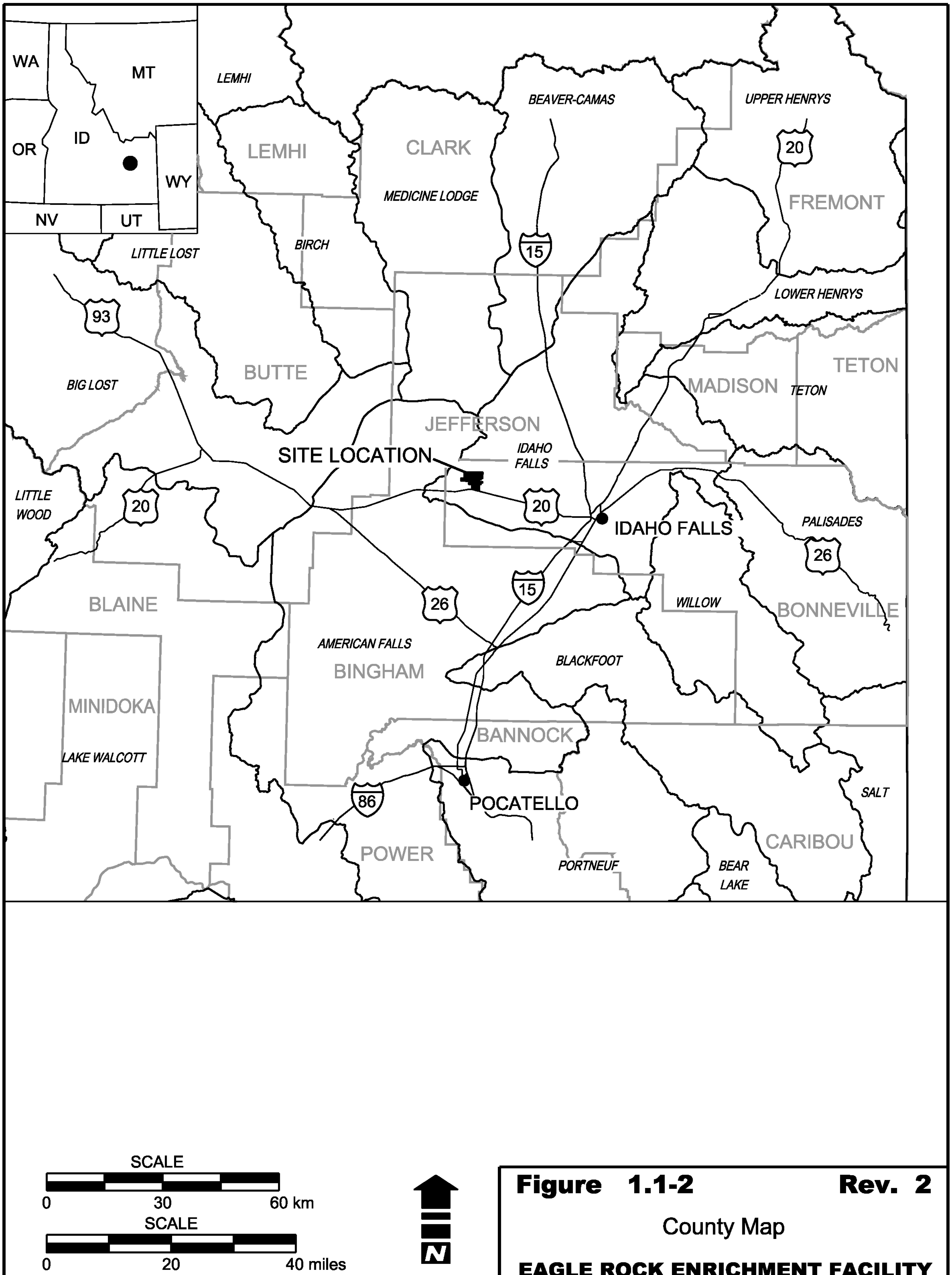


Figure 1.1-2 **Rev. 2**

County Map

EAGLE ROCK ENRICHMENT FACILITY
SAFETY ANALYSIS REPORT

Figure 1.1-3, Site Plan with Property and Controlled Area Boundary, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-4, Facility Layout,
contains Security-Related Information
Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-5, Separations Building Module/UF_6 Handling Area Basement, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-6, Separations Building Module/UF_6 Handling Area First Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-7, Separations Building Module/UF_6 Handling Area Second Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-7A, Separations Building Module/UF_6 Handling Area Roof, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-8, Technical Support/Operations Support Building First Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-9, Technical Support/Operations Support Building Second Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-10, Technical Support/Operations Support Building Third Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-11, Centrifuge Assembly Building First Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-12, Centrifuge Assembly Building Second Floor, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

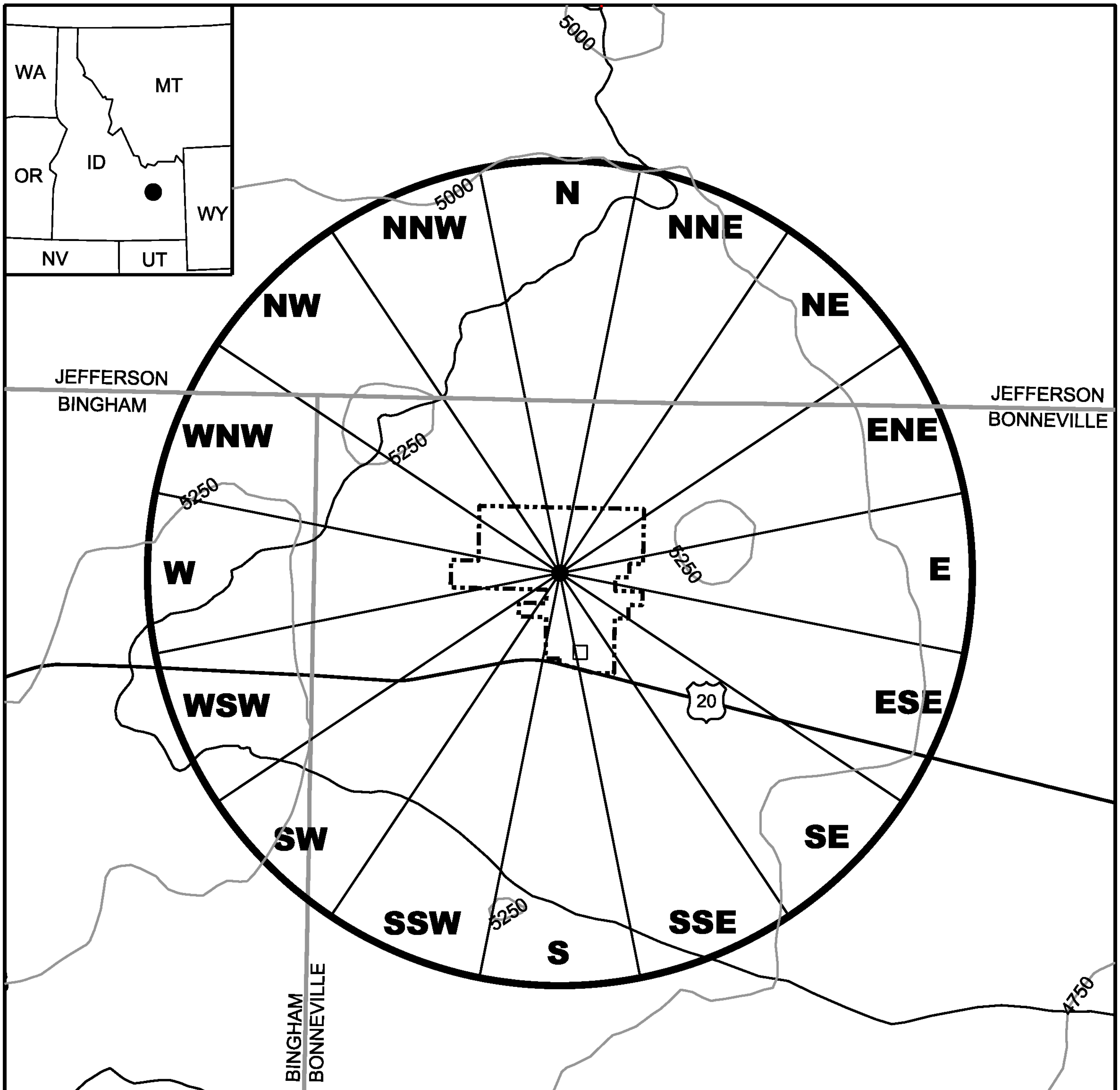
Figure 1.1-13, Cylinder Receipt and Shipping Building Floor Plan, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-14, Blending, Sampling and Preparation Building Floor Plan, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-15, Mechanical Services Building Floor Plan, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-16, Electrical Services Building Floor Plan, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

Figure 1.1-17, Electrical Services Building for Centrifuge Assembly Building Floor Plan, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390



LEGEND:

5250 — APPROXIMATE EXISTING GROUND SURFACE CONTOUR AND ELEVATION, ft

PROPOSED SITE BOUNDARY

5 mi (8 km) RADIUS

SCALE
0 4000 8000 m

SCALE
0 2 4 miles

N

Figure 1.3-1 **Rev. 2**

Radial Sectors 5 mi (8 km) Radius

EAGLE ROCK ENRICHMENT FACILITY SAFETY ANALYSIS REPORT