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2.0 ALTERNATIVES

This chapter describes the alternatives to the proposed action described in ER Section 1.2, Proposed Action. The range of alternatives considered in detail is consistent with the underlying need for and purposes of the proposed action, as set forth in ER Section 1.1, Purpose and Need for the Proposed Action. Accordingly, the range of alternatives considered is based on the underlying need for additional reliable and economical uranium enrichment capacity in the United States – as would be provided by the proposed Eagle Rock Enrichment Facility (EREF) – as well as related commercial considerations concerning the security of supply of enriched uranium. The alternatives considered in detail include (1) the “no-action” alternative under which the proposed EREF would not be built, (2) the proposed action to issue a Nuclear Regulatory Commission (NRC) license to AREVA Enrichment Services, LLC (AES) for the construction and operation of the EREF, (3) alternative technologies available for an operational uranium enrichment facility, (4) design alternatives and (5) alternative sites for the proposed enrichment facility.

This chapter also addresses the alternatives that were considered, but ultimately eliminated, as well as the potential cumulative impacts of the proposed action. Finally, this chapter presents, in tabular form, a comparison of the potential environmental impacts associated with the proposed action and various scenarios possibly arising under the no-action alternative.

2.1 DETAILED DESCRIPTION OF THE ALTERNATIVES

This section identifies the no action alternative, the proposed action, and reasonable alternatives to the proposed action. Included are the technical design requirements for the proposed action and its reasonable alternatives.

2.1.1 No-Action Alternative

The no-action alternative for the Eagle Rock Enrichment Facility (EREF) would be to not build the proposed EREF. Under the no-action alternative, the NRC would not approve the license application to construct and operate the proposed facility. Accordingly, the current owners of the private property upon which the proposed facility would be sited would be free to continue the current uses of the property or pursue alternative uses of the property. In the absence of NRC approval of the EREF license, utility customers would be required to meet their uranium enrichment service needs through existing suppliers. In the United States, this would mean that the one remaining operating enrichment facility, the gaseous diffusion facility operated by the United States Enrichment Corporation (USEC) at Paducah, Kentucky, would be the only domestic facility currently available to serve this purpose. Therefore, USEC would remain the sole current domestic supplier of low-enriched uranium. As discussed in ER Section 1.1.2.3, Current and Potential Future Sources of Uranium Enrichment Services, the Paducah Gaseous Diffusion Plant (GDP) operated by USEC is expected to be shutdown in June 2012.

In December 2003 and August 2004, two companies (Louisiana Energy Services (LES) and USEC) that offer uranium enrichment services worldwide, submitted applications to the NRC for licenses to build and operate new centrifuge based uranium enrichment plants in the United States. In June 2006 and April 2007, respectively, the NRC issued those licenses; and construction is presently underway on both facilities (National Enrichment Facility (NEF) and the American Centrifuge Plant (ACP)) (NRC, 2007a).

As discussed in ER Section 1.1.2.4.2, Scenario B – Base Supply of Enrichment Services Without AES's U.S. Plant, if it is assumed that the LES NEF (using proven Enrichment Technology Company Ltd. (ETC) technology) and the USEC ACP are completed and operate successfully in the U.S., then together with small contributions of equivalent supply from down blended U.S. HEU and limited recycle, they would be capable of supplying only 61% of the U.S. requirements during the period of AES's Reference Nuclear Power Growth forecast.

In addition to the potential LES and USEC future sources of enrichment services, General Electric (GE)-Hitachi Nuclear Energy (GEH) has initiated work that is based on Silex laser enrichment technology (GLE). On January 30, 2009, GEH delivered its environmental report to the NRC with the rest of the license application to be submitted by June 2009 (SILEX, 2009). If GEH ultimately makes the decision to deploy GLE commercially, following results of testing that is scheduled to occur during 2009, GEH then expects to have a commercial Lead Cascade operational by 2012 or 2013.

The above potential enrichment services alone would be inconsistent with the clear federal policy of fostering the development of additional, secure, reliable, and economical domestic enrichment capacity to promote both U.S. energy security and national security. The Department of Energy (DOE) believes that the earlier than anticipated cessation of plant operations at Portsmouth has serious domestic energy security consequences, including the inability of the U.S. enrichment supplier USEC to meet all its enrichment customers' contracted fuel requirements, in the event of a supply disruption from either the Paducah plant production or the Highly Enriched Uranium (HEU) Agreement deliveries. As the DOE has further recognized, these energy security concerns are due, in large part, to the lack of available replacement for the inefficient and noncompetitive gaseous diffusion enrichment plants. In its application for the ACP, USEC noted the Portsmouth facility "is over 50 years old and the power costs to product SWU are significant." Although USEC is pursuing development and deployment of its own advanced centrifuge technology, this technology has yet to be proven commercially viable.

Even if USEC were able to bring the proposed facility online successfully, as well as LES bring their facility online, their operation alone would not guarantee security of supply, particularly in view of forecasted installed nuclear generating capacity and uranium enrichment requirements discussed in ER Section 1.1.2, Market Analysis of Enriched Uranium Supply and Requirements.

As discussed in ER Section 1.1, Purpose and Need for the Proposed Action, the U.S.-Russian HEU agreement (for which USEC is the U.S. executive agent) is currently scheduled to expire in 2013, and like other arrangements for the importation of foreign-enriched uranium, it may be subject to disruptions caused by both political and commercial factors. These circumstances have raised concerns among U.S. purchasers of enrichment services with respect to the security of their supplies. The past contract dispute between Russia's Techsnabexport (Tenex) and its former affiliate Globe Nuclear Services & Supply provides one example of the concerns raised by potential supply disruptions. As noted in a trade press article, even though this dispute was not expected to impact the US-Russian HEU Agreement or other sales by Tenex, "some utilities may now come to view those supplies as less certain and take steps to line up alternate sources of supply or to ask for price discounts to account for perceived increased delivery risk." (NW, 2003)

Under the no-action alternative, a decision by the NRC not to approve the EREF license application would reduce the projected domestic enrichment capacity and therefore limit the diversity and security of the U.S. enrichment supply. This alternative, therefore, would not serve the recognized need of the U.S. government to promote energy and national security through the development of additional, secure, reliable, and economical domestic enrichment capacity; nor would it serve the need of utility customers to ensure secure supplies and diverse suppliers of enrichment services.

2.1.2 Proposed Action

The proposed action, as described in ER Section 1.2, Proposed Action, is the issuance of an NRC license under 10 CFR 30, 40 and 70 (CFR, 2008c; CFR, 2008d; CFR, 2008b) that would authorize AES to possess and use byproduct material, source material and special nuclear material (SNM) and to construct and operate a uranium enrichment facility at a site located in Bonneville County, Idaho. ER Section 1.2 contains a detailed description of the proposed action, including relevant general background information, organization sharing ownership, and project schedule.

2.1.2.1 Description of the Proposed Site

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 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 U. S. Bureau of Land Management (BLM). Also, there are two, 16-ha (40-ac) parcels located within the proposed site that the Federal government did reserve for itself certain mineral rights which were not subject to claim or patent by anyone under the General Mining Act of 1872 (USC, 2008f). These reservations were released, remised and quitclaimed to the person to whom the land was patented pursuant to Section 64.b of the Atomic Energy Act of 1954, as amended, and are no longer valid. The privately held land will be purchased by AES. The approximate center of the Eagle Rock Enrichment Facility is located at latitude 43 degrees, 35 minutes, 7.37 seconds North and longitude 112 degrees, 25 minutes, 28.71 seconds West. Refer to Figure 2.1-1, 80-Kilometer (50-Mile) Radius With Cities and Roads.

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. 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. 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 about 1,556 m (5,106 ft) to about 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.

The proposed site is in native rangeland, non-irrigated seeded pasture, and irrigated cropland. The proposed site is seasonally grazed. Wheat, barley, and potatoes are grown on 389 ha (962 ac) of irrigated land on the proposed site. One potato storage facility is located at the south end of the site.

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 nearest offsite croplands are within 0.8 km (0.5 mi) of the southeast corner of the proposed site. The nearest feedlot and dairy operations are about 16 km (10 mi) east of the proposed site. 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. 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. The lands north, east, and south of the site are a mixture of private-, State-, and Federal-owned parcels.

The city of Idaho Falls, the nearest major city, 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. The town of Fort Hall is located a distance of approximately 60 km (37 mi).

The nearest residence is 7.7 km (4.8 mi) east of the proposed site. Temporarily occupied structures in the 8-km (5-mi) radius include a transformer station adjacent to the proposed site to the east, and potato cellars, one 3.2 km (2 mi) west of the proposed site, and one 7.7 km (4.8 mi) to the east. 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. The Wasden Complex, consisting of caves formed by collapsed lava tubes, is located approximately 3.2 km (2 mi) northeast from the footprint of the EREF.

Figure 2.1-2, Site Area and Facility Layout Map 1.6-Kilometer (1-Mile) Radius, Figure 2.1-3, Existing Conditions Site Aerial Photograph, and Figure 2.1-4, EREF Buildings show the site property boundary and the general layout of the buildings on the EREF site.

Refer to ER Figure 1.2-3, EREF Location Relative to Transportation Routes, for the location of highways and railroad lines relative to the proposed site.

2.1.2.2 Applicant for the Proposed Action

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 the 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 et consignations 3.33%
- ERAP 3.74%
- Electricité de '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 20817, 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 of AES is 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.

2.1.2.3 Facility Description

The EREF is designed to separate a feed stream containing the naturally occurring proportions of uranium isotopes into a product stream enriched in ^{235}U and a uranium stream depleted in the ^{235}U isotope. Following is a summary description of the EREF process, buildings and related operation. The EREF ISA Summary contains a detailed description of facility characteristics, including plant design and operating parameters.

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 involves the mechanical separation of isotopes using a fast rotating cylinder (centrifuge) and is based on a difference in centrifugal forces due to differences in the molecular weight of the uranic isotopes. No chemical or nuclear reactions take place. The feed, product, and depleted uranium streams are all in the form of UF_6.

The UF_6 feed arrives from conversion facilities as a solid under partial vacuum in 122-cm (48-in) diameter transportation cylinders. Product material is collected in 76-cm (30-in) diameter containers and transported to a fuel fabricator. The depleted UF_6 material is collected in 122-cm (48-in) diameter containers and removed for temporary storage onsite.

The plant design capacity is 6.6 million separative work units (SWU) per year i.e., a nominal 6 MSWU per year production rate. At full production in a given year, the plant will receive approximately 17,518 MT (19,310 tons) of UF_6 feed, supply 2,252 MT (2,482 tons) of low enriched UF_6, and yield 15,270 MT (16,832 tons) of depleted UF_6. The principal EREF operational structures are shown on Figure 2.1-4, EREF Buildings, and include the following:

- Separations Building Modules (includes UF_6 Handing Area, Cascade Halls, Process Service Corridor)
- Blending, Sampling and Preparation Building (BSPB)
- Technical Support Building (TSB)
- Operation Support Building (OSB)
- Centrifuge Assembly Building (CAB)

- Cylinder Receipt and Shipping Building (CRSB)
- Electrical Services Building (ESB)
- ESB for the CAB
- Mechanical Services Buildings (MSBs) – 2 Buildings
- Cylinder Storage Pads
- Administration Building
- Security and Secure Administration Building
- Guard House
- Visitor Center
- Gasoline and Diesel Fueling Station (GDFS)

Information on items used, consumed, or stored at the site during construction and operation is provided in ER Section 3.12.4, Resources and Materials Used, Consumed or Stored During Construction and Operation.

2.1.2.3.1 Separations Building Modules (SBM)

The facility includes four identical Separations Building Modules. Each module consists of two Cascade Halls. Each Cascade Hall houses twelve cascades, each of which consists of hundreds of centrifuges connected in series and parallel producing a single product concentration at any one time. Each Cascade Hall is capable of producing a maximum of 825,000 SWU per year. In addition to the Cascade Halls, each Separations Building Module houses a UF_6 Handling Area and a Process Service Corridor.

An assay unit consists of twelve cascades. The centrifuges are mounted on precast concrete floor-mounted elements (flomels). Each Cascade Hall is enclosed by a structural steel frame that supports insulated sandwich panels. This enclosure surrounds each Cascade Hall to aid in maintaining a constant temperature within the cascade enclosure.

The UF_6 Handling Area contains the Feed System, Product and Tails Take-off Systems. The Process Service Corridor contains the gas transport equipment, which connects the cascades to the Product Take-off System and Tails Take-off Systems and the Cascade Systems. The Process Service Corridor also contains key electrical and cooling water systems. Each SBM will have its own Gaseous Effluent Ventilation System (GEVS). The SBM GEVS for Module 1 serves the Blending, Sampling, and Preparation Building (BSPB).

2.1.2.3.2 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 primary function of the BSPB is to provide means to fill 30B cylinders with UF_6 at a required ^{235}U concentration level and sample the product cylinders for ^{235}U concentration and UF_6 purity. In addition, cylinder activities including testing, weighing, conditioning, defrosting and inspection are performed in the BSPB.

Cylinder preparation activities include testing and inspecting new or cleaned 30B and 48Y cylinders and conditioning and evacuation of used (i.e., with heels) 30B and 48Y cylinders for use in the plant. Equipment is available within the room to fit plugs and valves to new empty or cleaned empty cylinders to internally visually inspect the cylinders and to pressure test the cylinders, condition cylinders and remove cylinder heels if required.

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.

2.1.2.3.3 Technical Support Building (TSB)

The TSB is adjacent to the Separation Building Modules (SBMs), the Blending, Sampling and Preparation Building (BSBP) and the Operation Support Building (OSB). The TSB contains radiological support areas for the facility. The TSB acts as a secure point of entry to the SBMs and the BSPB. Entry into the TSB is typically made by first entering into the OSB through a lobby and then passing through the OSB into the TSB itself.

The TSB contains the following functional areas located on the first floor:

<u>Solid Waste Collection Room</u>

The Solid Waste Collection Room processes both wet and dry low-level solid waste. Wet waste is categorized as radioactive, hazardous or industrial waste and includes assorted materials, oil recovery sludge, oil filters and miscellaneous hazardous wastes. Dry waste is also categorized as radioactive, hazardous or industrial waste and includes assorted materials, activated carbon, aluminum oxide (also referred to as alumina), sodium fluoride, HEPA filters, scrap metal and other miscellaneous plant equipment.

<u>TSB Gaseous Effluent Ventilation System (GEVS)</u>

The GEVS removes uranyl fluoride (UO_2F_2), i.e., uranium compounds particulates containing uranium and hydrogen fluoride (HF) from potentially contaminated process gas streams. Pre-filters and absolute high efficiency particulate air (HEPA) filters remove particulates, including uranium particles, and activated charcoal filters remove HF. The TSB GEVS serves the TSB.

<u>Technical Support Building Contaminated Area Heating, Ventilation and Air Conditioning (HVAC) System</u>

The Technical Support Building Contaminated Area HVAC System maintains the room temperature in various areas of the TSB, including some potentially contaminated areas. For the potentially contaminated areas, the TSB Contaminated Area HVAC System maintains a negative pressure in these rooms and discharges the room air to an exhaust vent on the TSB roof. The system provides for continuous alpha and HF monitoring.

<u>Liquid Effluent Collection and Treatment Room</u>

The Liquid Effluent Collection and Treatment Room is used to collect potentially contaminated liquid effluents produced onsite, which are monitored for contamination prior to processing. These liquid effluents are stored in tanks prior to processing. The contaminated liquids are processed for uranium removal. Liquid effluents produced by the plant include hydrolyzed uranium hexafluoride, degreaser water, citric acid, floor wash water, and miscellaneous effluent.

These liquid effluents are processed through several precipitation units, filtration units, microfiltration units and evaporation units.

<u>Laundry Sorting Room</u>

The Laundry Sorting Room provides an area to sort potentially contaminated and soiled clothing and other articles that have been used throughout the plant. Lightly contaminated articles will be shipped off-site to be laundered; heavily contaminated articles are inspected first and if too difficult to clean are sent to the Solid Waste Collection System, otherwise they will be shipped off-site to be laundered as well.

Radiation Monitoring Room

The Radiation Monitoring Room is the point of demarcation between non-contaminated areas and potentially contaminated areas of the plant. It includes space for personnel contamination monitoring equipment (e.g., hand and foot monitors or portal monitors), hand washing facilities, safety showers, and access controls for preventing the spread of contamination (e.g., a step-off pad).

Truck Bay/Shipping and Receiving Area

The Truck Bay is used as a place to load packaged low-level radioactive wastes and hazardous wastes onto trucks for transportation offsite to a licensed processing facility and/or licensed disposal facility. It is also used for miscellaneous shipping and receiving.

Ancillary Areas

The following ancillary areas are located on the first floor: electrical room, offices, stairs, corridors, and elevators.

The TSB contains the following areas located on the second floor: HVAC rooms, Electrical rooms, stairs, corridors and elevators:

The TSB contains the following functional areas located on the third floor:

Chemical Trap Workshop

The Chemical Trap Workshop provides space for the maintenance of chemical traps, the temporary storage of full and empty traps and for the contaminated chemicals used in the traps. The activities carried out within the Chemical Trap Workshop include receipt and storage of saturated chemical traps, chemical removal and temporary storage.

The Chemical Trap Workshop is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Mobile Unit Disassembly and Reassembly Workshop

This workshop provides space for the maintenance of mobile vacuum pump skids and the temporary storage of vacuum pump skid components.

The Mobile Unit Disassembly and Reassembly Workshop is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Valve and Pump Dismantling Workshop

This workshop provides space for the dismantling and maintenance of valves and pumps and for the temporary storage of valve and pump components prior to decontamination. It is also used for the temporary storage and subsequent dismantling of failed pumps. The activities carried out within this workshop include receipt and storage of contaminated pumps, out-gassing, Perfluoropolyether (PFPE) oil removal and storage, pump stripping, and the dismantling and maintenance of valves.

The Valve and Pump Dismantling Workshop is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Decontamination Workshop

The Decontamination Workshop provides a facility for the removal of radioactive contamination from contaminated materials and equipment. The decontamination system consists of a series of steps including equipment disassembly, degreasing, decontamination, drying and inspection. Components commonly decontaminated include pumps, valves, piping, instruments, sample bottles, tools and scrap metal.

The Decontamination Workshop is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Maintenance Facility

The Maintenance Facility provides space for the normal maintenance of contaminated plant equipment. The facility also deals with faults associated with the pump motors, all instrument and control equipment, lighting, power, and associated process and services pipe work. It also provides space for the temporary storage of minor plant equipment.

The Maintenance Facility is under negative pressure. Therefore, any equipment or personnel entering this room must go through an air-lock.

Laboratory Areas

The laboratory areas provide space for various rooms and laboratories that receive, prepare, and store various samples including:

- Mass Spectrometry Laboratory - for the process of uranium isotope measurement
- Analytical Chemistry Laboratory - for the process of UF_6 quality assurance
- Sample Preparation Room
- Sample Bottle Storage Room
- Uranium Analysis Room
- Physical Analysis Room
- Alpha/Beta/Gamma Counting
- Gas Fourier Transfer Infrared Spectrometry (G-FTR) Room
- Inductively Coupled Plasma Atomic Emission Spectroscopy/Inductive Coupled Plasma Mass Spectrometry (ICPAES/ICPMS) Room
- Sub-Sampling Unit Room

Ancillary Areas

The following ancillary areas are located on the third floor: archive storage, offices, conference rooms, stairs, corridors, and elevators.

2.1.2.3.4 Operation Support Building (OSB)

The OSB is adjacent to the Technical Support Building (TSB) and the Blending, Sampling and Preparation Building (BSBP). The OSB contains non-radiological support areas for the facility.

The OSB contains the following functional areas located on the first floor:

Vacuum Pump Rebuild Workshop

The Vacuum Pump Rebuild Workshop provides space for the maintenance and re-building of plant equipment, mainly pumps that have been decontaminated in the Decontamination Workshop, and other miscellaneous plant equipment.

Mechanical, Electrical and Instrumentation (ME&I) Workshop

The ME&I Workshop provides space for the normal maintenance of non-contaminated plant equipment. The facility also deals with faults associated with the pump motors, all instrument and control equipment, lighting, power, and associated process and services pipe work. It also provides space for the temporary storage of rebuilt and minor plant equipment.

Medical Room

The Medical Room provides space for a nurse's station.

Locker Rooms

The Locker Rooms provide change areas, showers, and toilets.

Lobby

The Lobby is the entry point to the plant.

Ancillary Areas

The following ancillary areas are located on the first floor: storage areas, heating, ventilation, and air conditioning (HVAC) and electrical rooms, offices, stairs, and corridors.

The OSB contains the following functional areas located on the second floor:

Control Room

The Control Room is the main monitoring point for the entire plant and provides all of the facilities for the control of the plant, operational requirements and personnel comfort. It is a permanently staffed area that contains the following equipment:

- Overview screen
- Control desk
- Fire alarm system
- Storage facilities
- Communication systems.

In an emergency, the Control Room serves as the primary Emergency Operations Center (EOC) for the facility.

Training Room and Operation Support

The Training Room and Operation Support is used for Control Room training and provides some plant operation support functions. It has visual and personnel access to the Control Room and contains the following:

- Plant Control System Training System
- Centrifuge Monitoring System Training System
- Central Control System switches and servers.

Security Alarm System Room

The Security Alarm System is used as the primary security monitoring station for the facility. All electronic security systems will be controlled and monitored from this center. These systems will include but not be limited to: Closed Circuit Television (CCTV), Intrusion Detection & Assessment (IDA), Access Control and radio dispatch.

Ancillary Areas

The following ancillary areas are located on the second floor: archive areas, conference room offices (operators, shift manager and security), stairs, and corridors.

The OSB contains the following functional areas located on the third floor:

Environmental Laboratory Area

The Environmental Laboratory Area provides rooms and space for various laboratory areas that receive, prepare, and store various samples as follows:

- Environmental Storage Room
- Environmental Sampling, Storage, Preparation and Analysis
- Fluorimetry Room
- Filter Counting Room

Exam Room

The Exam Room, which is part of the Medical Room, provides privacy for medical examinations.

Security Room

The Security Room provides a work space for the on-site shift security personnel.

Ancillary Areas

The following ancillary areas are located on the third floor: conference rooms, offices, stairs, and corridors.

2.1.2.3.5 Centrifuge Assembly Building (CAB)

The CAB is located adjacent to the Separations Building Modules (SBMs). It is used for the assembly, inspection, and separation testing of the centrifuges prior to installation in the Cascade Halls of the Separations Building Modules and introduction of UF_6. Centrifuge assembly operations are undertaken in clean room conditions. The building is divided into the following distinct areas:

Centrifuge Component Storage Areas

The Centrifuge Component Storage Areas serve as the initial receipt location for the centrifuge parts. They are designed to store delivered centrifuge components. These components are delivered by truck in specifically designed containers, which are then packed into International Organization for Standardization (ISO) freight containers. These containers are off-loaded via fork lift truck and placed in the storage areas through one of two roller shutter doors located at the end of the CAB.

Because the assembly operations are undertaken in clean room conditions, the centrifuge component containers will be cleaned within the Centrifuge Component Storage Areas, prior to admission to the Centrifuge Assembly Areas. The Centrifuge Component Storage Areas also act as an acclimatization area to allow components to equilibrate with the climatic conditions of the Centrifuge Assembly Areas.

Transfer of components and personnel between a Centrifuge Component Storage Area and a Centrifuge Assembly Area will be via an airlock to prevent ingress of airborne contaminants.

Centrifuge Assembly Areas

Centrifuge components are assembled into complete centrifuges in these areas. Assembly operations are carried out in one production line. The centrifuge operates in a vacuum; therefore, centrifuge assembly activities are undertaken in clean-room conditions to prevent ingress of volatile contaminants, which would have a detrimental effect on centrifuge performance. Prior to installation into the cascade, the centrifuge has to be conditioned, which is done in the Centrifuge Assembly Areas prior to storage in the Assembled Centrifuge Storage Areas.

Assembled Centrifuge Storage Areas

Assembled and conditioned centrifuges are stored in the Assembled Centrifuge Storage Areas prior to installation. During construction of the plant, a separate installation team will access these areas and transfer the assembled and conditioned centrifuges to the Cascade Halls for installation.

Centrifuges are to be routed via a covered communication corridor, which links the CAB with the Separations Building Modules.

Building Office Area

A general office area is located adjacent to the assembly areas. It contains the main personnel entrance to the building as well as entrances to the assembly storage and assembly workshop. It is a two-story area, which includes:

- Offices
- Change Rooms
- Break Room
- Maintenance Area
- Chemical Storage Area
- Battery Charging Area.

Centrifuge Test and Post Mortem Facilities

The Centrifuge Test Facility provides an area to test the functional performance of production centrifuges and ensure compliance with design parameters. It also provides an area to investigate production and operational problems. The demand for centrifuge post mortems is infrequent.

The principal functions of the Centrifuge Post Mortem Facility are to:

- Facilitate dismantling of contaminated centrifuges using equipment and processes that minimize the potential to contaminate personnel or adjacent facilities
- To prepare potentially contaminated components and materials for transfer to the TSB prior to disposal.

Centrifuges are brought into the facility on a specially designed transport cart via an airlock entry. The facility is also equipped with radiological monitoring devices, toilets and washing facilities; and hand, foot and clothing personnel monitors to detect surface contamination.

The Centrifuge Post Mortem Facility includes a centrifuge dismantling area and an inspection area. The centrifuge dismantling area includes a stand onto which the centrifuge to be dismantled is mounted providing access to the top and bottom of the centrifuge. A local overhead traveling crane is located over the stand to enable removal of the centrifuge from the transport cart and facilitate loading onto the stand.

The inspection area includes an inspection bench, portable lighting, a microscope, an endoscope and a digital video/camera.

2.1.2.3.6 Cylinder Receipt and Shipping Building (CRSB)

The CRSB is located near the Cylinder Storage Pads. All UF_6 cylinders are received and shipped from this location. It is designed to include space for the following:

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

Cylinders are delivered to the facility in transport trucks. The trucks park inside the CRSB at the main vehicle loading bay. Girder bridge cranes load and unload the cylinders from the trucks and handle the cylinders within the CRSB. The cranes span the width and run the full length of the building.

After delivery, the cylinders are processed for receipt as empty tails cylinders (48Y cylinders), empty product cylinders (30B cylinders) or UF_6 feed cylinders (48Y cylinders). They are inspected and moved to their appropriate locations.

All cylinders shipped from the site are processed through the CRSB.

2.1.2.3.7 Electrical Services Building (ESB)

The Electrical Services Building is located immediately north of the Separation Building Modules. It houses four standby diesel generators (DGs), which provide the site with standby power.

The building also contains day tanks, switchgears, control panels, and building heating, ventilation, and air conditioning (HVAC) equipment. The rooms housing the 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.

The diesel fuel unloading area provides tanker truck access to the two above ground tanks, which provide diesel fuel storage. Secondary containment (berms) will be provided to contain spills or leaks from the two above ground diesel fuel tanks. The above ground diesel storage tank area will be included in the site Spill Prevention Control and Countermeasures (SPCC) plan.

2.1.2.3.8 Mechanical Services Buildings (MSBs)

The Mechanical Services Buildings are located south of the Separation Building Modules. They house air compressors, the demineralized water systems, and the centrifuge cooling water system pumps, heat exchangers and expansion tanks.

2.1.2.3.9 Cylinder Storage Pads

The EREF uses several outside areas for storage of full cylinders containing UF_6 and empty cylinders.

Cylinders containing UF_6 that is depleted in ^{235}U are temporarily stored on the Full Tails Cylinder Storage Pads. The depleted UF_6 is stored under vacuum in corrosion resistant Type 48Y cylinders. Approximately 1,222 full tails cylinders per year could be stored on the storage pads. A storage area to support lifetime plant operations would need to accommodate a maximum of 25,718 cylinders of depleted uranium. These cylinders could be stacked two high and are temporarily stored on concrete saddles that elevate the cylinders approximately 0.2 m (0.65 ft) above ground level. (See ER Section 4.13.3.2, DUF_6 Cylinder Temporary Storage.) Transporters move the cylinders from the Blending, Sampling, and Preparation Building out to the Full Tails Cylinder Storage Pads, where cranes remove the cylinders from the transporters and place them on the storage pads. Since it is expected that full tails storage cylinders will be shipped offsite soon after they are filled, the storage pads will be developed in sections over the life of the facility on an as-needed basis.

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. Transporters will move the cylinders after delivery to the Cylinder Receipt and Shipping Building out to the Full Feed Cylinder Storage Pads, where cranes remove the cylinders from the transporters and place them on the storage pads. The full feed cylinders will be subsequently transported to the Blending, Sampling, and Preparation Building prior to use in the UF_6 Handling Area.

Empty cylinders (feed, product and tails) will be temporarily stored (up to six months) on the Empty Cylinder Storage Pads. The pads are sized to store approximately 1,840 empty cylinders. Empty cylinders can be stacked two high. Transporters will move the empty cylinders from various areas of the facility out to the Empty Cylinder Storage Pads, where cranes remove the cylinders from the transporters and place them on the storage pads. Empty cylinders will subsequently be transported to the Blending, Sampling, and Preparation Building for use.

The Full Tails, Full Feed, and Empty Cylinder Storage 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. Transporters will move the recently filled cylinders from the Blending, Sampling, and Preparation Building out to the Full Product Cylinder Storage Pad, where cranes remove the cylinders from the transporters and place them on the storage pad. The full product cylinders will subsequently be transported to the Cylinder Receipt and Shipping Building prior to shipment offsite.

The Full Product Cylinder Storage Pad is located near the Blending, Sampling, and Preparation Building adjacent to the Cylinder Receipt and Shipping Building.

The Cylinder Overpack Storage Pad is also located near the Blending, Sampling, and Preparation Building adjacent to the Cylinder Receipt and Shipping Building. The cylinder overpack protective packaging is stored on this pad.

2.1.2.3.10 Administration Building

The Administration Building is on the south end of the site near the Security and Secure Administration Building. It contains general office areas. All personnel access to the plant occurs at this location. 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.

Approximately 30 work locations are provided for the plant office staff. The office environment consists of private, semiprivate, and open office space. It also contains a kitchen, break room, conference rooms, building service facilities such as the janitor's closet and public telephone, and a mechanical equipment room.

2.1.2.3.11 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 enter the Security and Secure Administration Building after passing through the Administration Building.

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.

Entry to the plant area from the Security and Secure Administration Building is only possible through the EECP. Approximately 20 work locations are provided for the plant office staff. The office environment consists of private, semiprivate, and open office space. It also contains a kitchen, break room, conference rooms, building service facilities such as the janitor's closet and public telephone, and a mechanical equipment room.

2.1.2.3.12 Guard House

The 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.

2.1.2.3.13 Visitor Center

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

2.1.2.3.14 Electrical Services Building for the CAB (ESB-CAB)

The ESB-CAB houses four transformers and switchgear, which provide the CAB and the adjacent long term warehouse with power. The building contains switchgear, transformers, and control and lighting panels. The rooms are sized with adequate provisions made for maintenance, as well as equipment removal and equipment replacement.

2.1.2.3.15 Gasoline and Diesel Fueling Station

A Gasoline and 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.

2.1.2.4 Process Control Systems

The EREF uses various operations and Process Controls Systems to ensure safe and efficient plant operations. The principal process systems include:

- Decontamination System
- Liquid Effluent Collection and Treatment System
- Solid Waste Collection System
- Gaseous Effluent Ventilation System
- Centrifuge Test Facility and Post Mortem Gaseous Effluent Ventilation System
- Centrifuge Test and Post Mortem Facilities Exhaust Filtration System
- Technical Support Building Contaminated Area Heating, Ventilation and Air Conditioning (HVAC) System
- Ventilated Room Heating, Ventilation and Air Conditioning (HVAC) System

2.1.2.4.1 Decontamination System

The Decontamination System is designed to remove radioactive contamination - in the form of uranium hexafluoride (UF_6), uranium tetrafluoride (UF_4) and uranyl fluoride (UO_2F_2), i.e., uranium compounds from contaminated materials and equipment. The system consists of a series of steps, including equipment disassembly, degreasing, decontamination, drying, and inspection.

Items commonly decontaminated include pumps, valves, piping, instruments, sample bottles, and scrap metal. Decontamination is typically accomplished by immersing the contaminated component in a 5% citric acid bath with ultrasonic agitation, rinsing with water, drying using compressed air, and then inspecting before release. The process time is about one hour for most plant components. Liquid waste is sent to the Liquid Effluent Collection and Treatment System; solid waste/sludge to the Solid Waste Collection System, and enclosure exhaust air to the Gaseous Effluent Ventilation System prior to venting.

2.1.2.4.2 Liquid Effluent Collection and Treatment System

The Liquid Effluent Collection and Treatment System collects potentially contaminated liquid effluents that are generated in a variety of plant operations and processes. These liquid effluents are collected and stored in tanks prior to processing. The effluent input streams include hydrolyzed UF_6, degreaser water, citric acid, floor wash water, and miscellaneous effluent. The contaminated liquids are processed for uranium removal. Refer to ISA Summary Section 3.5 for additional information.

These liquid effluents are processed through several precipitation units, filtration units, microfiltration units and evaporation units. The final step uses an evaporation process that discharges clean steam to the atmosphere. The remaining solid waste is shipped offsite for disposal at an approved facility.

2.1.2.4.3 Solid Waste Collection System

Solid wastes are generated in two categories: wet and dry. The Solid Waste Collection System is simply a group of methods and procedures that apply, as appropriate, to the two categories of solid wastes. The wet waste portion of the system handles all plant radiological, hazardous, and industrial wastes. Input streams include oil recovery sludge, oil filters, and miscellaneous hazardous materials. Each is segregated and handled by separate procedures. The dry waste portion (i.e., liquid content is 1% or less of volume) input streams include activated carbon, aluminum oxide, sodium fluoride, filters, scrap metal, nonmetallic waste and miscellaneous hazardous materials. The wastes are likewise segregated and processed by separate procedures.

2.1.2.4.4 Gaseous Effluent Ventilation System

The Gaseous Effluent Ventilation System (GEVS) is designed to route some of the potentially contaminated gaseous streams in the Separations Building Modules (SBM), the Blending, Sampling, and Preparation Building and the Technical Support Building (TSB) that require treatment before discharge to the atmosphere. Each SBM and the TSB have an independent GEVS. The systems routes these streams through filter systems prior to exhausting via independent exhaust vents. The filter systems include a pre-filter, HEPA filter, potassium carbonate impregnated activated carbon filter and a final HEPA filter.

After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) exhaust vent on the building roofs.

Potentially contaminated gaseous streams in the SBM include cylinder operations at the stations and maintenance activities. Potentially contaminated gaseous streams in the TSB include the Chemical Trap Workshop, Mobile Unit Disassembly and Reassembly Workshop, Valve and Pump Dismantling Workshop, Maintenance Facility, Decontamination Workshop, Sub Sampling Unit Room, Mass Spectrometer Lab, Analytical Chemistry Lab, Liquid Effluent Collection and Treatment System tank vents. Potentially contaminated gaseous streams in the Blending, Sampling, and Preparation Building include blending operations, liquid sampling operations, cylinder preparation activities, and the Ventilated Room.

2.1.2.4.5 Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System

The Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System is used to collect and treat exhaust of potentially hazardous contaminants from the Centrifuge Test and Post Mortem Facilities. The Centrifuge Test and Post Mortem Facilities Gaseous Ventilation System is located in the Centrifuge Assembly Building and is monitored from the Control Room.

The ductwork is connected to one filter station and vents through a fan. The filter station and fan can handle 100% of the effluent. Operations that require the Centrifuge Test and Post Mortem Facilities Gaseous Effluent Ventilation System to be operational are manually shut down if the system shuts down. The filter system includes a single train of filters consisting of a pre-filter, HEPA filter, potassium carbonate impregnated activated carbon filter and a final HEPA filter. After filtration, the clean gases pass through a fan, which maintains the negative pressure upstream of the filter station. The clean gases are then discharged through the monitored (alpha and HF) exhaust vent on the Centrifuge Assembly Building.

2.1.2.4.6 Centrifuge Test and Post Mortem Facilities Exhaust Filtration System

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System ensures the Centrifuge Post Mortem Facility is maintained at a negative pressure with respect to adjacent areas. The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System is located in the Centrifuge Assembly Building and is monitored from the Control Room.

The Centrifuge Test and Post Mortem Facilities Exhaust Filtration System consists of a 100% filter-fan unit. The filter-fan unit can handle 100% of the effluent. The filter-fan unit operates when the Centrifuge Test and Post Mortem Facilities are in operation and is manually shut down if the Centrifuge Test and Post Mortem Facilities are shutdown. The exhaust flow from the filter-fan unit is discharged to atmosphere through the monitored (alpha and HF) exhaust vent located on the Centrifuge Assembly Building roof.

2.1.2.4.7 Technical Support Building Contaminated Area Heating, Ventilation and Air Conditioning (HVAC) System

The Technical Support Building Contaminated Area HVAC System maintains temperature for various areas of the TSB. For the potentially contaminated areas in the TSB, which include the Chemical Trap Workshop, Mobile Unit Disassembly and Reassembly Workshop, Valve and Pump Dismantling Workshop, Decontamination Workshop, and Maintenance Facility, the TSB Contaminated Area HVAC system maintains a negative pressure in these rooms and discharges the room air to an exhaust vent on the TSB roof. The system provides for continuous alpha and HF monitoring.

2.1.2.4.8 Ventilated Room Heating, Ventilation and Air Conditioning (HVAC) System

The Ventilated Room HVAC System maintains a negative pressure in the Ventilated Room, which is located in the BSPB, and discharges the room air to an exhaust vent on the BSPB roof. The system provides for continuous alpha and HF monitoring.

2.1.2.5 Site and Nearby Utilities

Site water wells will provide water to the site. Water consumption for the EREF is calculated to be 68.2 m^3/day (18,000 gal/d) to meet potable and process consumption needs. Peak water usage for fire protection is 24 L/s (375 gal/min). Electrical service to the site will be provided by Rocky Mountain Power (RMP). The projected demand is approximately 78 MVA. A sanitary sewage treatment system will be installed onsite for the collection and treatment of sanitary and non-contaminated liquid wastes.

Identified, onsite pipelines include 20.3 to 30.5 cm (8 to12 in) diameter, underground steel and PVC water pipe lines connected to Lava Well 3 located in the northeast corner of the site buried 61 to 122 cm (2 to 4 ft) deep. Also included in this area are buried and above ground electrical utility lines servicing the well pump and center pivots used for crop irrigation. The buried electrical lines run between 91 to 122 cm (3 to 4 ft) deep. An above ground electrical line also runs from a point near Highway 20 to the potato cellar located on the south end of the site. A 3.8 to 5 cm (1 ½ to 2 in) buried PVC water line used to service cattle troughs runs from the southeast corner to the northwest corner of the site. These water lines are buried 30.5 to 61 cm (12 to 24 in) deep. A buried electric line and a fiber optic line are located along the north side of Highway 20 within the Right of Way. There are two agricultural wells, referred to as Lava Well 3 and Spud Well, that were previously installed at the proposed site. Lava Well 3 is located in the northeast corner of the site. Spud Well is at the south end of the site near Highway 20. Two buried fuel tanks located near the Lava Well 3 were recently removed by the property owners.

There are no known existing onsite underground storage tanks or sewer systems. There are no gas lines on the site.

Detailed information concerning water resources and the use of potable water supplies is discussed in ER Section 3.4, Water Resources, and the impacts from these water resources are discussed in ER Section 4.4, Water Resources Impacts. A discussion of impacts related to utilities that will be provided to the site is included in ER Section 4.1, Land Use Impacts.

2.1.2.6 Chemicals Used at EREF

The EREF uses various types and quantities of non-hazardous and hazardous chemical materials. Table 2.1-1, Chemical Hazard Classification, lists the hazardous chemicals associated with the EREF operation and their associated hazards. Tables 2.1-2 through 2.1-6 summarize the chemicals (non-hazardous and hazardous) in use and storage, categorized by building or area. These tables also include the physical state and the expected quantity of chemical materials.

2.1.2.7 Monitoring Stations

The EREF will monitor both non-radiological and radiological parameters. Descriptions of the monitoring stations and the parameters measured are described in other sections of this ER as follows:

- Meteorology (ER Chapter 3, Section 3.6)
- Water Resources (ER Chapter 3, Section 3.4)
- Radiological Effluents (ER Chapter 6, Section 6.1)
- Physiochemical (ER Chapter 6, Section 6.2)
- Ecological (ER Chapter 6, Section 6.3)

2.1.2.8 Summary of Potential Environmental Impacts

The following is a summary of the impacts from undertaking the proposed action and measures used to mitigate impacts. Table 2.1-7, Summary of Environmental Impacts for the Proposed Action, summarizes the impact by environmental resource and provides a reference to the corresponding section in ER Chapter 4, Environmental Impacts, which includes a detailed description of the impacts. Detailed discussions of proposed mitigation measures and environmental monitoring programs are provided in ER Chapter 5, Mitigation Measures, and Chapter 6, Environmental Measurements and Monitoring Programs, respectively.

Operation of the EREF would result in the production of gaseous, liquid, and solid waste streams. Each stream could contain small amounts of hazardous and radioactive compounds either alone or in a mixed form.

Gaseous effluents from both non-radiological and radiological sources will be below regulatory limits as specified in permits issued by the Idaho Department of Environmental Quality Air Quality Division (IDEQ/AQD) (IDAPA, 2008i) and release limits by NRC (CFR, 2008x). Thus, potential impacts to members of the public and workers will be minimal.

Liquid effluents would include stormwater runoff and treated sanitary wastewaster from the site Domestic Sanitary Sewage Treatment Plant. All proposed liquid effluents would be discharged on site to the evaporative retention basin.

General site stormwater runoff is collected and released untreated to the Site Stormwater Detention Basin. Two single-lined retention basins, the Cylinder Pads Stormwater Retention Basins, will collect stormwater runoff from Cylinder Storage Pads (Full Feed Cylinder Storage Pads, Full Tails Cylinder Storage Pads, Empty Cylinder Storage Pads and Full Product Cylinder Storage Pad). Treated effluent from the site domestic sanitary sewage treatment plant will also be discharged to the two single-lined Cylinder Storage Pads Stormwater Retention Basins. All stormwater discharges will be regulated, as required, by a National Pollutant Discharge Elimination System (NPDES) Stormwater permit. Approximately 65,240 m^3/yr (17,234,700 gal/yr) of stormwater from the Cylinder Storage Pads are expected to be released, based on mean precipitation discharging to the Cylinder Storage Pads Stormwater Retention Basins. There is no infiltration into the site soils. Based on mean annual precipitation, approximately 85,175 m^3/yr (22,501,000 gal/yr) of stormwater runoff from the site is expected to be released annually to the Site Stormwater Detention Basin. This value takes into account infiltration into the area soils associated with landscaped areas, natural areas and loose gravel areas of the developed portion of the site providing stormwater runoff reaching the Site Stormwater Detention Basin.

EREF liquid effluent discharge rates would be relatively low; for example, total annual discharge from the site domestic sanitary sewage treatment plant is expected to be approximately 18,700 m^3/yr (4,927,500 gal/yr). This discharge source is not expected to contain any uranic material. These treated discharges would be collected and contained in the single-lined Cylinder Storage Pads Stormwater Retention Basins. Emergency hand washing and shower water is collected, monitored and treated by the Liquid Effluent Collection Treatment System as necessary.

Groundwater from two on-site wells would supply water for the proposed EREF. The wells could supply up to 1,713 m^3/day (452,500 gpd) under the current property water appropriation. Average and peak potable water requirements for operation of the EREF are expected to be approximately 68.2 m^3/day (18,000 gpd) and 47 L/sec (739 gpm), respectively. These usage rates are well within the capacities of the wells and are under the appropriation.

The preferred location for non-hazardous construction-related waste is the Bonneville County's construction and demolition landfill (currently the Hatch Pit). When the Hatch Pit approaches its maximum capacity as determined by Bonneville County, a new landfill for construction and demolition wastes will either be opened by Bonneville County or another location found, as alternative locations for disposal of non-hazardous construction-related waste exist in Bingham and Jefferson Counties. These counties are within a reasonable haul distance of the EREF. AES contacted these counties and both acknowledged that they accept construction and demolition waste from outside their respective borders.

Solid waste that would be generated at the proposed EREF, which falls into non-hazardous, radioactive, hazardous, or mixed waste categories, would be collected and transferred to authorized treatment or disposal facilities off site as follows. All solid radioactive waste generated would be Class A low-level waste as defined in 10 CFR 61 (CFR, 2008ee). Approximately 146,500 kg/yr (323,000 lbs/yr) of low-level waste would be generated. During operation, the proposed EREF would generate about 5,062 kg/yr (11,160 lbs/yr) of hazardous waste and about 100 kg/yr (220 lbs/yr) of mixed wastes. As a result, the EREF would be a small quantity generator (SQG) of hazardous waste, which would be disposed by licensed contractors. AES does not plan to treat hazardous waste or store quantities longer than 180 days. Non-hazardous and industrial waste, expected to be approximately 70,307 kg/yr (155,000 lbs/yr) annually, would be collected and disposed of by a licensed solid waste disposal contractor. For example, the non-hazardous wastes could be disposed of in the Bonneville County Peterson Hill Landfill. This landfill accepted 81,647 MT (90,000 tons) of waste in 2007. The estimated annual non-hazardous waste would represent less than 0.01% of the total annual waste accepted at the landfill. This landfill will maintain this yearly 81,647 MT (90,000 tons) waste capacity for the next 80 years.

No communities or habitats defined as rare or unique, or that support threatened and endangered species, have been identified as occurring on the EREF site. Thus, proposed activities are not expected to impact communities or habitats defined as rare or unique, or that support threatened and endangered species, within the 1,700-ha (4,200-ac) proposed site.

Noise generated by the operation of the proposed EREF would be primarily limited to the area immediately surrounding the proposed EREF footprint and U.S. Highway 20. Noise from traffic on U.S. Highway 20 associated with deliveries and worker vehicles during the operation of the proposed EREF would be heard at residences along U.S. Highway 20. There is considerable existing traffic already present on U.S. Highway 20. Therefore, maximum noise levels would not increase, although there would be a longer duration of noise associated with peak commute traffic.

A pedestrian cultural resource survey of the area where the proposed EREF is to be located was conducted from April through July, 2008. The survey resulted in the recording of 11 sites and 17 isolated occurrences (finds); there are three prehistoric, four historic, and four multi-component sites. Further investigation was conducted to determine the national Register of Historic Places (NRHP) eligibility for the prehistoric components of three sites (MW002, MW012, and MW015). Subsequent testing of these sites resulted in a recommendation of not eligible. The historic component of one site (MW004) is recommended as eligible. Seven sites (MW003, MW006, MW007, MW009, MW011, MW013, and MW014) are recommended not eligible for inclusion in the NRHP. The potentially eligible site is within the proposed plant footprint. A treatment/mitigation plan for MW004 will be developed by AES in consultation with the Idaho SHPO to recover significant information. Therefore, the impact on archaeological and cultural resources would be small.

The size and industrial nature of this proposed plant would be new to the immediate area. However, similarly sized industrial facilities are located west of the proposed site. The proposed facility would be about 2.4 km (1.5 mi) or greater from public viewing areas such as U.S. Highway 20, the Wilderness Study Area and the Wasden Complex, making details of the proposed facility difficult to observe. Therefore, the impact on views would be small.

The results of the economic analysis show that the greatest fiscal impact will derive from the 11-year construction period (including four years of assemblage and testing) associated with the proposed facility. The largest impact on local business revenues stems from local construction expenditures, while the most significant impact in household earnings and jobs is associated with construction payroll and employment projected during the 11-year construction period.

Annual facility operations will involve up to 550 employees receiving pay of $36.6 million and $12.7 million in benefits. AES expects that most of these jobs will be filled by residents of the nearby 11-counties, providing numerous opportunities in construction of new housing, in provision of services, and in education. EREF operations could have minor impacts on local public services including education, health services, housing, and recreational facilities, but are anticipated to be minimal.

Radiological release rates to the atmosphere during normal operations are estimated to be less than 19.5 MBq/yr (528 µCi/yr). As stated above, EREF liquid discharges are not expected to contain any uranic material. Estimated annual effective dose equivalents and critical organ (lung) dose equivalents from discharged gaseous effluent to a maximally exposed teen individual located at the plant site boundary are 8.8E-04 mSv (8.8E-02 mrem) and 6.4E-03 mSv (6.4E-01 mrem), respectively. The annual effective dose equivalent and critical organ (teen-lung) dose equivalents from discharged gaseous effluent to the nearest resident located beyond 8 km (5 mi) in any sector are expected to be less than 3.5E-05 mSv (3.5E-03 mrem) and 2.6E-04 mSv (2.6E-02 mrem), respectively.

These dose equivalents due to normal operations are small fractions of the normal background radiation range of 2.0 to 3.0 mSv (200 to 300 mrem) dose equivalent that an average individual receives in the United States (NCRP, 1987a), and within regulatory limits (CFR, 2008x). Given the conservative assumptions used in estimating these values, these concentrations and resulting dose equivalents are insignificant, and their potential impacts on the environment and health are inconsequential.

Operation of the EREF would also result in the annual nominal production of approximately 15,270 MT (16,832 tons) per year of depleted UF_6. The depleted UF_6 would be temporarily stored on site in depleted uranium tails cylinders and would have minor impact while in storage. The maximum annual dose equivalent due to external radiation from the cylinder storage pads (skyshine and direct) is estimated to be less than 1.5E-02 mSv (1.5 mrem) to the maximally exposed person at the nearest point on the site boundary (2,000 hrs/yr) and less than 1.0E-12 mSv (less than 1E-10 mrem) to the maximally exposed resident (8,760 hrs/yr) located approximately 8 km (5 mi) from the cylinder storage pads.

Based on 2000 U.S. Census Bureau data, construction and/or operation of the EREF would not pose a disproportionate impact to the minority or low-income populations within Bonneville, Bingham, and Jefferson counties.

2.1.3 Reasonable Alternatives

This section includes a discussion of alternative enrichment technologies available for an operational enrichment facility, significant alternative designs selected for the Eagle Rock Enrichment Facility (EREF) to improve environmental protection, and the site selection process AES used to select the proposed EREF site and to identify alternatives to that site.

2.1.3.1 Alternative Technologies

AES proposes to use the gas centrifuge enrichment process at the EREF. The gas centrifuge technology used by AES (i.e., Enrichment Technology Company (ETC) technology that is operated by Urenco at three facilities in Europe) has been operated and improved several times over the past 35 years. AES considers the alternative technologies of gaseous diffusion or laser enrichment, to be unreasonable due to their high operating, economic, and environmental costs and/or lack of demonstrated commercial viability.

Gaseous diffusion technology involves the pumping of gaseous uranium hexafluoride (UF_6) through diffusion barriers, resulting in the gas exiting the barrier being slightly enriched ^{235}U isotope. The diffusion barriers and their associated compressed gases are staged, similar to the staging of centrifuges, to produce higher enrichments. The technology, which was developed in the United States during the 1940s, would entail increased capital cost requirements and excessive electrical energy consumption, without obvious environmental advantages. The amount of energy to produce one separative work unit (SWU) is about 50 times greater than the energy required for centrifuge technology (NRC, 1994). Gaseous diffusion technology is currently being used by the U.S. Enrichment Corporation (USEC) at its Paducah facility.

There are two types of laser enrichment technologies, the AVLIS and SILEX technologies. The development of the AVLIS technology has involved USEC. AVLIS is the Atomic Vapor Laser

Isotopic Separation process based on selective photo-ionization (through a laser light) and subsequent separation of ^{235}U atoms from vaporized uranium metal. This technology was proposed as a commercial venture by USEC and its partners in the late 1990s, but soon suspended due to operating and economic factors.

SILEX (Separation of Isotopes by Laser Excitation) is an advanced laser-based process developed by the Australian company, SILEX Systems, Ltd. Particularly, the SILEX technology is a molecular process, which uses lasers that expose ^{235}U and ^{238}U isotopes to an intense monochromatic laser light, producing ionization in one isotope (in this case, ^{235}U), but not in the others. This results in isotope separation and leaves one isotope enriched and the others relatively unaffected. (SILEX, 2008)

General Electric (GE)-Hitachi Nuclear Energy (GEH) has initiated work that is based on SILEX laser enrichment technology (GLE) On January 30, 2009, GEH delivered its environmental report to the NRC with the rest of the license application to be submitted by June 2009 (SILEX, 2009). If GEH ultimately makes the decision to deploy GLE commercially, following results of testing that is scheduled to occur during 2009, GEH then expects to have a commercial Lead Cascade operational by 2012 or 2013. Accordingly, the commercialization of the SILEX enrichment process is still in the early stages of development. Hence, the SILEX laser enrichment technology continues to lack demonstrated commercial viability.

2.1.3.2 Alternative Designs

The EREF design is, in effect, an enhancement to the design of the Claiborne Enrichment Center formerly proposed by Louisiana Energy Services (LES). LES submitted a license application to NRC in 1991 for the proposed Claiborne Enrichment Center. Although the NRC staff approved the Claiborne Enrichment Center design, the underlying ETC (formerly Urenco) centrifuge plant design has undergone certain enhancements in recent years due to operating experience in Europe. Summarized below are the six systems with significant features that have been incorporated into the EREF to improve plant efficiency and further reduce environmental impacts. They include the Cascade System, UF_6 Feed System, Product Take-Off System, Product Liquid Sampling System, Product Blending System, and Tails Take-Off System. Similar improvements are also included in the NRC-licensed, and currently under construction, LES National Enrichment Facility (NEF) in New Mexico.

The primary difference between the Claiborne Enrichment Center and the EREF cascade systems is that all assay units are now identical, whereas in the Claiborne Enrichment Center, one assay unit was designed to produce low assays - in the region of 2.5%. An additional change is the increase from seven Cascades per Cascade Hall to twelve Cascades per Cascade Hall. Maximum Cascade Hall capacity has been increased to 825,000 SWU/yr.

There are two major differences in the "UF_6 Feed System" for the EREF as compared to the Claiborne Enrichment Center. First, the liquid UF_6 phase above atmospheric pressure has been eliminated. Sublimation from the solid phase directly to the gaseous phase below atmospheric pressure is the process proposed in the EREF. A sealed autoclave is replaced with a Solid Feed Station enclosure for heating the feed cylinder. A second major difference is the use of chilled air to cool the feed purification cylinder rather than chilled water.

The EREF "Product Take-Off System" uses a process similar to the Claiborne Enrichment Center, but there are differences. In the current system there is only one product pumping stage, while the Claiborne Enrichment Center used two pumping stages to transport the product for desublimation. In this system, pressures are controlled such that desublimation cannot occur in the piping, eliminating the need for heat tracing and valve hot boxes. In the Claiborne

Enrichment Center the product cylinder stations relied on common chillers to cool the stations, but the current system uses a dedicated chiller for each station. The cold traps used to desublime any UF_6 in the vent gases are smaller than in the Claiborne Enrichment Center design and each is on load cells to continuously monitor accumulation.

EREF's "Product Liquid Sampling System" uses a process very similar to Claiborne Enrichment Center. EREF has a permanent vent system, the Blending and Sampling Vent Subsystem, rather than a mobile unit as used in Claiborne Enrichment Center.

The EREF "Product Blending System" uses a process similar to the Claiborne Enrichment Center, but one major difference is that the EREF uses Solid Feed Stations to heat the donor cylinders. In the EREF system, the feed material is heated and sublimed directly to a gas under low pressure. Autoclaves were used to heat the donor cylinders in the Claiborne Enrichment Center. In that system, the feed material was heated to a liquid and then drawn off as a gas. The EREF utilizes two Product Blending Subsystems with a total of three donor stations and three receiver stations. Another difference is the use of a dedicated vacuum pump/trap set in the current design versus a mobile set in the Claiborne Enrichment Center.

EREF's "Tails Take-Off System" uses a process similar to the Claiborne Enrichment Center, but there are differences. In the new system there is only one depleted UF_6 pumping stage, while the Claiborne Enrichment Center used two pumping stages to transport the depleted UF_6 for desublimation. Depleted UF_6 is desublimed in cylinders cooled with chilled air in the current system, while the Claiborne Enrichment Center used chilled water to cool the cylinders. The Claiborne Enrichment Center contained a total of ten tail cylinders in five double cooling stations for each Separation Plant Module (two Cascade Halls), but the EREF system uses eleven cylinders in single cooling stations for each Cascade Hall. Finally, the current system has a dedicated vacuum pump/trap set for venting and does not use the Feed Purification System like the Claiborne Enrichment Center.

In addition to enhancements in the EREF design as compared to the Claiborne Enrichment Center, the EREF design of the Separations Building Modules (SBM) Gaseous Effluent Ventilation System (GEVS) is an improvement over that licensed by LES for the NEF. The EREF GEVS consists of two separate systems. The "Items Relied on for Safety (IROFS)" portion of GEVS called the GEVS with Passive IROFS that Contain Safe-by-Design Component Attributes is sized and arranged such that a nuclear criticality cannot occur. The other portion of the GEVS, local extraction, is not connected to any sources of enriched material.

Other differences between EREF and NEF include:

- EREF does not utilize cooling towers and therefore, uses much less water since evaporative losses and cooling tower blowdown are eliminated.
- EREF will use evaporators in the liquid effluent treatment system and therefore, eliminate the need to discharge treated process water to an onsite basin.
- EREF has redesigned the NEF Technical Services Building into two separate buildings: Technical Support Building (TSB) and Operation Support Building (OSB). The TSB will contain the radiological support functions and the OSB will contain only non-radiological support functions. This design allows for more compact control of the facility's radiological areas.
- EREF does not utilize a circulating water system for the building HVAC air-conditioning units. The use of glycol, biocides and other chemicals to treat this water is eliminated.

- EREF HVAC units include economizer sections which allow for full outside air intake during moderate weather conditions, thus minimizing the use of air-conditioning compressors and associated electrical power.

Beyond other minor changes, there were no other major design alternatives considered by AES that could further lower the impact of the EREF on the environment.

2.1.3.3 Alternate Sites

AES plans to construct and operate a uranium enrichment facility in the United States (U.S.). Site selection is one of the first steps of this process. The selection process needs to identify a site that will meet AES's technical specifications, business and sustainable development standards, safety requirements, and minimize environmental impacts. The process must also meet environmental review requirements under the National Environmental Policy Act of 1969 as implemented by the U.S. Nuclear Regulatory Commission (NRC) codified in 10 CFR Part 51 (CFR, 2008a) for NRC license applications. In particular, the environmental report (ER) prepared by AES should consider the full range of reasonable alternatives, including alternative sites. The ER should evaluate potential impacts of alternatives at a similar level of detail and compare the results of the evaluation. Therefore, the site selection process must use consistent evaluation criteria, data, and analytical processes; and all steps need to be documented. This report describes the site selection process and results.

2.1.3.3.1 Methodology

AES used a four-step process to select a preferred site that meets technical, environmental, safety, and business requirements. The steps included: (1) identifying potential regions and sites, (2) screening candidate sites (Phase I), (3) evaluation of sites passing Phase I criteria (Phase II), and (4) identifying a preferred site. AES also used three primary siting objectives throughout the four-step process; these objectives were: (1) meet technical requirements, (2) be environmentally acceptable, and (3) provide operational efficiencies.

Step 1 – Identification of Potential Regions and Sites

The region of interest for this project was the continental United States. AES conducted an initial review of the contiguous U.S. to identify smaller regions that met fundamental operating requirements of low seismic hazard and low likelihood of extreme weather conditions. Unstable seismic settings and extreme weather conditions can affect safety, design costs, and operational continuity.

The four criteria used to identify suitable regions were: (1) peak ground acceleration, (2) tornado frequency, (3) hurricane frequency, and (4) severe winter weather. Peak ground acceleration (PGA) was selected because of centrifuge sensitivity to vibrations. A PGA greater than 0.09 g was identified as exceeding upper design-cost limits. Constructing the facility in areas with a PGA no greater than 0.09 g was considered to be necessary to meet design standards, safety requirements, and operational requirements. United States Geologic Survey (USGS) general seismic hazard maps were evaluated through the nationalatlas.gov interactive map system. Areas with a PGA greater than 0.09 g (10 percent probability of exceedance in 50 years) were avoided. Tornado event frequency was selected because of its influence on design to meet safety requirements. Constructing the facility in areas having a tornado design wind speed no greater than 160 mph (probability of 10^{-5} yr^{-1}) was considered to be cost prohibitive to meet design standards and safety requirements. Areas were identified using general maps in NRC NUREG/CR-4461 (NRC, 2007b). Areas having a tornado design wind speed of 257 km/hr (160 mi/hr) (probability of 10^{-5} yr^{-1}) were avoided. Hurricane frequency was selected because of its influence on design to meet safety requirements and potential impact on maintaining operations during an event. Constructing a facility in areas potentially affected by hurricanes with wind speeds no greater than 154 km/hr (96 mi/hr) was considered necessary to meet design standards, safety requirements, and operational requirements. Maps of the U.S. potentially affected by Category 1 though 5 hurricanes (Saffir-Simpson index) based on data from 1950 through 2003 were evaluated to identify regions with a high likelihood of impact (wind or flood damage). Areas with a high likelihood of being impacted by a hurricane with wind speeds in excess of 154 km/hr (96 mi/hr) (Saffir-Simpson scale categories 2-5) were avoided. Severe winter weather was selected because of potential impacts on maintaining operations. Road closures could impact worker safety during commutes and the ability to maintain operations if workers or materials were not able to reach the facility. National Oceanic and Atmospheric Administration (NOAA) and Federal Highway Administration (FHWA) data and maps were reviewed to evaluate frequency of snow fall and road closures. Areas with a high potential to have road closures due to winter weather were avoided.

This initial review was conducted to be inclusive of regions and to only exclude regions that clearly were in areas to be avoided because of seismic or weather concerns. Regions that were at the margins of avoidance areas were retained for further consideration. Through discussions with AES, local elected officials and economic development organizations identified and offered sites for consideration within the acceptable regions. The available site locations were overlain on general hazard maps representing seismic and weather conditions to confirm that they were in suitable regions.

Step 2 –Screen Candidate Sites (Phase I)

Candidate sites passing the initial review were screened in Phase I. A set of 'Phase I' criteria were established to screen the sites. The 'Phase I' criteria were based on guidance developed by AES. The screening criteria used were: (1) Seismic History, (2) Geology, (3) Facility/Site (site size relative to facility footprint), (4) Redundant Electrical Power Supply, (5) Flooding Potential, (6) Prior Land Contamination, (7) Availability of Existing Site Data, (8) Threatened and Endangered Species Near or On-Site, (9) Sensitive Properties (e.g., National Parks), (10) Climate and Meteorology, and (11) Wetlands within the Facility Footprint on the Site.

Data were gathered for each site pertaining to each screening criterion. Data included information that was publicly available from agency and organizational websites, technical literature, and agency reports. AES met with site representatives to gain a better understanding of the sites. Site sponsors provided site-specific information on screening criteria to assist AES in screening. No other contacts were made and no field data were collected. Data sources were similar across regions and sites to ensure that data quantity and quality allowed for equitable comparisons.

Each site was evaluated against each criterion based on professional judgement. Each site assigned a "Yes" as passing the criterion while a "No" was given when a site failed the criterion. A site that failed any criterion was not carried forward into Phase II (site evaluation).

Step 3 – Site Evaluation (Phase II)

Sites that passed the Phase I screening process were evaluated in greater detail in the Phase II site evaluation. A decision analysis approach known as multi-attribute utility analysis (MAUA) was used to conduct a consistent, repeatable, and documented evaluation. The method is a widely used and proven method for evaluating alternatives that address multiple objectives. The method provides a quantitative basis to evaluate the extent that alternative sites meet the project objectives. The basic steps of MAUA are:

- Establish objectives

- Identify and define criteria to measure how well an alternative achieves the objectives and place the criteria in a hierarchy under each objective. Grouping criteria into categories can improve the organization of the hierarchy for more complex processes requiring many criteria
- Assign weights to each objective, category, and criterion to calculate the relative importance (contribution to site score) of each criterion, category, and objective to selecting the site
- Develop performance measures (rating scales) for each of the criteria
- Data collection and site scoring for each criterion using the performance measures
- Combine relative importance factor and scores to obtain overall measure of desirability for each site and conduct sensitivity analysis
- A team of technical specialists, project managers, and environmental specialists worked together to develop, review and assess the product of each step. Technical staff and others participated in reiterative reviews to ensure that the MAUA approach was technically credible and defensible.

2.1.3.3.1.1 Establish Objectives

AES established three site selection objectives to reflect the diverse requirements that the project needed to meet. The three objectives were related to technical, environmental, and operational requirements of the project. The technical requirements objective reflects the need of the site and area to be seismically and structurally stable, have sufficient area for safety, have adequate electricity and water supply, an adequate workforce, and have a straight-forward mechanism for land transfer. The environmental objective reflects a need to have an environmentally acceptable site that avoids large environmental impacts. This objective also reflects adjacent land use compatibility and the quality of services and community infrastructure. The operational efficiencies objective includes low-level radioactive waste disposal options, transportation capabilities, business environment, and support from the public.

2.1.3.3.1.2 Criteria Identification and Hierarchy Organization

Thirty-eight criteria were identified to describe the objectives and to measure how well a site achieves the objectives. Criteria categories were first identified that captured critical aspects of the site-selection objectives. As shown in Figure 2.1-5, 17 criteria were identified to measure sites against the technical requirements objective; 14 criteria were identified to measure sites against the environmental acceptability objective; and 7 criteria were identified to measure sites against the operational efficiencies objective.

2.1.3.3.1.3 Objective, Category, and Criteria Weighting

The third step in the MAUA approach was to weigh each of the objectives, categories, and criteria. Weighting provides a quantitative estimate of the relative importance of each objective, category, and criterion to selecting the site. Weighting was accomplished for objectives, then categories, and finally criteria by a small team. The larger technical team reviewed the preliminary weighting and rank ordered the 38 criteria based on the contribution to the site score for each criterion. Weighting was modified and refined to ensure that the rank order of criteria met AES's selection requirements. As an example, seismic and geologic stability of a site were considered more important compared to construction and operational workforce availability. Individual criterion weights ranged from 6.0 to less than 1.0. Because weighting (and therefore contribution to site score) is relative among all criteria, the total of the contribution to site score of all 38 criteria equals to one as does the total of the contribution to site score for all categories, and the three objectives. Table 2.1-8, Objectives, Categories, and Criteria with Weights and Contribution to Site Score, lists the weights and contribution to site score of each objective, category, and criteria to the scoring.

The ten most heavily weighted criteria included all three objectives. Six of the top ten criteria measure a site's ability to meet the technical requirements objective. Three of the top ten criteria measure a site's ability to meet the environmental objective. One criterion of the ten highest ranked criteria measures a site's ability to meet the operational efficiencies objective.

2.1.3.3.1.4 Develop Performance Measures for Each Criterion

Performance measures were developed for each criterion to define the important attributes of site quality. A scale of 1 to 10 was used to quantify the technical specialists' assessment of each criterion. The scale quantified the quality of the site in meeting that portion of an objective represented by the criterion. In addition, the scale provided a consistent score comparison among criteria and among scorers.

2.1.3.3.1.5 Obtain Overall Measure of Desirability for Each Site and Conduct Sensitivity Analysis

The criteria scores for each site were combined with their weights to determine the relative contribution of each criterion to the overall value of the site. These relative criterion scores were summed to obtain the measure of how well each site met the three site objectives. Sensitivity analysis was used to examine the relative importance of each criterion and objective to project ranking. The sensitivity analyses also demonstrates how sites compare based on their scores for each criterion and objective.

2.1.3.3.1.6 Preferred Site Identification

The final step in the process was to identify a preferred site. The results of the MAUA provided a ranking among the sites evaluated in Phase II. The ranking among sites was considered, in combination with AES's business needs to select a preferred site.

Step 4 – Identifying a Preferred Site

2.1.3.3.2 Identification of Potential Regions and Sites

The four criteria used to identify regions of the U.S. that may be suitable for an enrichment facility were: (1) peak ground acceleration, (2) tornado frequency, (3) hurricane frequency, and (4) severe winter weather. Three regions of the contiguous U.S. were identified as having suitable characteristics for an enrichment facility and included portions of the mid-Atlantic states, portions of the southwest, and portions of the inter-mountain west. Figure 2.1-6, Regions of the U.S. Meeting the Four Initial Criteria for an Enrichment Facility, shows the avoidance areas and the regions that meet the initial acceptance criteria. Areas to be avoided because of high PGA included the west coast, major portions of the intermountain west, portions of the lower Midwest, portions of South Carolina and Tennessee, and portions of the Northeast. Areas to be avoided because of high tornado/wind risk included most of the central U.S., much of the Ohio Valley, portions of Pennsylvania, central and northern portions of the Gulf Coast states, and Georgia. Areas to be avoided because of high incidence of hurricanes included portions of states along the Atlantic and Gulf coasts. Areas to be avoided because of a potential for heavy snow, ice conditions, and high winds included most states bordering Canada and portions of northern Great Plains states.

AES in consultation with site sponsors identified 54 potential sites in nine states. Of those sites, 44 were passed forward to be evaluated in the Phase I screening process. Ten sites were eliminated from consideration due to being in areas of high potential of hurricane flooding and wind or high potential of tornados. These sites were eliminated using the criteria shown in Figure 2.1-6, Regions of the U.S. Meeting the Four Initial Criteria for an Enrichment Facility and are listed in Table 2.1-9, Potential Sites Eliminated During the Initial Review and the Basis for Elimination.

2.1.3.3.2.1 Phase I Screening Results

The 44 sites, located in seven states, identified in the initial review step were screened using the Phase I criteria to identify potential high-quality sites suitable for the Phase II evaluation. Table 2.1-10, Candidate Sites for Phase I Screening, summarizes the screening results for all 44 sites. Of the 44 sites, 33 sites failed at least one criterion and one site was modified to include additional acreage (at the request of the site sponsor). The remaining ten sites, located in seven states, include the: Bonneville site, ID; McNeil site, ID; Grist site, TX; WCS-2 site, TX; ELEA site, NM; WIPP-2 site, NM; Horn Rapids site, WA; Fleming Smith site, SC; Portsmouth site, OH; and Wildwood site, VA. Below is a summary highlighting some of the key attributes of the sites passing the Phase I screening.

The Bonneville, ID site, about 32 km (20 mi) west of Idaho Falls, was one of two sites selected from a cluster of six sites screened for the Idaho area. The site is under single private ownership, is close to power, and is not close to sensitive resources (e.g., Class I air receptors, national parks or monuments, recreational areas). It is currently used for grazing and cropping and does not appear to have habitat for endangered or threatened species. The past land uses of grazing and cropping suggests no potential contamination. It is about 24 km (15 mi) from the DOE Idaho National Laboratory (INL) and, therefore, environmental information is available that reflects the conditions of the site. INL also is a major source of a trained workforce.

The McNeil, ID site, about 19 km (12 mi) west of Idaho Falls, was selected from the cluster of six sites screened for the Idaho area. It is about 6 km (4 mi) from the Bonneville site. The site is under single private ownership, is close to power, and is not close to sensitive resources (e.g., Class I air receptors, national parks or monuments, recreational areas). It is currently used as crop land and therefore has no habitat for protected species. The past land use of cropping suggests no potential contamination. It is about 31 km (19 mi) from the INL and, therefore, environmental information is available that reflects the conditions of the site. INL also is a major source of a trained workforce.

The WCS-2, TX site is about 48 km (30 mi) west of Andrews and the western edge of the site is about 3 km (2 mi) east of the New Mexico border. This property is close to areas with detailed environmental data and monitoring systems (e.g., Waste Control Specialists facility boundary is about 0.8 km (0.5 mi) and the National Enrichment Facility boundary is about 5 km (3 mi)), which are the closest potential contamination sources. It is within 2 km (1 mi) of the state highway. There are no recreational areas within 16 km (10 mi) of the site.

The Grist, TX site is about 40 km (25 mi) west of Andrews and the western edge of the site is about 7.2 km (4.5 mi) east of the New Mexico border. It is currently uncultivated cropland. This property is close to areas with detailed environmental data and monitoring systems (e.g., Waste Control Specialists facility boundary is within 8 km (5 mi) and the National Enrichment Facility boundary is about 10 km (6 mi)), which are the closest potential contamination sources. It is within 5 km (3 mi) of the state highway. There are no recreational areas within 24 km (15 mi) of the site.

The ELEA, NM site is about 48 km (30 mi) northeast of Carlsbad and 48 km (30 mi) southwest of Hobbs. The property is owned by a consortium, which includes Eddy and Lea Counties. The consortium is interested in transferring their property to AES. The site is about 19 km (12 mi) from the Department of Energy (DOE) Waste Isolation Pilot Project (WIPP) boundary. There are potash and oil and gas leases on the property. The site has access to electrical power and other infrastructure. In addition, site-specific environmental data is available from a detailed site-specific siting study, Bureau of Land Management (BLM) EISs, and DOE's WIPP monitoring system. The majority of the workforce could be drawn from both Carlsbad and Hobbs. There is evidence of contamination (primarily metals and radionuclides) from prior use. The contamination is isolated to the northeast corner of the site and likely would not be disturbed if the facility is located at this site.

The WIPP-2, NM site is about 48 km (30 mi) west of Carlsbad and 64 km (40 mi) south of Hobbs. It is on BLM 259 ha (640 acres) and the State of New Mexico 227 ha (560 acres) lands. All parties are interested in transferring their property to AES and BLM has demonstrated processes to lease and transfer surface and mineral titles. There are no mineral leases on the BLM owned property, but likely mineral leases are present under the State of New Mexico property. Potash is known to exist under the property. There is no evidence of contamination from prior use. The site is about 3 km (2 mi) from the DOE WIPP boundary and, therefore, has access to electrical power and other infrastructure. In addition, site-specific environmental data is available from drilling and well logs, BLM EISs, and DOE's WIPP monitoring system. The majority of the workforce could be drawn from both Carlsbad and Hobbs

The Horn Rapids, WA site is on the southern border of the DOE Hanford Reservation immediately north of the city of Richland. It is owned by DOE and is in an area planned for industrial use. It has two electric substations and waterlines nearby. It has no wetlands or floodplains within the footprint, and no sensitive properties in the vicinity. There is contamination on portions of the site. A trichloroethene plume is in the groundwater under a portion of the eastern side of the site. The contaminant is at levels that allow for unrestricted use. There also is asbestos on a portion of the southern edge of the site. The contaminant levels allow for restricted use. Configuration of the AES facility would likely avoid these contaminated areas. The AREVA fuel fabrication facility is immediately south of the site. There are remediation activities occurring immediately east and several kilometers (miles) north of the site. The Richland Airport is about 3 km (2 mi) south of the site.

The Fleming Smith, SC site is in the west central portion of the state and is about 24 km (15 mi) from the town of Laurens (county seat); it is on private land (held by Duke Energy). Electric power lines and water lines are on or adjacent to the property. It has no wetlands or floodplains within the footprint, no sensitive properties in the vicinity and few permitted air emission or waste facilities nearby. Aerial photographs show only limited disturbance on the site and therefore, likely no contamination is present. An interstate road is within 2 km (1 mi) of the site and an industrial/commercial site is adjacent to the site.

The Portsmouth, OH site is in the south central portion of the state and is about 5 km (3 mi) from the town of Piketon. It is owned by multiple private land owners. It has no wetlands within the facility footprint and no sensitive properties in the vicinity. The formerly operating Portsmouth Gaseous Diffusion Plant (PGDP) is within 2 km (1 mi) of the site. Electric power and water would be available from the PGDP site. The USEC American Enrichment Plant is being constructed within 2 km (1 mi) of the site. Similarly, DOE will operate a depleted uranium hexafluoride deconversion plant in the vicinity. In addition, the surrounding DOE property is being remediated from former activities. There are no other permitted air emission or waste facilities nearby. There is contamination associated with the PGDP, but not on the proposed site.

The Wildwood, VA site is located in southwest Virginia, near the North Carolina border in Carroll County, and about 16 km (10 mi) northeast of Galax. A 138-kV powerline is about 5 km (3 mi) from the site. The Blue Ridge Parkway, located over 16 km (10 mi) from the site, is the closest known sensitive resource. Site-specific data may be available from Department of Transportation studies associated with siting Interstate 77 and mineral resource reports. There is a small regional airport runway located approximately 0.8 km (0.5 mi) west of site.

2.1.3.3.2.2 Phase II Site Evaluation Results

The ten sites recommended from the Phase I screening were assessed using the 38 criteria identified for the Phase II site evaluation. The ten sites are located in seven states as shown on Figure 2.1-7, General Locations of the Ten Sites Assessed in the Phase II Site Evaluation. Pairs of sites within close proximity to each other are located in Idaho, New Mexico, and Texas and single sites are located in Washington, Ohio, South Carolina, and Virginia. Each site received an unweighted score for each criterion, which are listed in Table 2.1–11, Unweighted Scores for Each Criterion for the Ten Sites Assessed in the Phase II Site Evaluation.

2.1.3.3.2.3 Summary of Total Scores and Scores by Objective

Using the unweighted scores and the individual criterion weights, the MAUA analysis produced a weighted score for each site. The Idaho sites scored highest (0.81 and 0.80) followed in order by the Texas (0.75 and 0.75), Washington (0.71), New Mexico (0.68 and 0.65), South Carolina (0.64), Ohio (0.62), and Virginia (0.57) sites. The resultant scoring along with the contribution by objective is shown in Figure 2.1-8, Total Weighted Scores for the Ten Sites Assessed in the Phase II Site Evaluation. Both Idaho sites had high scores for all three objectives. The Texas sites had high scores for technical requirements but lower scores compared to the Idaho sites for environmental acceptability and operational efficiencies. The New Mexico sites were generally lower across all three objectives compared to the Idaho and Texas sites. The Washington site was comparable to the Idaho and Texas sites related to technical requirements; however, it received the lowest score among all sites for operational efficiencies. The South Carolina site generally scored lower than the New Mexico sites with the exception that it had a higher score for the technical requirements objective compared to the WIPP-2, New Mexico site. The Ohio site scored lowest for environmental acceptability and relatively high for operational efficiencies. The Virginia site consistently scored low for all three objectives.

Scores for the technical requirements objective, shown in Figure 2.1–9, Weighted Scores for the Technical Requirements Objective for the Ten Sites Assessed in the Phase II Site Evaluation,, were driven primarily by site characteristics criteria scores (e.g., topography and geology, size, ownership, and surface and mineral rights) followed by electrical systems criteria. Differences among scores, for this objective, primarily were a result of variations in topography and geology, size, land ownership, mineral rights, water supply, and PGA (safety design criterion) scores.

Scores for the environmental acceptability objective, shown in Figure 2.1–10, Weighted Scores for the Environmental Acceptability Objective for the Ten Sites Assessed in the Phase II Site Evaluation, were driven primarily by land use and demography, environmental protection, and human services criteria scores. Differences among scores, for this objective, primarily were a result of variations in permitting, hazardous facilities proximity, sensitive area proximity (e.g., nearest resident), and housing scores.

Scores for the operational efficiencies requirements objective, shown in Figure 2.1-11, Weighted Scores for the Operational Efficiencies Objective for the Ten Sites Assessed in the Phase II Site Evaluation, were driven primarily by support and business environment criteria scores. Differences among site scores, for this objective, primarily were a result of variations in public support, business environment, construction traffic, and low level waste disposal option scores.

2.1.3.3.2.4 Summary of Site Scores and Comparison of Sites

The Bonneville and McNeil, Idaho sites had the highest overall scores. Their similar scores reflect the close proximity of the two sites (about 6 km (4 mi)). Both sites offer remote locations near a major highway with few residences or other activities in the area. They are bounded by BLM and private properties that are used for grazing and/or farming. The topography and geology are favorable; land transfer would be simple and nearly immediate; and there are no surface or mineral rights issues. Water from the Snake River Aquifer would be delivered by on-site wells. There is strong consistent support at the local and state levels, and the permitting process will be straight-forward with no special permitting issues. In addition, the sites scored high for workforce availability and housing. The key differences between these two Idaho sites are that the Bonneville site is substantially larger (over 1,619 ha (4,000 acres)) than the McNeil site (405 ha (1000 acres)) and the distance to the nearest resident was much closer to the McNeil site (2.0 km (1.25 mi) for McNeil versus 7.6 km (4.75 mi) for Bonneville).

The WCS-2 and Grist, Texas sites had the next highest overall scores after the Idaho sites. Their similar scores reflect the close proximity of the two sites (about 6 km (4 mi)). Both sites offer remote locations near a major highway with few residences in the area. Both sites are surrounded by private property owned by different landowners. The sites have favorable seismic characteristics, topography, and geology; land transfer would be simple and nearly immediate. Water from the Ogallala Aquifer would be delivered via new lines from the water well field north of the sites in Gaines County. There is strong consistent support at the local and state levels, and there are no special permitting issues. The differences between the two Texas sites include that the WCS-2 site is within 3 km (2 mi) of the WCS low-level and hazardous waste facility. Therefore, the WCS-2 site scores lower than the Grist site for the criterion of proximity to a hazardous facility; however, the WCS-2 site scores higher for the criterion of existing survey data. In addition, the WCS-2 site is the second largest site 1,036 ha (2,560 acres), while the Grist site is one of the smallest sites at nearly 364 ha (900 acres).

The Grist and WCS-2 sites scored lower than the Idaho sites because there are rights-of-way (pipelines) on the WCS-2 site and mineral rights on both sites (oil and gas development) that would need to be purchased. There is at least one pressurized pipeline within 2 km (1 mi) of each site. Construction traffic likely will affect the traffic flow on the two-lane highway that provides access to both sites. In addition, the sites scored lower for workforce availability and housing.

The Horn Rapids, Washington site had an intermediate score compared to all the sites. It is on the south edge of the DOE Hanford Reservation. There are no surface rights or mineral rights. The site is about 3 km (2 mi) from the town of Richland and the nearest residents. An industrial road leads directly to the site and the nearest highway access is about 5 km (3 mi) from the site. The electric, water, sewage, and other infrastructure are excellent, as is workforce availability. There is an AREVA fuel fabrication facility adjacent to the site. There are no nearby sensitive resources or areas.

While the site has excellent technical project attributes, the site scores lower than other sites because of a combination of characteristics. Although a process is in place under the 1999 Comprehensive Land-Use Plan EIS, land transfer may be complicated because of DOE transfer process requirements. There is a small regional airport about 3 km (2 mi) from the site. The runway is oriented to have flight patterns coming over the site. The site lacks strong support at the State and National level.

The ELEA and WIPP-2, New Mexico sites had overall scores which were lower than the Washington site. Their similar scores reflect the close proximity of the two sites (about 11 km (7 mi)). Both sites offer remote locations near a major highway with few residences in the area.

Both sites are surrounded by BLM and private property owned by different landowners. The sites have favorable seismic characteristics and there is strong local support.

There are several differences between the two New Mexico sites that reduced the score of the WIPP-2 site compared to the ELEA site. The ELEA site is privately owned, while the WIPP-2 site is owned by the BLM and the State of New Mexico. Transfer of the BLM property will be more complicated and will require more time, compared to transfer of private property. While the WIPP-2 site has good regional data generated by the DOE WIPP about two miles south, the site-specific data is less complete compared to the ELEA site. The ELEA site has the most complete site-specific data of all ten sites. Future use of properties adjacent to the WIPP-2 site has greater risk for mineral development compared to the ELEA site; although other companies own the mineral leases under and adjacent to both sites. Additional cultural resource permitting may be required on the WIPP-2 site for a known archaeological site that is located on the edge of the property but falls outside the area likely to be disturbed. Water from the Ogallala Aquifer would be supplied to the WIPP-2 site from an Eddy County water system. This water system would need to be expanded to ensure sufficient water availability during peak water use. Conversely, water from the Ogallala Aquifer would be supplied to the ELEA site from a Lea County water system, which has sufficient current capacity even during peak demand periods.

The ELEA and WIPP-2 sites scored lower than the other sites because of the rights-of-way (i.e., pipelines, transmission line, water line, and communication tower) on the ELEA site. In addition, there are mineral leases (i.e., potash, oil, and gas) on both sites. In addition, the sites scored lower for workforce availability and housing.

The Fleming Smith, South Carolina site had an overall score somewhat less than the New Mexico sites. The site is near the town of Laurens and near a major interstate highway. The site is next to existing and proposed industrial developments, but there are also residents within 0.4 km (0.25 mi) of the site. The site has readily available electric supply and other utilities, a large regional workforce, and there is strong local and state support. Water from reservoirs would be supplied to the site via an existing Laurens water system, which has sufficient capacity during peak use.

The site scores lower than the other sites assessed (other than the Portsmouth, Ohio and Wildwood, Virginia sites) due to a combination of characteristics. The topography of the site will require extensive earth moving. The extensive fill may also impact the seismic stability characteristics of the site. There are several right-of ways, with a sewer right-of-way bisecting the site, and a pressurized pipeline running along the southern edge of the site. In addition, there is a wetland within the footprint of the site which will require a wetland permit. An increase in the size of the facility footprint following Phase I screening brought the wetland into the footprint boundary.

The Portsmouth, Ohio site had an overall score which was the second lowest score of all the sites. The site is about 5 km (3 mi) from the town of Piketon. The site is immediately adjacent to a major interstate highway. The electric, water, sewage, and other infrastructure are excellent, as is operational workforce availability. There are DOE and USEC enrichment facilities immediately adjacent to the site. Residents are within 2 km (1 mi) of the site. The site is owned by multiple private owners. There are no other surface or mineral rights.

The site scores were lower than most other sites assessed due to a combination of characteristics. Land transfer may be complicated because of multiple ownership. The topography of the site will require earth moving. The fill may also negatively impact the seismic characteristics of the site. In addition, there is a floodplain within the site boundary associated with the Little Beaver Creek on the southwest portion of the site. The site is irregularly shaped which results in one of the smallest effective areas compared to all other sites. There is a closed landfill (with monitoring wells) adjacent to the site, which has trichloroethylene (TCE) contamination. A road and rail line divide the site.

The Wildwood, Virginia site had an overall score which was the lowest score of all the sites. The site is about 16 km (10 mi) from the town of Hillsville. The site is immediately adjacent to a major interstate highway and a commercial development currently under construction. In addition, residents are within 3 km (2 mi) of the site. It is privately owned with no surface or mineral rights. Therefore, land transfer can be simple and rapid. Water from reservoirs would be supplied to the site via a new line from the county system. However, system capacity would need to be expanded to handle peak use demands.

The site scores lower than the other sites assessed due to a combination of characteristics. The topography of the site will require extensive earth moving. The extensive fill may also negatively impact the seismic characteristics of the site. In addition, there may be wetlands associated with the drainage that bisects the site. The site is irregularly shaped which results in the smallest effective area compared to all other sites. The site has the least site-specific data available. In addition, there is a small regional airport (light commercial use) less than 3 km (2 mi) from the site. The runway is oriented to have flight patterns coming over the site.

2.1.3.3.3 Sensitivity Analysis

A sensitivity analysis was conducted for each of the three objectives (technical requirements, environmental acceptability, and operational efficiencies) to ensure that site evaluation was not sensitive to small changes in the relative weights of objectives or criteria. Figures 2.1-12, 2.1-13, and 2.1-14 show the site rank and score sensitivity to different weights of the three objectives. Each sensitivity graph shows how the rank and score may change with an increase in the weight of one objective. The horizontal axis measures the weight of an objective and the vertical axis measures the overall site score. The vertical line on each of these graphs represents the current weight for each objective. In general, the analysis demonstrates that the site ranks are robust to objective weight changes.

Figure 2.1–12, Sensitivity of Site Ranking and Scores to Variable Weighting of the Technical Requirements Objective, shows that the site rank (order among sites) is relatively insensitive to a change in the weight of the technical requirements objective and the supporting criteria. The weight would have to be increased from 49 percent to 56 percent for a reordering of the Fleming Smith and WIPP-2 sites or decreased to 41 percent for a reordering between the Grist and WCS-2 sites, which is reflective of the close scoring between the sites.

Figure 2.1–13, Sensitivity of Site Ranking and Scores to Variable Weighting of the Environmental Acceptability Objective, shows that the site rank (order among sites) is relatively insensitive to a change in the weight of the environmental acceptability objective and the supporting criteria. The weight would have to increase from 34 percent to 55 percent for a reordering of the Wildwood and Portsmouth sites or decreased to five percent for a reordering of the WIPP-2 and Portsmouth sites.

Figure 2.1–14, Sensitivity of Site Ranking and Scores to Variable Weighting of the Operational Efficiencies Objective, shows that the site rank (order among sites) is relatively insensitive to changes in the weight of the operational efficiencies objective and supporting criteria with the exceptions of the Horn Rapids and Portsmouth sites. The weight would have to increase from 17 to 28 percent for a reordering between the ELEA and Horn Rapids sites or decrease to 13 percent for a reordering between the WIPP-2 and Fleming Smith sites. The Horn Rapids site had a relatively low score for this objective and high scores for the other two objectives. Therefore increasing the importance weight of this objective would decrease the weight of the other two objectives, dropping the rank for the Horn Rapids site to last when the objective is weighted 73 percent or higher. Conversely, the Portsmouth site received high scores for this objective and therefore, the site score increases greatly as the weighting for this objective increases.

2.1.3.3.4 Conclusions

The site selection process considered over 50 potential sites across the United States. Ten sites passed the Phase I screening and were reviewed in greater detail during the Phase II site evaluation. The evaluation demonstrated that all ten sites would be technically and environmentally suitable locations for the AES enrichment plant.

Based on its review, AES has identified the Bonneville, Idaho site as the proposed site for an enrichment plant. The site has the greatest amount of acreage, which can be readily transferred from a single private landowner. Water is available through on-site wells and existing water rights can be transferred. Estimated costs for electric power, labor, and materials are among the lowest considered. In addition, Bonneville County and the State of Idaho have shown strong support for the proposed enrichment plant.

None of the candidate sites were obviously superior to the proposed site.

An expansion of the EREF from 3.3 million SWU/year to 6.6 million SWU/year would not alter any of the site selection criteria values that are used in the original site selection study for the proposed site in Idaho. Some adjustments would occur for alternate sites, specifically related to operational workforce for the Texas sites and peak water use for the South Carolina site. An increase in operational workforce would lower this scoring for the two Texas sites, and an increase in peak water use would lower this scoring for the South Carolina site. However, these adjustments do not alter the overall ranking of sites or conclusions of the site selection study.

TABLES

Table 2.1-1 Chemical Hazard Classification [(1)]
(Page 1 of 2)

Chemical	Formula	Phase(s) [(2)]	Radioactive	Toxic	Corrosive	Water Reactive	Flammable	Combustible	Oxidizer	Other	Comments
uranium hexafluoride [(3)]	UF_6	S/L/G	•	•	•	•					
uranic compounds	UO_2F_2, UF_4, U_3O_8,	S/L	•	•	•	•					UF_6 reaction byproducts, deposits & in solution
hydrogen fluoride	HF	G		•	•	•					UF_6 reaction byproduct
sodium fluoride	NaF	S		•							granules
aluminum oxide (activated)	Al_2O_3	S								•	irritant, powder / granules
carbon (activated)	C	S						•			powder / granules
paper, polymers		S						•			ventilation filter media, anti-contamination clothing, ion exchange resin, etc.
potassium hydroxide	KOH	S		•	•						
phosphate		S								•	surfactant, irritant, P-3 Plastoclin 4100 B
scrap metals		S	•								contaminated scrap/parts
citric acid	$C_6H_8O_4$	S/L			•						crystals & solution (5-10%)
sodium hydroxide	NaOH	S/L		•	•						powder & solution (0.1N)
hydrocarbon oils / greases	varies	S/L						•			
hydrocarbon sludges	varies	S/L						•			
perfluoropolyether fluids	varies	L								•	irritant, long chain perfluorocarbons
methylene chloride	CH_2Cl_2	L								•	Health hazard
polydimethylsiloxane (silicone oil)	varies	L						•			
hydrocarbon / polar solvents and liquids	varies	L					•				gasoline,ethanol, acetone, toluene, petroleum ether, paint, cutting oils
nitric acid	HNO_3	L			•						(50-70%) weight concentration
hydrofluoric acid	HF (H_2O)	L			•						38% weight concentration
hydrogen peroxide	H_2O_2	L							•		
sulfuric acid	H_2SO_4	L			•						
phosphoric acid	H_3PO_4	L			•						(10-25%) weight concentration

Table 2.1-1 Chemical Hazard Classification [1]
(Page 2 of 2)

Chemical	Formula	Phase(s) [2]	Radioactive	Toxic	Corrosive	Water Reactive	Flammable	Combustible	Oxidizer	Other	Comments
diesel fuel	varies	L						•			generator / vehicle fuel
deionized water	H_2O	L			•						
hydrofluorocarbons	varies	L/G								•	refrigerant, irritant
nitrogen	N_2	L/G								•	asphyxiant, test gas / purge gas
propane	C_3H_8	L/G					•				test gas
hydrogen	H_2	G					•				test gas
acetylene	C_2H_2	G					•				welding gas
oxygen	O_2	G							•		test gas / welding gas
argon	Ar	G								•	asphyxiant, test gas / welding gas
helium	He	G								•	asphyxiant, test gas

Notes:

1. Hazardous material classifications per the International Fire Code (IFC). Radioactive classification has also been included although not identified as a specific IFC classification.
2. Lists the phases applicable based on facility use of chemical; S – solid, L – liquid, G – gas/vapor.
3. Solid UF_6 cylinders also have ullage space containing vapor UF_6 and traces of HF, air, non-condensables and U non-volatiles (<1% total wt)

Table 2.1-2 Chemical Inventory – Separations Building Module (SBM) and Blending, Sampling and Preparation Building (BSPB)[1], contains Security-Related Information Withheld Under 10 CFR 2.390

Table 2.1-3 Chemical Inventory - Centrifuge Assembly Building (CAB), contains Security-Related Information Withheld Under 10 CFR 2.390

Table 2.1-4 Chemical Inventory – Technical Support Building (TSB) and Operation Support Building (OSB), contains Security-Related Information Withheld Under 10 CFR 2.390

Table 2.1-5 Chemical Inventory – Mechanical Services Building (MSB) and Electrical Services Building (ESB), contains Security-Related Information Withheld Under 10 CFR 2.390

Table 2.1-6 Chemical Inventory – Exterior Areas, contains Security-Related Information Withheld Under 10 CFR 2.390

Table 2.1-7 Summary of Environmental Impacts for the Proposed Action (Page 1 of 2)

Environmental Impact	Proposed Action[a]	ER Reference Section
Land Use	Small impact; about 86% of the site would remain undeveloped and current activities on nearby properties would not change.	4.1
Transportation	Construction Period – Moderate to Large Impact; The impact of traffic volume increases associated with construction of the EREF would be mitigated by constructing highway entrances early in the construction process and designing the highway entrances to minimize the disruption of traffic flow, particularly during the times of peak commute. Operation Period-Small Impact; ~5,025 radiological and 3,700 non-radiological additional heavy truck shipments/yr; traffic patterns impact predicted to be inconsequential. Decommissioning period – small impact; ~363 additional vehicle trips/day; traffic patterns impact predicted to be inconsequential.	4.2
Geology and Soils	Small impact; potential short-term erosion during construction, but enhanced afterward due to soil stabilization.	4.3
Water Resources	No impact from operation on surface waters. Small impact from operation to groundwater. Stormwater discharges to basins controlled by NPDES permit.	4.4
Ecological Resources	Small impact. No rare, threatened, or endangered (RTE) species present.	4.5
Air Quality	Small impact; vehicle and fugitive emissions less than NAAQS regulatory limits during construction or operation.	4.6
Noise	Small impact; operational noise levels would be within HUD guidelines of 60 dBA_{Ldn} (residential use) and EPA limit of 55 dBA_{Ldn}	4.7
Historic and Cultural	Small impact; NRHP sites can be avoided or mitigated, if required.	4.8
Visual/Scenic	Small impact; facility would be out of character but distant from public observation areas.	4.9
Socioeconomic	Small impact to economy and local public services.	4.10
Environmental Justice	Small impact.	4.11

Table 2.1-7 Summary of Environmental Impacts for the Proposed Action (Page 2 of 2)

Environmental Impact	Proposed Action[a]	ER Reference Section
Public and Occupational Exposure	Small impact; dose equivalents below NRC and EPA regulatory limits.	4.12
Waste Management (Rad/NonRad)	Small impact; within off-site licensed facility capacities; reduced waste streams due to new and high efficient technology.	4.13
- Gaseous	Well below regulatory limits/permits.	3.12
- Solid	Approximately 146,500 kg/yr (323,000 lbs/yr) of low-level wastes[b]	3.12
- Mixed	100 kg/yr (220 lbs/yr)	3.12
- Hazardous	5,062 kg/yr (11,160 lbs/yr)	3.12
- Non-hazardous	70,307 kg/yr (155,000 lbs/yr)	3.12

Notes:

[a] Projected impacts are based on preliminary design and assumed to be bounding. Impacts are expected to occur for the life of the plant.

[b] Excludes depleted UF_6.

Table 2.1-8 Objectives, Categories, and Critieria with Weights and Contribution to Site Score (Page 1 of 2)

OBJECTIVE			CATEGORY			CRITERIA		
Objective	Weight	Contribution	Category	Weight	Contribution[a]	Criteria & Contribution	Weight	Contribution
Technical Requirements	100	0.49	Site	100	0.17	Topography & Geology	100	0.05
						Size	70	0.04
						Surface & Mineral Rights	70	0.04
						Zoning & Ownership	70	0.04
						New Radiation Hazard	5	<0.01
			Safety Design	70	0.12	Peak Ground Acceleration	100	0.06
						Fire Hazard	15	0.01
						Wind Hazard	40	0.02
						Existing Survey Data	60	0.03
			Electrical System	60	0.10	Quality	100	0.03
						Rates	90	0.03
						Cost	75	0.02
						Feeders	70	0.02
			Workforce	30	0.05	Construction Workforce	100	0.03
						Operational Workforce	65	0.02
						Technical Resources	35	0.01
			Water Treatment & Supply	20	0.04	Water Treatment & Supply	100	0.04

Table 2.1-8 Objectives, Categories, and Criteria with Weights and Contribution to Site Score (Page 2 of 2)

OBJECTIVE			CATEGORY			CRITERIA		
Objective	Weight	Contribution	Category	Weight	Contribution[a]	Criteria & Contribution	Weight	Contribution
Environmental Acceptability	70	0.34	Environmental Protection	95	0.10	Permitting	100	0.04
						On-site Water Features	65	0.02
						Groundwater	100	0.04
			Off-site Contamination Hazard	40	0.04	Current Off-site Plumes	100	0.02
						Future Migration	30	0.01
						Documented Monitoring	50	0.01
			Land Use & Demography	100	0.11	Environmental Justice	100	0.04
						Hazardous Facilities	95	0.03
						Sensitive Areas	75	0.03
						Adjacent Site Plans	40	0.02
			Human Services	80	0.09	Emergency Services	100	0.03
						Housing & Necessities	90	0.03
						Schools	65	0.02
						Recreational & Cultural Options	50	0.01
Operational Efficiencies	34	0.17	LLW Disposal	15	0.02	LLW Disposal	100	0.02
			Transportation	35	0.04	Highway Access	100	0.02
						Construction Traffic	80	0.02
			Support & Business Environment	100	0.11	Business Environment	30	0.02
						Public Support	100	0.05
						Agencies	50	0.03
						Labor Support	30	0.02

[a] Values do not add to 1.00 in the contribution columns for category and criteria due to rounding.

Table 2.1-9 Potential Sites Eliminated During the Initial Review and the Basis for Elimination

(Page 1 of 1)

No.	State	Site	Basis for Elimination
1	AL	Dothan County	High risk hurricane zone
2	IA	Cedar Rapids	High risk tornado zone
3	TX	Amarillo	High risk tornado zone
4	VA	Cooke Rail Site	High risk hurricane zone
5	VA	Crosspointe Centre	High risk hurricane zone
6	VA	Cypress Cove	High risk hurricane zone
7	VA	Grayland	High risk hurricane zone
8	VA	Pickett Park	High risk hurricane zone
9	VA	Simpson Property	High risk hurricane zone
10	VA	Windsor Mega Site	High risk hurricane zone

Table 2.1-10 Candidate Sites for Phase I Screening
(Page 1 of 2)

No.	County, State	Site	Result – Basis for Exclusion
1	**Bonneville, ID**	**Bonneville**	**Passed: Evaluated in Phase II**
2	**Bonneville, ID**	**McNeil**	**Passed: Evaluated in Phase II**
3	Power, ID	Power County-1	Failed: Sensitive properties
4	Power, ID	Power County-2	Failed: Contamination
5	Bingham, ID	Blackfoot	Failed: Sensitive properties
6	Butte, ID	Atomic City	Failed: Ownership/Transfer
7	**Lea, NM**	**ELEA**	**Passed: Evaluated in Phase II**
8	Lea, NM	Lea County-1	Failed: Data availability
9	Lea, NM	Lea County-2	Failed: Wetlands
10	Lea, NM	Lea County-3	Failed: Karst
11	Eddy, NM	Seven Rivers	Failed: Size, bisected by a public road
12	Eddy, NM	Berry Parcel	Failed: Liquefaction
13	Eddy, NM	Harroun	Failed: Liquefaction, karst, electric power, sensitive properties
14	Eddy, NM	Becker	Failed: Liquefaction, karst, contamination
15	Eddy, NM	WIPP-1	Failed: Ownership/Transfer
16	**Eddy, NM**	**WIPP-2**	**Passed: Evaluated in Phase II**
17	**Pike, OH**	**Portsmouth**	**Passed: Evaluated in Phase II**
18	Pike, OH	Zahn's Corner-1	Failed: Size, contamination, wetlands
19	Pike, OH	Zahn's Corner-2	Failed: Wetlands, contamination
20	Aiken, SC	Savannah River Site (DOE)	Failed: Ownership/transfer, endangered species, wetlands
21	Cherokee, SC	Jobe Sand	Failed: Size

Table 2.1-10 Candidate Sites for Phase I Screening
(Page 2 of 2)

No.	County, State	Site	Result – Basis for Exclusion
22	Laurens, SC	Copeland Stone	Failed: Sensitive properties, wetlands
23	**Laurens, SC**	**Fleming Smith**	**Passed: Evaluated in Phase II**
25	Greenwood, SC	Solutia	Failed: Size
26	Chester, SC	L&C Mega Site	Failed: Data availability, wetlands
27	Edgefield, SC	Gracewood	Failed: Wetlands
28	**Andrews, TX**	**Grist**	**Passed: Evaluated in Phase II**
29	Andrews, TX	Tom	Failed: Site characterization data
30	Andrews, TX	Parker	Failed: Site characterization data
31	Andrews, TX	Fisher	Failed: Site characterization data
32	Andrews, TX	WCS-1	Modified to become part of WCS-2
33	**Andrews, TX**	**WCS-2**	**Passed: Evaluated in Phase II**
34	Martin, TX	Midland North	Failed: Site characterization data
35	Midland, TX	Midland South	Failed: Data availability
36	Amherst, VA	Amherst County-1	Failed: Floodplains, wetlands
37	Amherst, VA	Amherst County-2	Failed: Endangered species, sensitive properties
38	Appomattox, VA	Concord	Failed: Floodplains, wetlands
39	**Carroll, VA**	**Wildwood**	**Passed: Evaluated in Phase II**
40	Benton, WA	West Richland	Failed: Seismic, faults
41	**Benton, WA**	**Horn Rapids (DOE)**	**Passed: Evaluated in Phase II**
42	Benton, WA	Energy NW-1 (DOE)	Failed: Faults, contamination, ownership/transfer
43	Benton, WA	Energy NW-2 (DOE)	Failed: Contamination, ownership/transfer
44	Benton, WA	Highway 240 (DOE)	Failed: Seismic, ownership/transfer, sensitive properties

Table 2.1-11 Unweighted Scores for Each Criterion for the Ten Sites Assessed in the Phase II Site Evaluation

(Page 1 of 2)

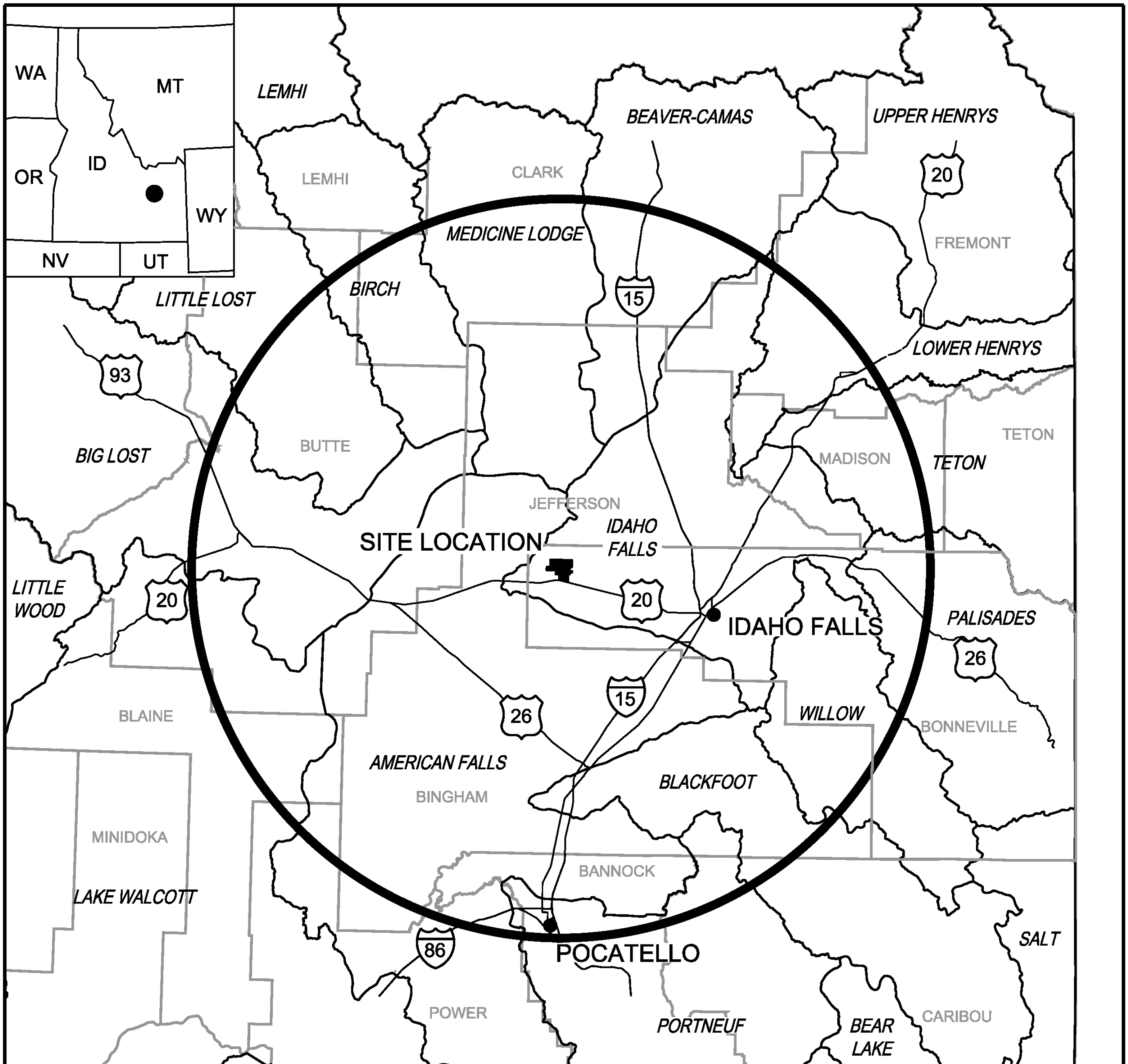
	Criteria	Bonne-ville	McNeil	Grist	WCS-2	Horn Rapids	ELEA	WIPP-2	Fleming Smith	Ports-mouth	Wild-wood
1	Top.& Geology	9	9	8.5	8	9	5	6	5.5	4	3.5
2	Size	9	7	6	10	6	5	6	5	3	2
3	Surface & Mineral	10	9	6	5	8	6	6	6	4	8
4	Zoning & Owner.	10	10	10	10	6	10	6	10	6	10
5	New Rad. Hazard	7	7	7	7	7	8	7	3	5	2
6	Peak Ground Accel.	1	1	8	8	1	7	7	5	7	5
7	Fire Hazard	6	10	5.5	5.5	8	8	5	4	5.5	7
8	Wind Hazard	9	9	4	4	10	4	4	4	3	7
9	Existing Surveys	5	5	5	9	10	10	7	8	10	4
10	Electric Supply	10	10	10	10	10	9	9	9	10	10
11	Cost-Sharing	5	5	7	7	5	3	3	7	3	3
12	Electric Rates	10	10	8	8	8	8	8	8	7	8
13	Transmission Feed	6	6	8	8	10	10	9	10	10	8
14	Constr. Workforce	8	8	6	6	10	5	5	9	8	4
15	Operat. Workforce	10	10	8	8	10	7	7	9	8	7
16	Techn. Resources	10	10	7	7	10	8	8	5	10	5
17	Water Trt. & Supp.	8	9	8	8	10	9	3	7	9	3
18	Permitting	8	9	9	9	6	5	4	3	3	4
19	Water Features	9	9	9	9	9	9	9	5	5	5
20	Groundwater	6	6	8	8	5	8	8	5	5	6
21	Off-site Plumes	9	9	9	8	4	5	6	6	2	9
22	Future Migration	9	9	9	7	5	7	6	6	1	9
23	Doc. Monitoring	8	8	9	9	9	9	9	10	10	10

Table 2.1-11 Unweighted Scores for Each Criterion for the Ten Sites Assessed in the Phase II Site Evaluation

(Page 2 of 2)

	Criteria	Bonne-ville	McNeil	Grist	WCS-2	Horn Rapids	ELEA	WIPP-2	Fleming Smith	Ports-mouth	Wild-wood
24	Environ. Justice	10	10	10	10	10	10	10	10	10	10
25	Sensitive Areas	7	5	10	8	5	5	5	3	1	3
26	Hazardous Facilities	10	10	4	1	2	1	9	3	1	3
27	Adjacent Site Plans	9	9	8	7	9	7	3	5	3	3
28	Emergency Services	10	10	8	8	10	8	8	8	10	6
29	Housing & Necessities	9	9	5	5	9	4	4	9	8	5
30	Schools	9	9	8	8	9	8	8	7	7	6
31	Rec. & Cultural	9	9	5	5	9	4	4	7	7	6
32	Business Environment	8	8	5	5	6	5	5	7	6	6
33	Agencies	9	9	7	7	4	5	5	7	9	7
34	Public Support	9	9	9	9	4	9	9	5	7	5
35	Labor Support	6	6	3	3	5	5	5	1	5	1
36	Highway Access	9	10	7	8	7	10	8	8	10	10
37	Construction Traffic	6	6	6	6	6	6	6	6	6	6
38	LLW Disposal	7	7	6	6	9	7	7	10	5	5

FIGURES



LEGEND:

80 km (50 mi) RADIUS

SCALE

0 30 60 km

SCALE

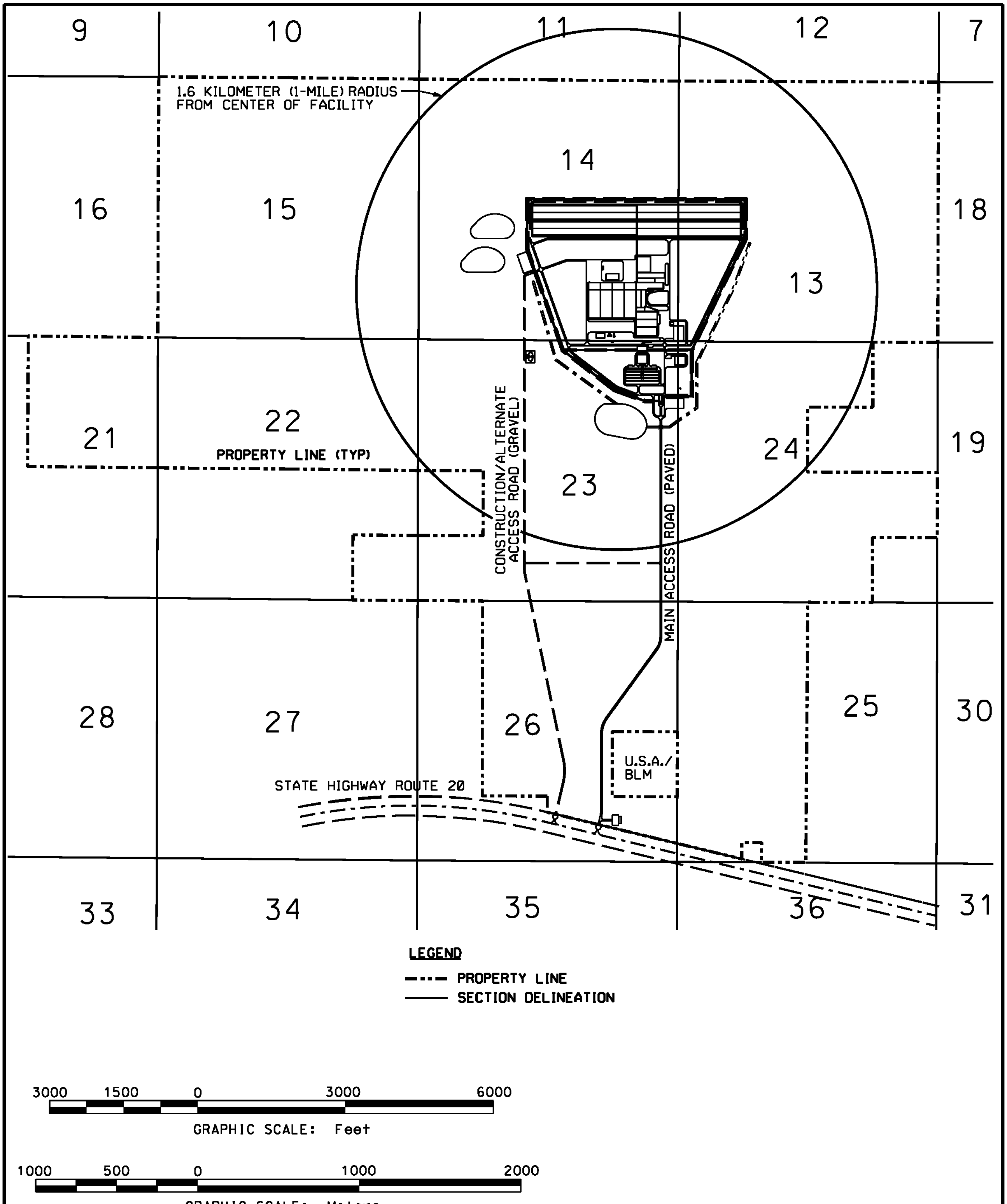
0 20 40 miles

N

Figure 2.1-1 **Rev. 2**

80-KILOMETER (50-MILE) RADIUS
WITH CITIES AND ROADS

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT



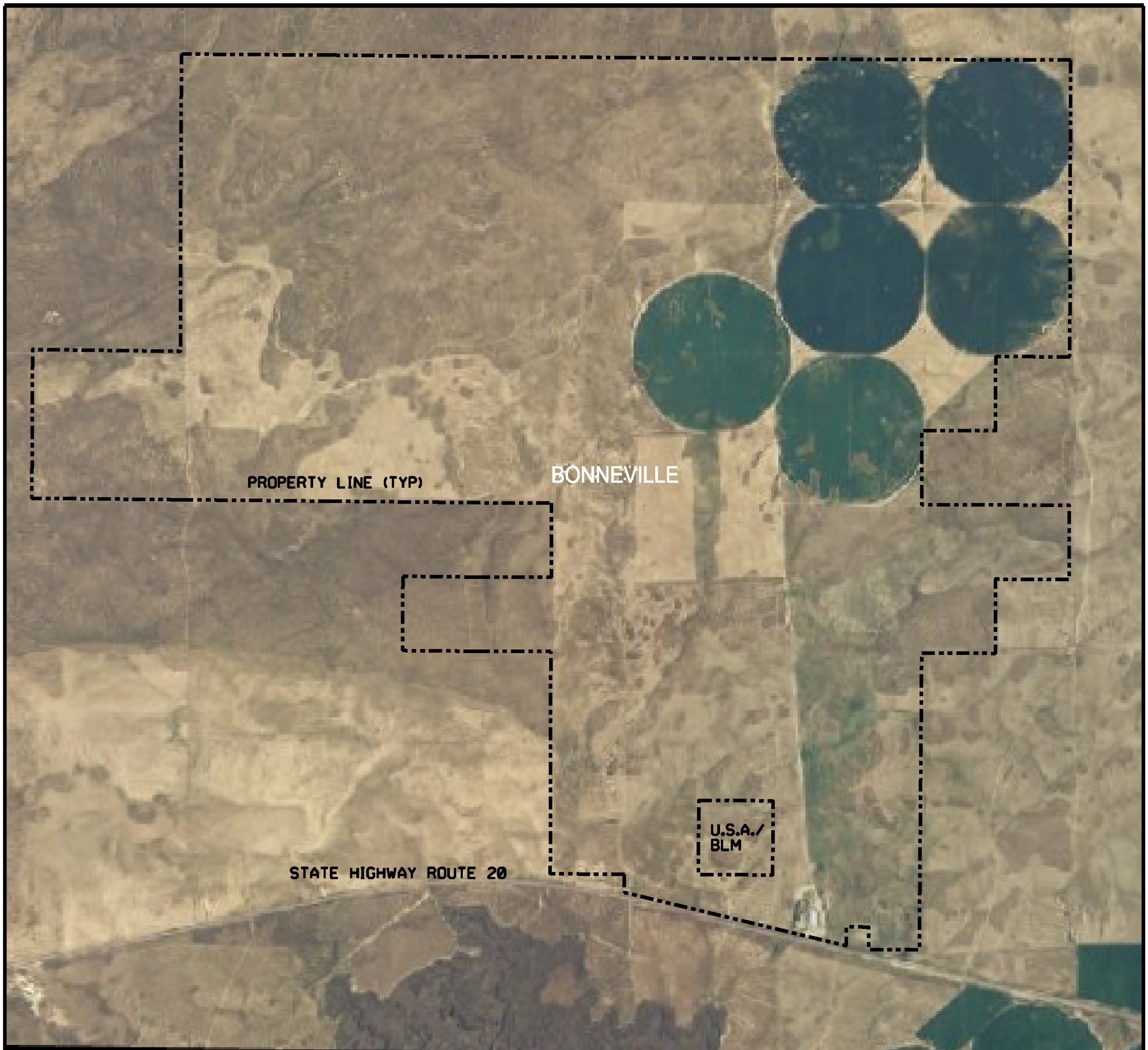
NOTES:

1. SEE FIGURE 2.1-4 FOR ENLARGED FACILITY LAYOUT.

Figure 2.1-2 **Rev. 2**

Site Area and Facility Layout Map
1.6 Kilometer (1 Mile) Radius

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT



LEGEND:

PROPERTY LINE

GRAPHIC SCALE

3000 1500 0 3000 6000FT

SCALE: 1''= 3000'

GRAPHIC SCALE (METRIC)

1000 500 0 1000 2000meters

Figure 2.1-3 **Rev. 2**

Existing Conditions
Site Aerial Photograph

EAGLE ROCK ENRICHMENT FACILITY
ENVIRONMENTAL REPORT

Figure 2.1-4, EREF Buildings, contains Security-Related Information Withheld from Disclosure under 10 CFR 2.390

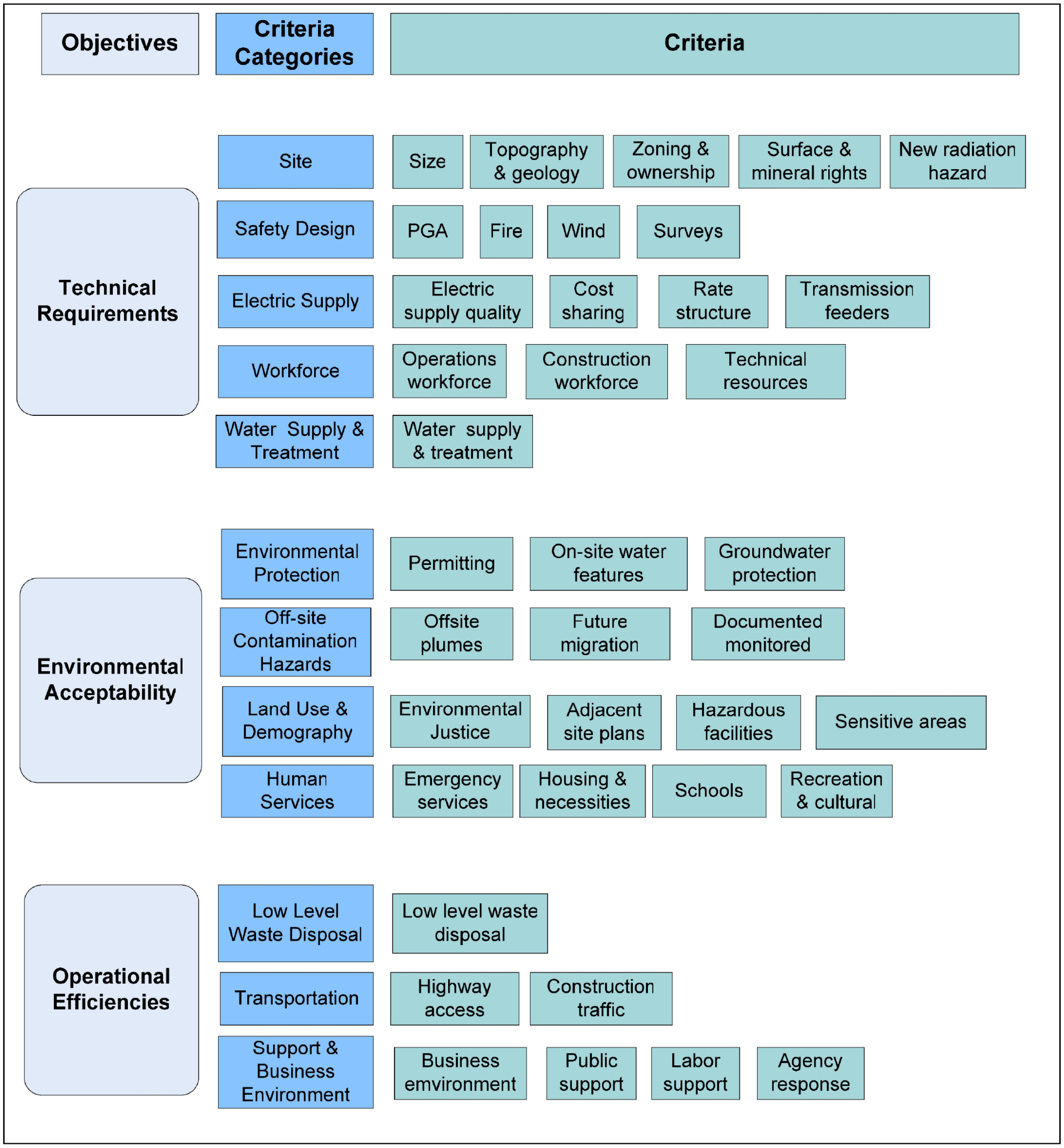


Figure 2.1-5 **Rev. 2**

Hierarchal Organization of Site Selection Objectives, Criteria Categories, and Criteria

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

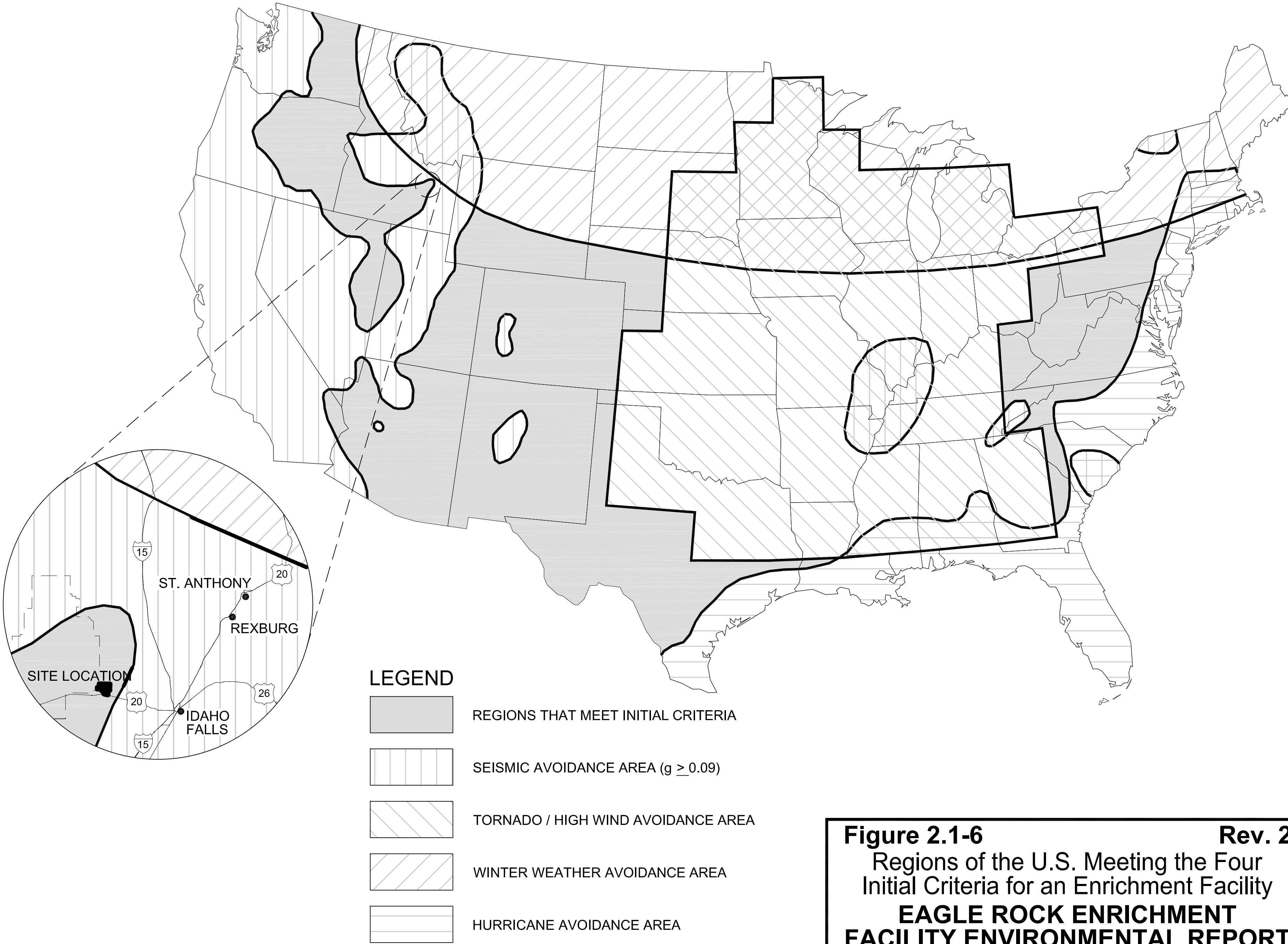


Figure 2.1-6 **Rev. 2**

Regions of the U.S. Meeting the Four Initial Criteria for an Enrichment Facility

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

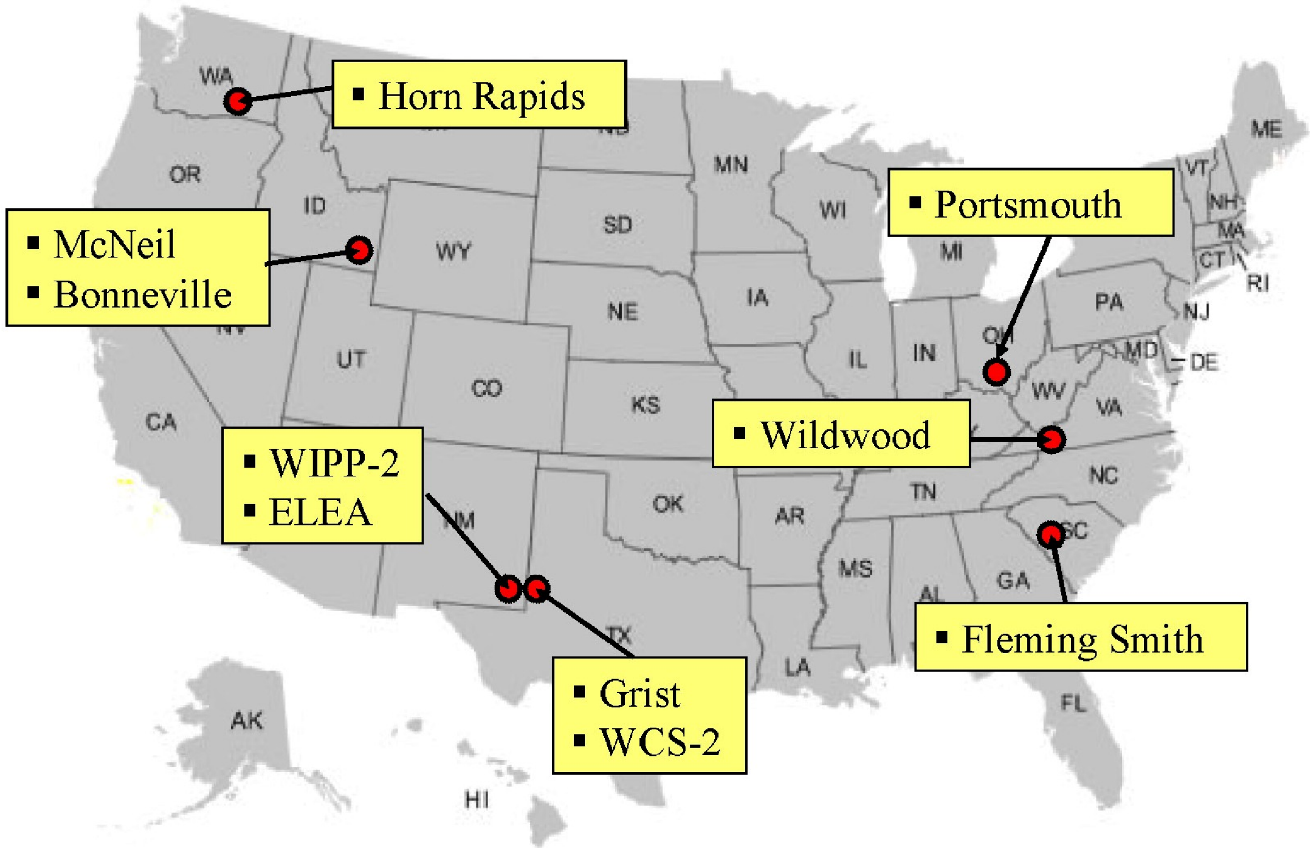


Figure 2.1-7 **Rev. 2**

General Locations of the Ten Sites Assessed in the Phase II Site Evaluation

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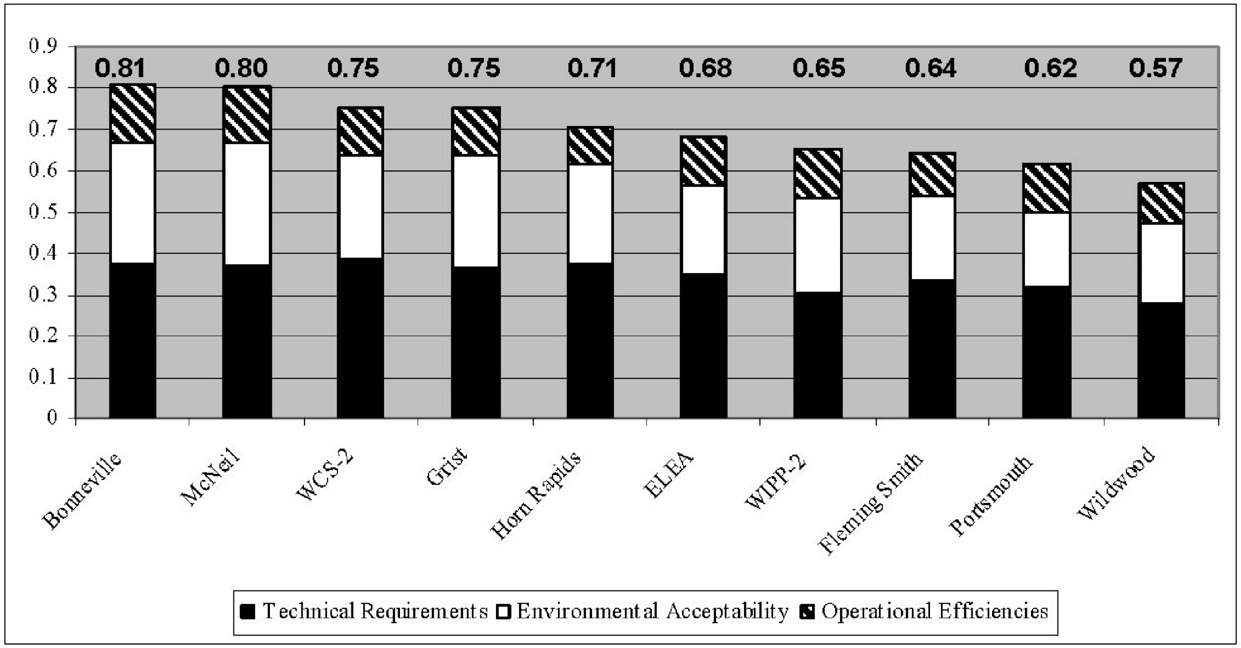

Figure 2.1-8 **Rev. 2**

Total Weighted Scores for the Ten Sites Assessed in the Phase II Site Evaluation

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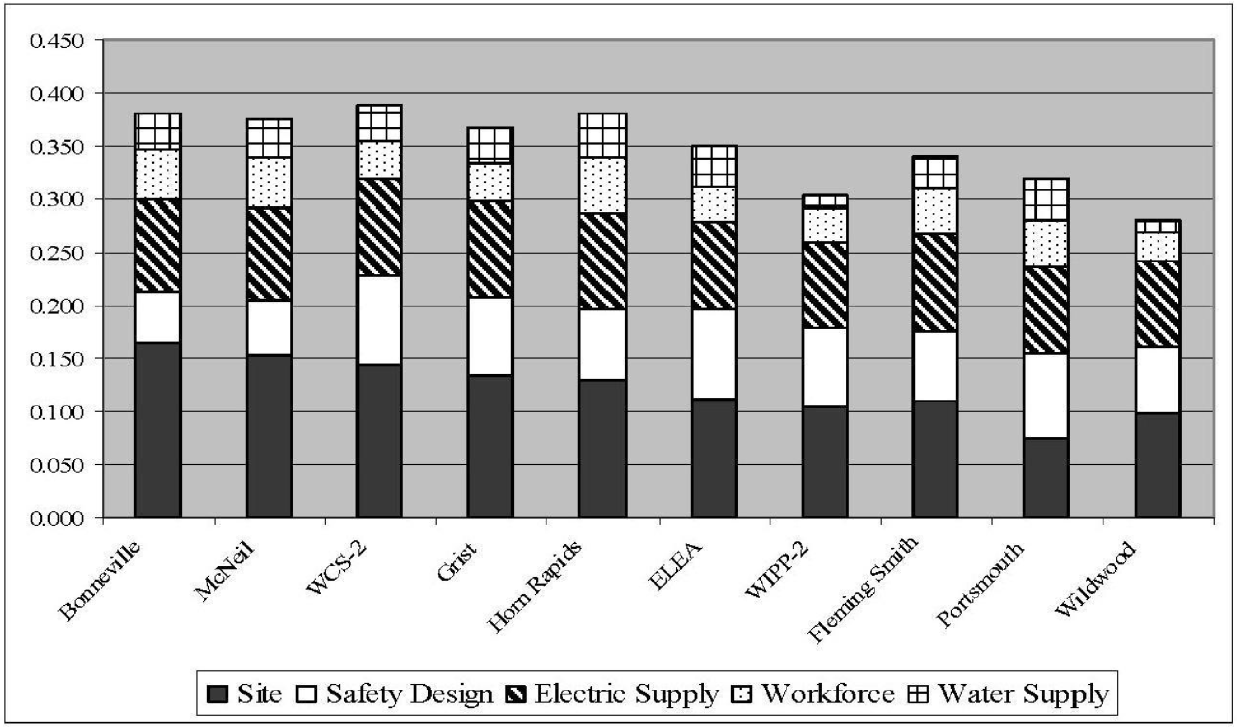

Figure 2.1-9 **Rev. 2**

Weighted Scores for the Technical Requirements Objective for the Ten Sites Assessed in the Phase II Site Evaluation

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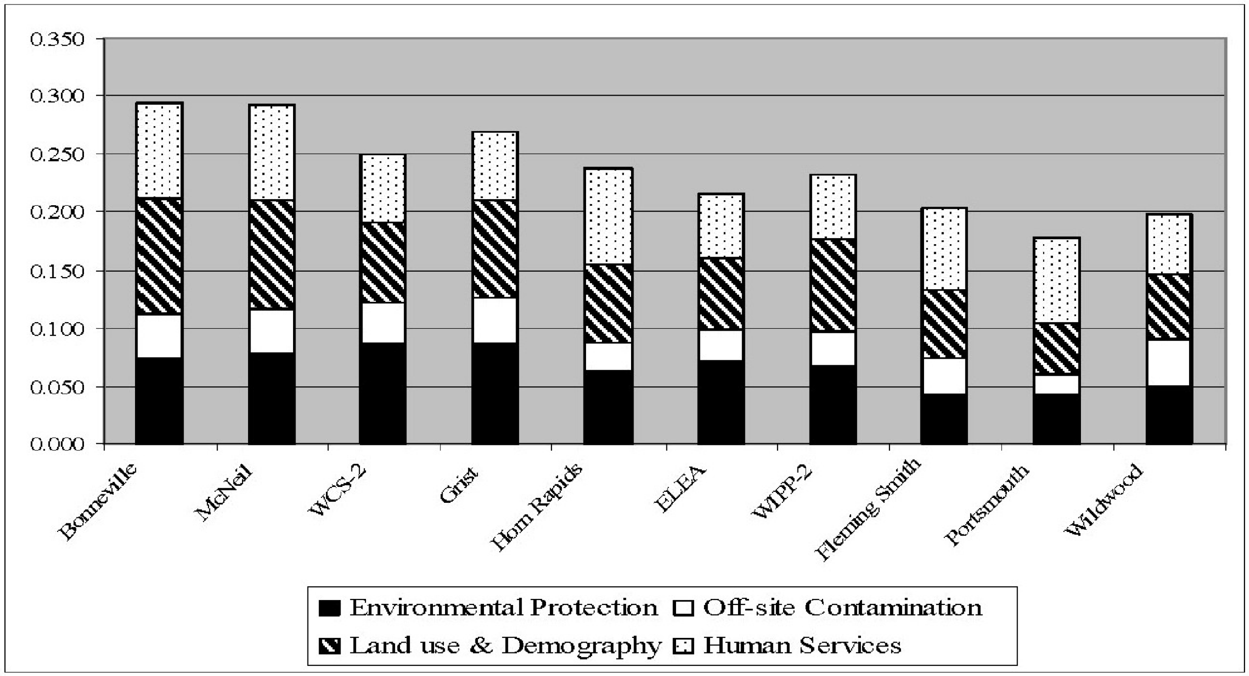

Figure 2.1-10 **Rev. 2**

Weighted Scores for the Environmental Acceptability Objective for the Ten Sites Assessed in the Phase II Site Evaluation

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

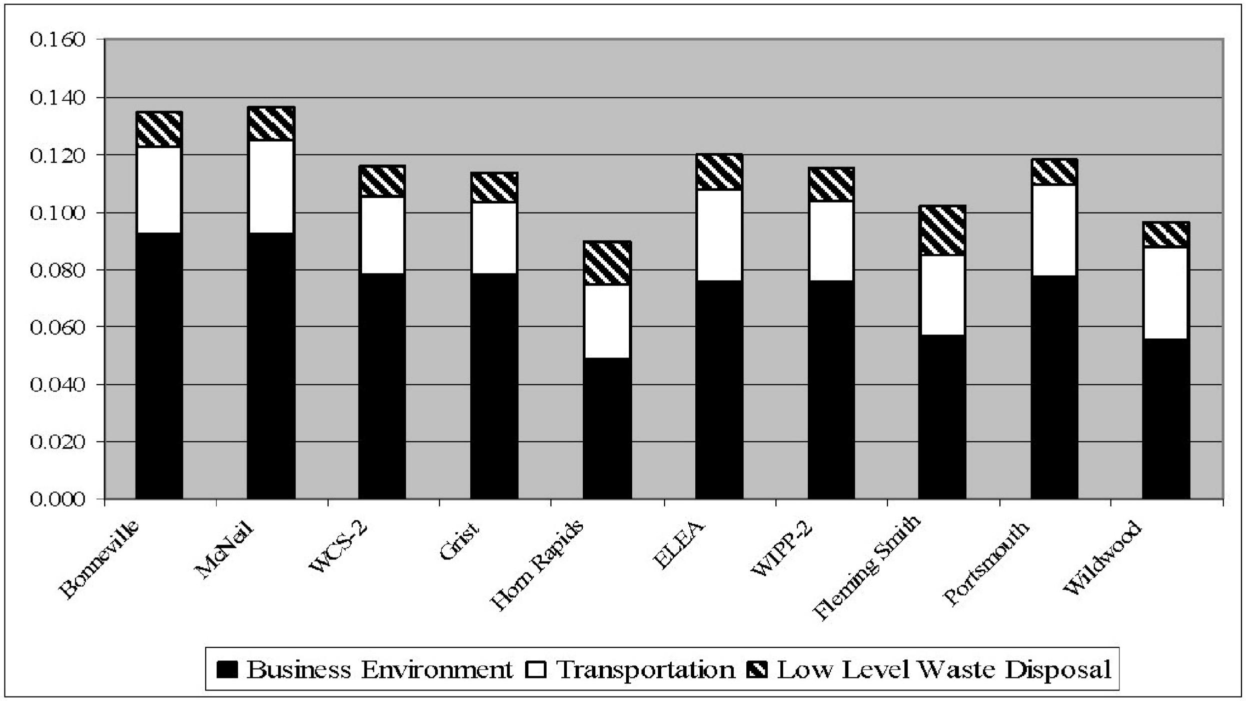

Figure 2.1-11 **Rev. 2**

Weighted Scores for the Operational Efficiencies Objective for the Ten Sites Assessed in the Phase II Site Evaluation

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

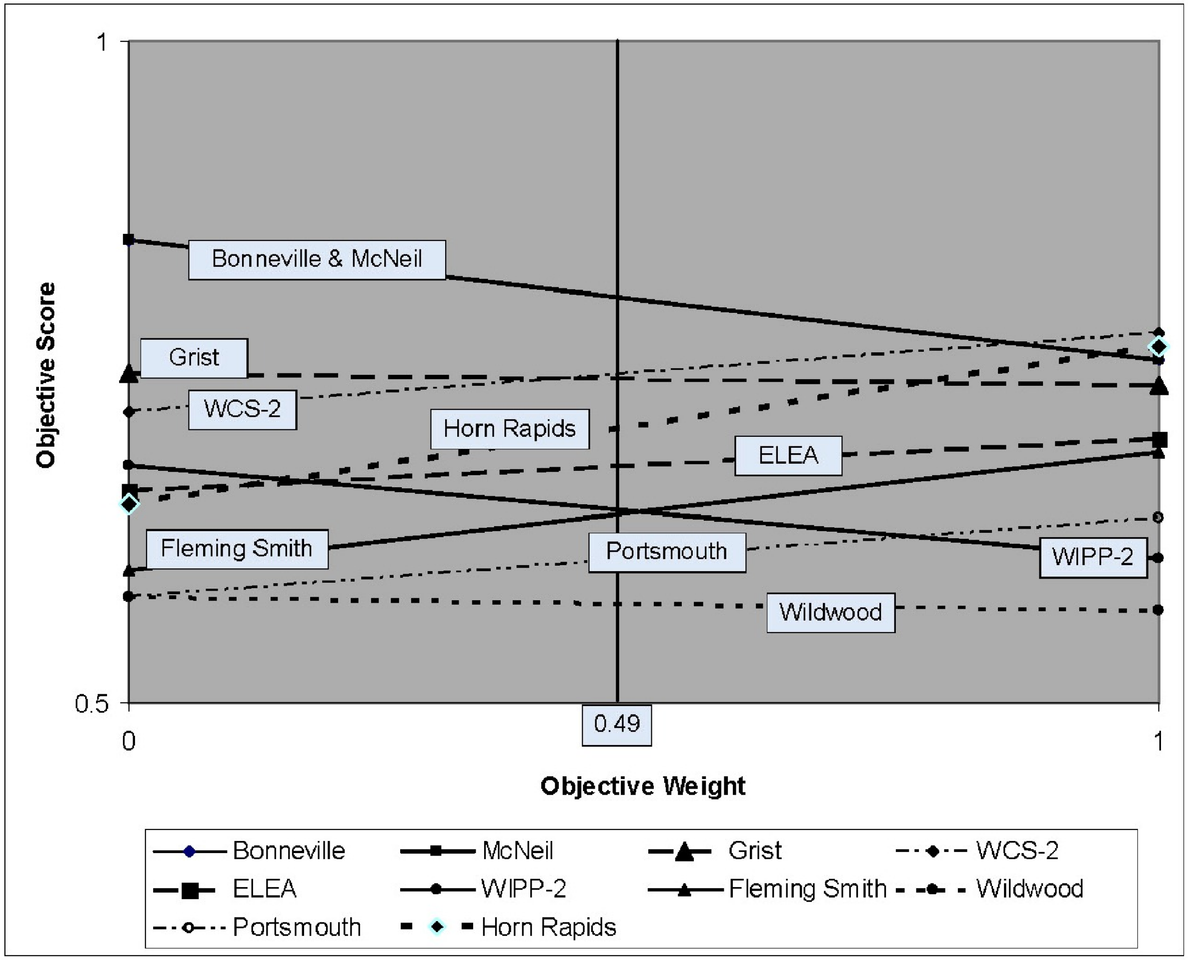

Figure 2.1-12 **Rev. 2**

Sensitivity of Site Ranking and Scores to Variable Weighting of the Technical Requirements Objective

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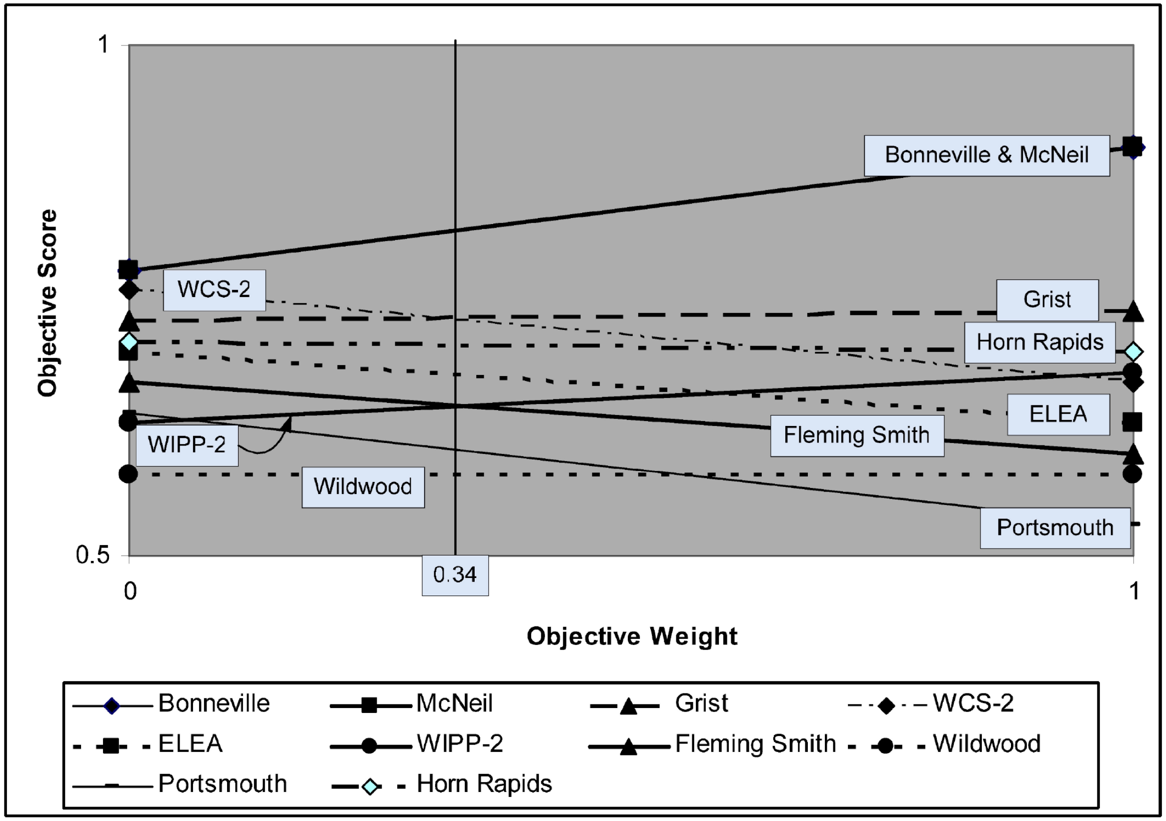

Figure 2.1-13 **Rev. 2**

Sensitivity of Site Ranking and Scores to Variable Weighting of the Environmental Acceptability Objective

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

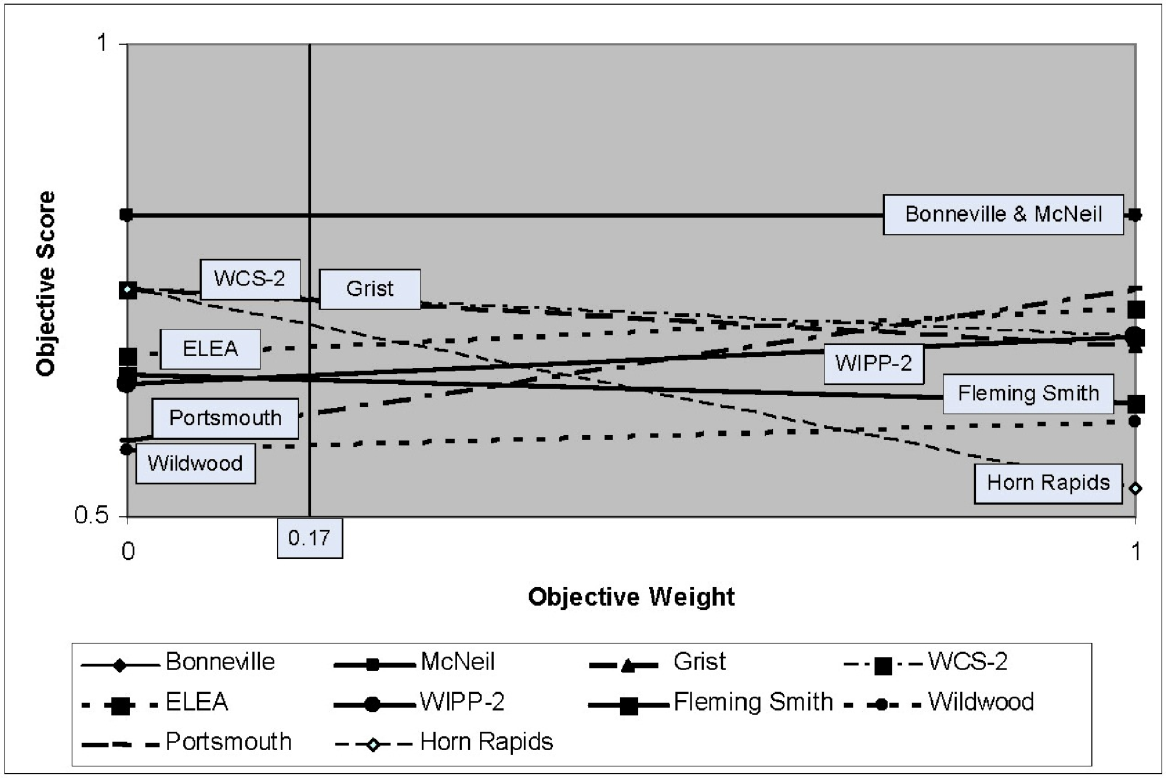

Figure 2.1-14 **Rev. 2**

Sensitivity of Site Ranking and Scores to Variable Weighting of the Operational Efficiencies Objective

EAGLE ROCK ENRICHMENT FACILITY ENVIRONMENTAL REPORT

2.2 ALTERNATIVES CONSIDERED BUT ELIMINATED

As set forth in ER Section 1.1, Purpose and Need for the Proposed Action, AREVA considered primary alternatives to the proposed action, i.e., alternatives to the construction and operation of the Eagle Rock Enrichment Facility (EREF). These alternatives include alternative sources of low-enriched uranium (LEU) currently available and potentially available to U.S. nuclear utilities in the future, such as the future deployment of a gas centrifuge plant by USEC; expansion by Urenco of its centrifuge capability in Europe; commissioning by Urenco's subsidiary, Louisiana Energy Services (LES), of its new plant in New Mexico, the National Enrichment Facility (NEF); continued sales of HEU-derived LEU under the U.S.-Russia HEU Agreement through 2013; and the potential increased availability of LEU derived from U.S.-owned HEU. The alternatives considered do not meet the underlying need for the proposed EREF, which is to provide additional reliable and economical uranium enrichment capacity in the United States, in accordance with U.S. energy and security policy objectives. The alternatives considered similarly fail to meet the important related commercial objectives of enhancing security of supply and eliminating dependence on the current single domestic enricher (USEC) or dependence on only two domestic enrichers when the NEF is commissioned. Additionally, various combinations of technical, economic, and political uncertainties associated with the alternatives identified in ER Section 1.1.2 warrant their elimination from further consideration in this ER. However, for completeness, the environmental impacts of several of the alternatives are compared to those of the proposed action in ER Section 2.4, Comparison of the Predicted Environmental Impacts.

AES also considered various secondary alternatives to the proposed action. These include alternative enrichment technologies, design alternatives, and alternative sites.

With respect to alternative technologies, AES considered the gaseous diffusion technology as an alternative method for enriching uranium, in so far as it is the only presently commercially operating process in the United States that allows for enrichment of uranium on the scale sought by AES for the proposed EREF. AES has concluded that the gas centrifuge process is superior because the production of the same amount of separative work units (SWU) by the gaseous diffusion process requires approximately 50 times more electricity. Indeed, as evidenced by its American Centrifuge Project, USEC intends to replace its use of the gaseous diffusion technology with the use of a gas centrifuge technology.

With respect to alternative designs, AES considered six system design changes from the Claiborne Enrichment Center for the EREF that would reduce the impact to the environment (see ER Section 2.1.3.2, Alternative Designs). The systems changed to improve plant efficiency and reduce environmental impact include the Cascade System, Feed System, Product Take-Off System, Product Liquid Sampling System, Product Blending System, and Tails Take-Off System. The EREF also includes several improvements over that licensed by LES for the NEF. These improvements include the redesigned Gaseous Effluent Ventilation System (GEVS), elimination of cooling towers, elimination of an onsite laundry, elimination of an onsite basin for disposal of treated liquid effluent, elimination of a circulating water system for building HVAC, addition of improved economizer HVAC units and consolidation of radiological support functions within a single building. Beyond other minor changes, there are no other significant design alternatives that could lower the impact of the EREF on the environment.

With respect to alternative sites, ten sites passed the Phase I screening (see ER Section 2.1.3.3). The Bonneville and McNeil, Idaho sites had the highest overall scores (0.81 and 0.80, respectively). The WCS-2 and Grist, Texas sites had the next highest overall scores (0.75 each) followed by the Horn Rapids, Washington site (0.71), the ELEA, New Mexico site (0.68), the WIPP-2, New Mexico site (0.65), the Fleming Smith, South Carolina site (0.64), the Portsmouth, Ohio site (0.62) and the Wildwood, Virginia site (0.57). Based on its review, AREVA selected the Bonneville, Idaho site as the proposed site for the EREF.

2.3 CUMULATIVE EFFECTS

Cumulative effects are those cumulative impacts that result from the incremental impact of an action added to other past, present, and reasonably foreseeable future actions. In conducting this analysis, AES considered past, current, and potential future facilities and activities that could have some potential for cumulative impacts when combined with the proposed construction and operation of the EREF.

AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. Thus, the local cumulative effects are those associated with the construction and operation of the EREF and the existing offsite development on surrounding properties. The anticipated direct and indirect impacts of the proposed construction and operation of EREF are expected to be small, except for the moderate to large impact due to the high percentage increase in traffic during the construction time frame for the EREF. The incremental cumulative impacts caused by EREF are also small, except for the moderate to large impact due to the high percentage increase in traffic during the construction time period.

The local cumulative effect on land use will be the impact caused by the construction and operation of the EREF and the existing offsite development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. Section 4.1, Land Use Impacts, discusses the land use impact associated with the construction and operation of the EREF. The cumulative impact associated with land use will be small, because the EREF impact is small and the nearby land is primarily utilized for grazing and cropping.

While INL and the city of Idaho Falls are contributing factors to cumulative impacts to transportation (U.S. Highway 20 use), AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. Section 4.2.8, Cumulative Impacts, discusses the transportation impacts from the existing traffic and the EREF. The cumulative impacts of traffic volume increases associated with construction of the EREF will be moderate to large, while the cumulative impacts of traffic volume increases associated with operation of the EREF will be small. The mitigation measures for the traffic increase during the construction phase of the EREF are defined in Section 4.2.5, Mitigation Measures.

A non-local cumulative impact is the cumulative dose to the general public or worker from transportation of UF_6 as feed, product or depleted material, and solid waste. Section 4.2.7, Radioactive Material Transportation, describes the radiological impacts associated with transportation of radiological materials associated with the EREF. The cumulative dose impacts to the general public or worker will be small.

The local cumulative impact to the geology and soils is limited to those resulting from construction and operation of the EREF and the existing development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. As described in Section 4.3.2, Cumulative Impacts to Geologic Resources, the cumulative impact to the geology and soils is small.

The local cumulative impact to water resources is limited to those resulting from construction and operation of the EREF and the existing development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. As described in Section 4.4.8, Identification of Predicted Cumulative Effects on Water Resources, the cumulative impact to the water resources will be small.

The local cumulative impact to ecological resources is limited to those resulting from construction and operation of the EREF and the existing development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. As described in Section 4.5.11, Cumulative Impacts, the cumulative impact to the ecological resources will be small.

In addition to the EREF, there are ten sources of emissions that could affect air quality in the four county local region as described in Section 3.6.3.9, Regional Emissions. Section 4.6.7, Cumulative Air Quality Impacts, determined that the cumulative impact to regional air quality will be small.

The cumulative non-local effect to noise from the EREF, existing traffic along U.S. Highway 20, farm and ranch operations, infrequent small aircraft, and environmental noise will be small per Section 4.7.6, Cumulative Impacts.

The local cumulative impact to historic and cultural resources is limited to those resulting from construction and operation of the EREF and the existing development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. As described in Section 4.8.7, Cumulative Impacts, the cumulative impact to historic and cultural resources will be small.

The local cumulative impact to visual/scenic resources is limited to those resulting from construction and operation of the EREF and existing offsite development on surrounding properties, because AES does not know of any other Federal, State, or private development plans within 16 km (10 mi) of the EREF. As described in Section 4.9.7, Cumulative Impacts to Visual/Scenic Quality, the cumulative impact to visual/scenic resources will be small.

Section 4.10.5 describes that several proposed developments within 80 km (50 mi) of the proposed site may contribute to regional cumulative socioeconomic effect. The cumulative socioeconomic effect of the proposed developments and the construction and operation of the EREF will be small.

A summary assessment of the potential for cumulative impacts is shown in Table 2.3-1, Potential Cumulative Effects for the EREF.

TABLES

Table 2.3-1 Potential Cumulative Effects for the EREF
(Page 1 of 1)

ER Section Reference	Effect On	EREF Effect	Cumulative Effects
4.1	Land Use	Small	Small
4.2	Transportation	Moderate to large for construction and small for operation	Moderate to large for construction and small for operation
4.3	Geology and Soils	Small	Small
4.4	Water Resources	Small	Small
4.5	Ecological	Small	Small
4.6	Air Quality	Small	Small
4.7	Noise	Small. Increased noise levels during construction, but few nearby receptors.	Small cumulative environmental noise effects when combined with existing U.S. Highway 20 noise levels from other local and non-local facilities and activities.
4.8	Historic and Cultural	Small	Small
4.9	Visual/Scenic Resources	Small	Small
4.10	Socioeconomics	Small	Small
4.11	Environmental Justice	Small	None
4.12	Public and Occupational Health	Small	Small
4.13	Waste Management	Small	Small

2.4 COMPARISON OF THE PREDICTED ENVIRONMENTAL IMPACTS

ER Section 1.1.2 analyzes various scenarios that assume that the Eagle Rock Enrichment Facility (EREF) is not built, referred to here as the no-action alternative scenarios. Only two of the scenarios are relevant to a comparison of domestic environmental impacts (C and D) because the others either include the proposed action (A, H), support the proposed action (B), would require an analysis of environmental impacts in Europe or Russia (E and F) which is outside of the scope required to be considered in the National Environmental Policy Act, or is a scenario that must be recognized as being highly speculative (G). The anticipated impacts to the environment for each of the no-action alternative scenarios (C and D) compared to the proposed action are described below.

Table 2.4-1, Comparison of Potential Impacts for the Proposed Action and the No-Action Alternative Scenarios, summarizes the potential impacts of each scenario and compares them against the proposed action in terms of domestic capacity and supply for both Reference and High Nuclear Power Growth. In the Reference Growth forecast, AREVA assumes that world nuclear plants currently in operation will dominate nuclear capacity through 2025. The High Growth forecast assumes a higher contribution from license renewals and new plants. Both growth scenarios are described in detail in ER Section 1.1.2.1. Table 2.4-1 also provides an overall summary of the environmental impacts for the ER Chapter 4 categories as tabulated in Table 2.4-2, Comparison of Environmental Impacts for the Proposed Action and No-Action Alternative Scenarios.

Table 2.4-2 compares the two no-action scenarios against the proposed action for each of the ER Chapter 4 environmental categories in relative terms, i.e., it estimates whether the impacts are the same, greater than or less than those anticipated for the proposed action. ER Chapter 4 itself contains the detailed description of potential impacts of the proposed action on individual resources of the affected environment.

Proposed Action (Scenario A)

The Proposed Action or Scenario A represents the scenario that is being actively pursued by AES, LES and USEC: AES deploys the EREF with a nominal capacity of 6 million SWU while LES and USEC complete their domestic enrichment projects consistent with schedules announced by each company as described in Section 1.1.2.3.1. This includes USEC's replacement of the Paducah Gaseous Diffusion Plant with the 5.9 million SWU-capacity American Centrifuge Plant and LES' completion of the 3 million SWU-capacity National Enrichment Facility.

Scenario C - Base Supply Without EREF; Plus GEH Deployment of GLE

Scenario C assumes that General Electric Hitachi (GEH), parent company of Global Laser Enrichment (GLE), successfully deploys the Silex enrichment technology with commercial deployment of a 6 million SWU commercial plant by 2015 and ramping up to 6 million SWU by 2020. With Reference Nuclear Power Growth, there is small surplus enrichment capacity until the 2021-2025 period and the 2026-2030 period when there is a deficit of 0.7% and 4.4% respectively. With the High Nuclear Power Growth forecast, a deficit of 1.2% occurs in the 2011-2015 period and grows to 3.9% in the 2016-2020 period, 10.6% in the 2021-2025 period, and 16.2% in the 2026-2030 period.

While providing for indigenous U.S. supply, there are several critical concerns associated with this alternative scenario. On January 30, 2009, GEH delivered its environmental report to the

NRC with the rest of the license application to be submitted by June 2009 (SILEX, 2009). GEH will decide if GLE will be deployed commercially, following results of testing that is scheduled to occur during 2009. Therefore, Scenario C, far from being a certain alternative source of enrichment services, is at the present time highly speculative from both a technological and commercial perspective. Ultimately, GEH may decide not to proceed with construction and deployment of GLE. Even if it does make the decision to proceed, there remain uncertainties associated with the schedule and licensing of a new technology, and ultimately financing, building and operating it.

While GLE may eventually offer value as a supplier of enrichment services to the industry in the long term, it is not prudent to substitute (i) a potential source of supply for which the enrichment technology has not yet been commercially tested and a commercial plant deployment decision has not yet been made for (ii) the proposed AREVA plant in the U.S. that would be using commercially proven centrifuge enrichment technology that would be built and operated by a company that has been providing enrichment services world wide for many decades. The selection of Scenario C would not alleviate concerns among U.S. purchasers of enrichment services regarding long-term security of supply. Therefore, Scenario C is not viewed by AREVA as a responsible alternative to that of proceeding with the AREVA plant in the U.S.

Scenario D - Base Supply Without EREF; Plus USEC Expansion of ACP

Scenario D assumes that USEC successfully completes and then, during the 2013-2016 period, successfully expands the ACP by an additional 3.2 million SWU per year enrichment capacity to attain its licensed maximum capacity of 7 million SWU per year. With the Reference Nuclear Power Growth forecast, a 5.0% deficit of requirements over available supply appears in the 2021-2025 period, and an 8.4% deficit of requirements over available supply appears in the 2026-2030 period. With the High Nuclear Power Growth forecast, a 2.3% deficit occurs in the 2011-2015 period and grows to 7.3% in the 2016-2020 period, 14.0% in the 2021-2025 period, and 19.2% in the 2026-2030 period.

However, it should be noted that at the present time, the USEC ACP is not operational and USEC has also not obtained all the financing needed to construct the initial 3.8 million SWU of capacity. In addition, USEC has not publicly stated that a decision has been made to expand enrichment capacity of the ACP immediately upon completion of capacity that is presently under construction, as would be required under this scenario. Ultimately, USEC may decide not to proceed with such an expansion.

While USEC offers value as a long term supplier of enrichment services to the industry, it is not prudent to substitute (i) potential sources of supply for which commercial plant expansion decisions have not yet been made, and in the case of USEC the enrichment technology not yet commercially proven, or (ii) the proposed AREVA plant in the U.S. using commercially proven centrifuge enrichment technology that would be built and operated by a company that has been providing enrichment services world wide for many decades. The selection of Scenario D would not alleviate concerns among U.S. purchasers of enrichment services regarding long-term security of supply. In addition, it would not result in an additional source of indigenous competitive supply, but just USEC with greater enrichment capacity and LES. Therefore, Scenario D is not viewed by AES as a responsible alternative to that of proceeding with the AES plant in the U.S.

Summary

Not building the EREF could have the following consequences:

- A uranium supply deficit for which other sources of supply must compensate.
- Expansion of other facilities resulting in a higher concentration of production in one location.
- Diminished long-term security of supply for U.S. commercial nuclear power generating stations.
- Decreased competition potentially resulting in higher fuel costs for U.S. commercial nuclear generating stations.
- Diminish the objective of long-term security of supply.

Accordingly, AES considers that the EREF would be a complementary and competitive supplier for the uranium enrichment services required for the nuclear generating stations that are currently in operation and for the impending growth of nuclear generation consistent with growing world electric generation demand and an increased reliance on nuclear power as a means of reducing carbon emissions. EREF would foster increased competition and would provide a means to offset foreign enrichment supplies. It would also avoid reliance on new unproven enrichment technologies and a concentration of enrichment services in a single location.

While the no-action alternative scenarios would avoid any impacts to Bonneville County, Idaho, due to construction and operation of the EREF, it would lead to impacts at other locations. If the proposed EREF is not built, there will be a continued and increasing need for uranium enrichment services. The no-action alternative scenarios, as discussed above, would allow for at least two domestic options in regard to continued uranium enrichment supply; Scenarios C and D.

As summarized in Table 2.4-2, Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios, the impacts to the environment of all no-action alternative scenarios are anticipated to be about the same (Scenario C) or greater than (Scenario D) the proposed action in both the short and long term. There are potentially lesser impacts in some environmental categories, which are offset by greater environmental impacts in other categories due to, for instance, concentration of enrichment in one location. In addition, the important objective of security of supply is delayed. Hence, it is reasonable to reject the no-action alternative scenarios because the affect to the environment from the proposed action is small, as demonstrated in ER Chapter 4, Environmental Impacts, and the benefits desirable, as demonstrated in ER Chapter 7, Cost-Benefit Analysis.

TABLES

Table 2.4-1 Comparison of Potential Impacts for the Proposed Action and the No-Action Alternative Scenarios (Page 1 of 1)

Potential Impact	Proposed Action[1]	Alternative Scenarios		
		Scenario C Base Supply Without EREF; Plus GEH Deployment of GLE		Scenario D Base Supply Without EREF; Plus USEC Expansion of ACP
Domestic Capacity	EREF provides a nominal 6 million SWU/yr supply; ACP provides 3.8 million SWU/yr; and NEF provides 5.9 million SWU/yr. Paducah GDP is removed from service as ACP comes on line.	GLE operational in 2015 and provides base enrichment capacity of 3.5 million SWU/yr and ramping up to 6 million SWU/yr by 2020. Under Reference Growth, deficit begins in 2021; under High Growth, deficit begins in 2011.		ACP increases capacity to 7 million SWU/yr in 2013-2016 period. Under Reference Growth, deficit begins in 2021; under High Growth, deficit begins in 2011.
Domestic Supply	Establishes three indigenous long-term sources of energy efficient, low cost, reliable enrichment services; fosters competition and results in more secure source; ensures competitive procurement process for customers; provides replacement supply for inefficient and noncompetitive gaseous diffusion enrichment plants and protects against prospect of supply shortfalls if foreign sources become unavailable.	Growing supply to requirement deficit after early surplus under Reference Growth; GLE is unproven technology and is undergoing testing and no commitment to build has been made.		Growing supply to requirement deficit after early surplus; USEC ACP not operational and USEC has not stated that a decision has been made to expand.
Summary of Environmental Impacts (see Table 2.4-2 for list of categories)	Total Scoring[2]: 0	Total Scoring[2]: 0		Total Scoring[2]: -2.0

[1]Proposed action assumes that AES, LES and USEC deploy centrifuge plants and GDP is shutdown when the USEC centrifuge plant comes on line. The proposed action receives a neutral score of zero (i.e. baseline impact on the environment).
[2]All Alternative Scenarios are compared against the Proposed Action. A positive score means less impact on the environment than the Proposed Action; a negative score means greater impact.

Table 2.4-2 Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios (Page 1 of 4)

Environmental Category	Proposed Action	Alternative Scenarios		
		Scenario C Base Supply Without EREF; Plus GEH Deployment of GLE		**Scenario D Base Supply Without EREF; Plus USEC Expansion of ACP**
Land Use	Minimal for EREF (See ER Section 4.1)	Same impact since three enrichment plants are built Scoring: 0		Same or less impact since only two of three GCPs built but expansion at ACP impacts some additional land Scoring: +0.5
Transportation	Minimal for EREF (See ER Section 4.2)	Same impact since three enrichment plants are built Scoring: 0		Greater impact since concentrating shipments at fewer locations Scoring: -1
Geology and Soils	Minimal for EREF (See ER Section 4.3)	Same impact since three enrichment plants are built Scoring: 0		Same impact if increased capacity on undisturbed land; less impact if on already disturbed land Scoring: 0 or +1 (use +0.5)
Water Resources	Minimal for EREF (see ER Section 4.4)	Same impact if similar water requirements Scoring: 0		Greater impact since concentrating water usage at one location Scoring: -1

Table 2.4-2 Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios (Page 2 of 4)

Environmental Category	Proposed Action	Alternative Scenarios		
		Scenario C **Base Supply Without EREF; Plus GEH Deployment of GLE**		**Scenario D** **Base Supply Without EREF; Plus USEC Expansion of ACP**
Ecological resources	Minimal for EREF (See ER Section 4.5)	Same impact since three enrichment plants are built Scoring: 0		Same or greater impact since expansion concentrates at one location Scoring: -0.5
Air Quality	Minimal for EREF, less than regulatory limits (See ER Section 4.6)	Same impact since three enrichment plants are built Scoring: 0		Same or greater impact since expansion concentrates at one location Scoring: -0.5
Noise	Minimal for EREF, within HUD and EPA limits (See ER Section 4.7)	Same impact since three enrichment plants are built Scoring: 0		Same or greater impact since expansion concentrates at one location Scoring: -0.5
Historic and Cultural	Minimal for EREF, impacts can be avoided or mitigated (See ER Section 4.8)	Same impact since three enrichment plants are built Scoring: 0		Same or less impact Scoring: +0.5

Table 2.4-2 Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios (Page 3 of 4)

Environmental Category	Proposed Action	Alternative Scenarios		
		Scenario C **Base Supply Without EREF; Plus GEH Deployment of GLE**		**Scenario D** **Base Supply Without EREF; Plus USEC Expansion of ACP**
Visual/Scenic	Minimal for EREF (See ER Section 4.9)	Same impact since three enrichment plants are built Scoring: 0		Same or less impact Scoring: +0.5
Socioeconomic	Positive impact to local economy due to EREF (See ER Section 4.10	Same impact since three enrichment plants are built Scoring: 0		Same or less positive impact Scoring: -0.5
Environmental Justice	No disproportionate impact for EREF (See ER Section 4.11)	Same impact Scoring: 0		Same impact Scoring: 0
Public and Occupational Exposure	Minimal for EREF; doses below NRC and EPA regulatory limits (See ER Section 4.12)	Same impact since three enrichment plants are built Scoring: 0		Same impact since overall SWU capacity would be about the same Scoring: 0
Waste Management	Minimal for EREF (See ER Section 4.13)	Same impact since three enrichment plants are built Scoring: 0		Same impact since overall SWU capacity would be about the same Scoring: 0

Table 2.4-2 Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios
(Page 4 of 4)

Scoring Key is as follows:	
+1	Less impact than Proposed Action
+0.5	Same or less impact than Proposed Action
0	Same impact as Proposed Action
-0.5	Same or greater impact than Proposed Action
-1	Greater impact than Proposed Action
-1.5	Significantly greater impact than Proposed Action