4 ENVIRONMENTAL IMPACTS

4.1 Introduction

This chapter presents the potential impacts associated with the construction, operation, and decommissioning of the proposed National Enrichment Facility (NEF). For the proposed action, this Environmental Impact Statement (EIS) considers impacts from site preparation and construction activities, normal operations, credible accidents, and cumulative impacts and resource commitments. The chapter is organized by environmentally affected areas (i.e., air, water, noise, public and occupational health, etc.). Impacts to each environmentally affected area are divided into two categories—site preparation/construction, and operation—except in those areas where the impacts occur over the entire proposed action and cannot be divided.

Section 4.2 discusses the proposed action under consideration in this EIS—namely, the site preparation, construction, and operations of the proposed NEF in Lea County, New Mexico. The decontamination and decommissioning impacts discussed in section 4.3 would only be preliminary, or estimated, for the proposed NEF. Detailed impacts from decontamination and decommissioning would be assessed at the end of the proposed NEF's operations and prior to U.S. Nuclear Regulatory Commission (NRC) approval to begin such activities. Under Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) § 70.38, the NRC requires that LES file an application for decommissioning of the proposed NEF 12 months prior to the expiration of the license. This application would include a detailed Decommissioning Plan that would take into account the extent of radiological contamination at the site. Moreover, because decontamination and decommissioning would take place well in the future, advanced technology improving the decontamination and decommissioning process would be available.

Determination of the Significance of Potential Environmental Impacts

A standard of significance has been established for assessing environmental impacts. Based on the Council on Environmental Quality's regulations, each impact is to be assigned one of the following three significance levels:

- ***Small:*** *The environmental effects are not detectable or are so minor that they would neither destabilize nor noticeably alter any important attribute of the resource.*
- ***Moderate:*** *The environmental effects are sufficient to noticeably alter but not destabilize important attributes of the resource.*
- ***Large:*** *The environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource.*

Source: NRC, 2003a.

In addition, this chapter discusses the potential cumulative impacts (section 4.4), irreversible and irretrievable commitment of resources (section 4.5), unavoidable adverse environmental impacts (section 4.6), the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity (section 4.7), and the no-action alternative (section 4.8).

Environmental impacts are separated into radiological and nonradiological areas of concern. Radiological impacts include radiation doses to the public and workers from the routine operations, transportation, potential accidents, and decommissioning and environmental impacts from potential releases in the air, soil, or water. Nonradiological impacts include chemical hazards, emissions (e.g., vehicle fumes), occupational accidents and injuries (e.g., vehicle collisions), and workplace accidents.

4.2 Proposed Action

As defined in Chapter 2 of this EIS, the proposed action is the construction, operation, and decontamination and decommissioning of the proposed NEF. The NRC would issue a license to Louisiana Energy Services (LES) in accordance with the requirements of 10 CFR Parts 30, 40, and 70 to possess and use source, byproduct, and special nuclear material. This section discusses impacts of construction and operation, while section 4.3 discusses decontamination and decommissioning impacts.

4.2.1 Land Use Impacts

Impacts on land use are considered in terms of commitment of the land for the proposed use and its potential exclusion from other possible uses.

The State of New Mexico and Lea County have completed a land exchange that transfers ownership of the proposed site to Lea County. On December 8, 2004, LES began a 30-year lease of the proposed 220-hectares (543-acre) site from Lea County. If the proposed NEF is licensed, LES would purchase the land at the end of the lease. The transfer of the land would not conflict with any existing Federal, State, local, or Indian tribe land-use plans. Rather, the construction and operation of the proposed NEF would support a preferred land-use plan being pursued by the city of Eunice, New Mexico. The proposed NEF construction and operation would have no foreseeable conflicts with the Land and Water Conservation Fund and the Urban Park and Recreation Recovery programs in the area (NMEMN, 2004; Abousleman, 2004a). Following decontamination and decommissioning activities, long-term stewardship would be the responsibility of LES (or other entity if LES sells the property) after meeting the NRC's license termination requirements for protection of public health and safety.

4.2.1.1 Site Preparation and Construction

The most obvious land-use impact would be onsite disturbance during project construction and operation. Potential land-use impacts would be limited to about 81 hectares (200 acres) within a 220-hectare (543-acre) site. The remaining property (139 hectares or 343 acres) is expected to be left in a natural state for the duration of the license. The impacts resulting from restricting the current land use (i.e., cattle grazing) would be SMALL due to the abundance of other nearby grazing land.

The relocation of the carbon dioxide (CO_2) pipeline would result in temporary disruption of CO_2 supplies to recipients. Because there would be no change in capacity once the relocation along the site boundaries is completed, the resultant impact would be SMALL and confined to the relocation period. The relocation activities would comply with all applicable regulations and best management practices (BMPs) to minimize any direct or indirect environmental impacts.

Installation of the necessary municipal water-supply piping, natural gas supply piping, and electrical transmission lines would also result in temporary land-use impacts (principally from the disruption of access to property along county right-of-way easements where these infrastructure projects would occur). As with the relocation of the CO_2 pipeline, these impacts would be SMALL and temporary. The electrical transmission lines would also be installed according to applicable regulations and BMPs within the proposed NEF site.

4.2.1.2 Operations

Operation of the proposed NEF would limit land use to those processes related to uranium enrichment. The operation of the proposed NEF would be consistent with the existing land use of the neighboring industrial facilities. Therefore, the impacts to the surrounding land use would be SMALL.

4.2.1.3 Mitigation Measures

Several BMPs would help minimize impacts to surrounding land use by limiting the impacts to within the proposed NEF boundaries. Construction BMPs would be used to mitigate potential short-term increases in soil erosion due to construction activities in addition to specific BMPs for relocating the CO_2 pipeline. A Spill Prevention Control and Countermeasures Plan would be implemented to address any potential spills that could occur within the proposed NEF site. A waste management program would be used to minimize solid waste and hazardous materials that could contaminate the surrounding soils.

4.2.2 Historical and Cultural Resources Impacts

This section discusses the potential impacts to the known historical and cultural resources on the proposed NEF site.

The *National Historic Preservation Act* (NHPA) as amended requires Federal agencies to take into account the potential effects of their undertakings on historic properties. Under Section 106 of the NHPA, two undertakings could create potential adverse effects to historic properties at the proposed NEF site—a Federal agency (i.e., NRC) licensing action and a State of New Mexico land-exchange process. As discussed below, impacts from both undertakings would be combined and evaluated under a single consultation process.

As indicated in section 3.1 of Chapter 3 of this EIS, a land-exchange transferred ownership of the property from the State of New Mexico to Lea County. On December 8, 2004, LES began a 30-year lease of the property from Lea County after which, if the proposed NEF is licensed, LES would purchase the land. The New Mexico State Historic Preservation Office and New Mexico State Land Office consider this land-exchange process to be an adverse effect on historic properties (NMDCA, 2004).

The cultural resources inventory (Graves, 2004) indicated the presence of seven prehistoric archaeological sites recorded in the 220-hectare (543-acre) proposed NEF site. Two (LA 149701 and LA 140702) are located in the northeast sector of the proposed facility layout and would be directly impacted during construction activities. A third (LA 140705) is situated along the proposed access road. The remaining archaeological sites are located north and northwest of the facility layout, along the northern boundary of the property.

Three sites (LA 140701, LA 140702, and LA 140703) were originally recommended by the field investigators as not retaining sufficient integrity or research value for eligibility for listing on the National Register of Historic Places. The remaining four archaeological sites, LA 140404 through LA 140707, were recommended as being either potentially eligible or eligible for listing on the National Register of Historic Places. Subsequent review of the field results by the New Mexico State Historic Preservation Office and New Mexico State Land Office officials determined that all of the seven archaeological sites were similar in nature and that buried cultural resources could be present at each one (NMDCA, 2004). Consequently, each of the seven sites is now considered eligible for listing on the National Register of Historic Places and is considered to be an historic property.

The Section 106 consultation process with regional Federally recognized Indian tribes and other organizations was initiated (see subsection 1.5.6.2 and Appendix B). This course of action yielded no information on potential traditional cultural properties or other culturally significant resources at the proposed NEF site.

Consultations between LES, the New Mexico State Historic Preservation Office, the New Mexico State Land Office, the Advisory Council on Historic Preservation, and the NRC staff led to an agreement that a single Memorandum of Agreement would be prepared to conclude the Section 106 consultation process (NRC, 2004a). The Memorandum of Agreement records the terms and conditions agreed upon between the consulting parties to resolve adverse effects to historic properties at the proposed NEF site. It includes the above parties as well as Lea County as signatories, the potentially affected Indian tribes as concurring parties, and references and incorporates an historic properties treatment plan as an appendix. Once measures outlined in the treatment plan are executed, adverse impacts to all seven of the historic properties at the proposed NEF site would be mitigated, including effects from both the licensing and land-exchange processes. Mitigative tasks in the treatment plan would be fully implemented prior to construction of the proposed NEF. The transmittal letters and the Memorandum of Agreement are included in Appendix B. The treatment plan is not publicly available due to the sensitive nature of the information contained in the plan.

Based on the successful completion of the identification of historic and archaeological sites, National Register of Historic Places evaluations, and effective treatment of potential adverse effects to historic properties, along with the existence of written procedures to provide immediate reaction and notification in the event of inadvertent discovery of cultural resources, the potential impacts on historical and cultural resources at the proposed NEF site would be expected to be SMALL.

4.2.2.1 Mitigation Measures

An historic properties treatment plan has been finalized between the NRC, LES, the New Mexico State Historic Preservation Office, the New Mexico State Land Office, Lea County, and the Advisory Council on Historic Preservation with Indian tribes as concurring parties. This plan establishes the terms and conditions to resolve the potential for adverse effects to historic properties at the proposed NEF site (Proper, 2004).

The treatment plan includes several data-recovery approaches to retrieve scientific information from each of the seven archaeological sites. These approaches include mapping and collection of surface artifacts, subsurface testing of cultural features and artifact concentrations, and mechanical cross-trenching of the site areas. A geoarchaeological study would accompany the subsurface testing and trenching efforts. Analyses of the retrieved data would focus on determining the age of the sites, site function, paleoenvironmental setting, and cultural attributes associated with the site occupancy. A final written report would be prepared and all artifacts and associated data would be permanently curated at an approved archival facility.

4.2.3 Visual and Scenic Resources Impacts

Although the construction and operation of the proposed NEF would modify the visual and scenic quality of the area, it would remain compatible with the surrounding land uses (Figure 4-1). The site is bordered by Wallach Concrete, Inc., and Sundance Services, Inc., to the north; the Lea County Landfill to the south/southeast across New Mexico Highway 234; DD Landfarm to the west; and Waste Control

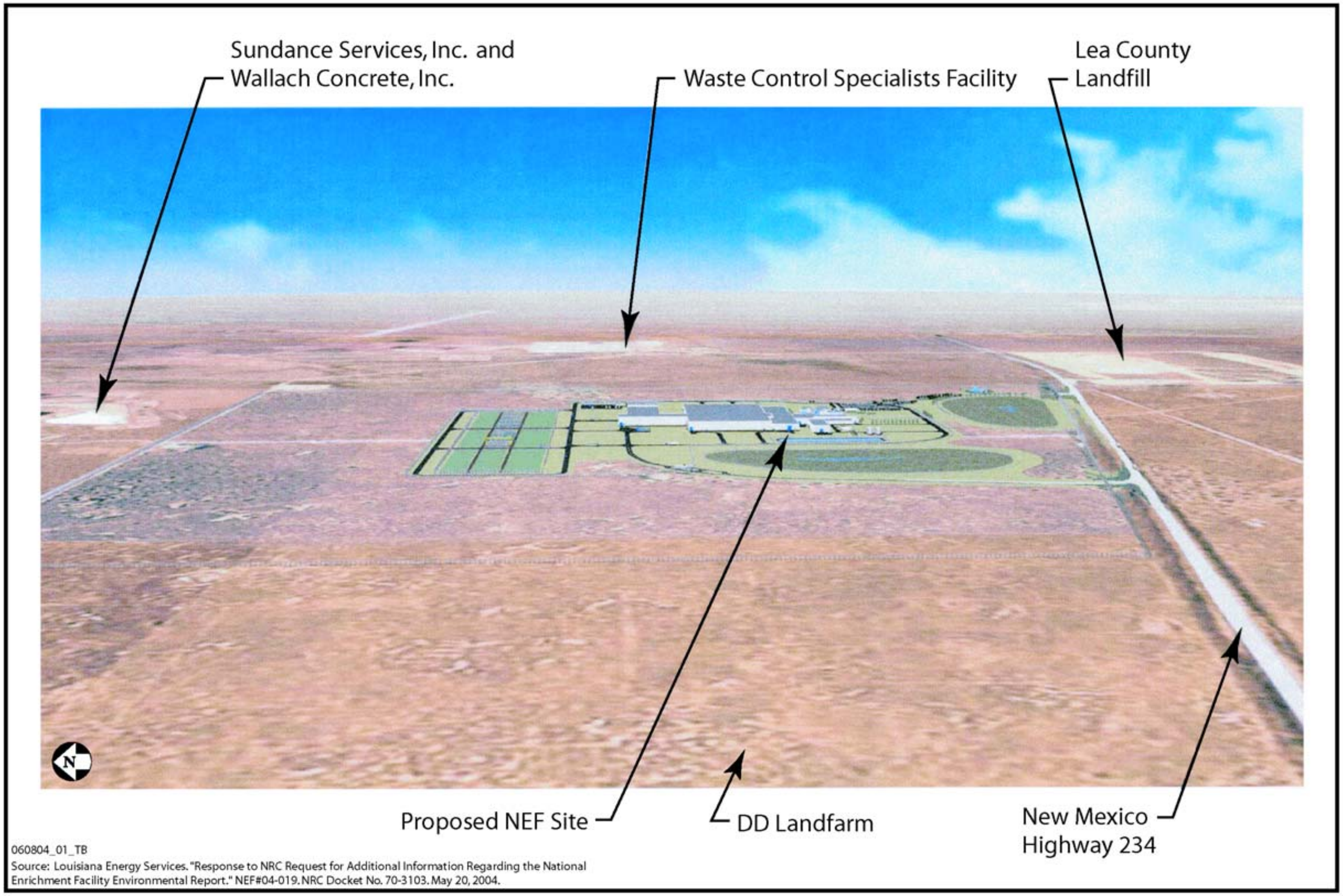

Figure 4-1 Visual Impact of the Proposed NEF on Nearby Facilities (LES, 2005a)

Specialists (WCS) to the east. In addition, the general area has been developed by the oil and gas industry with several processing facilities having flame-off towers and other processing columns (one is located in the southern portion of Eunice, New Mexico), and hundreds of oil pump jacks and associated rigs. The proposed NEF site received the lowest scenic-quality rating using the U.S. Bureau of Land Management (BLM) visual resource inventory process (LES, 2005a). With its tallest structure at no more than 40 meters (131 feet) high, the proposed NEF would not affect the BLM scenic-quality rating.

4.2.3.1 Site Preparation and Construction

Visibility impacts from construction would be limited to fugitive dust emissions. Fugitive dust would originate predominately from vehicle traffic on unpaved surfaces, earth moving, excavating and bulldozing, and to a lesser extent, wind erosion. Application of standard dust-suppression practices along with maintenance of appropriate vehicle speed controls and emission controls on diesel and gasoline motors would minimize the impact from fugitive dust emissions.

Visual impacts from construction are not significantly different from other excavation activities in the surrounding area such as building additional disposal cells at the Lea County Landfill or mining aggregate at Wallach Concrete, Inc. Because the majority of the site would remain undeveloped, the overall impacts to visual resources from the proposed NEF site construction would be SMALL.

4.2.3.2 Operations

Only taller onsite structures would be visible from existing highways. While onsite structures could be visible from nearby locations, the details of these structures would be indistinguishable from a distance.

Under low-wind-speed conditions and high relative humidity, the operation of the proposed NEF could produce fog or mist clouds from the cooling towers that might interfere with visibility. To investigate this possibility, data from hourly surface observations at the Midland-Odessa National Weather Station were analyzed in Appendix E for the ideal conditions to produce fog (i.e., high relative humidity, low wind speed, and stable weather conditions). The results of this analysis demonstrate that less than 0.5 percent of the total hours per year (i.e., 44 hours) yield favorable conditions for the cooling towers to contribute to the creation of fog.

Security lights and additional vehicle traffic to and from the proposed NEF would also create visual impacts to the surrounding land and existing facilities. The visual impacts from the security lighting at night would be less significant than those of the flame-off towers and lighting of nearby oil- and gas-processing facilities.

The impact from commuting traffic would only be for a short period of time each day. The potential visual impacts associated with the operation of the proposed NEF site on neighboring properties and the nearby oil and gas well fields would be considered SMALL.

4.2.3.3 Mitigation Measures

LES would apply a fugitive dust control program as a mitigation measure to minimize airborne dust during construction. Low-water-consumption landscaping techniques and prompt covering of bare areas would help keep the visual characteristics of the site consistent with the surrounding terrain. LES would consider down-shielding of security lights consistent with security plan requirements.

4.2.4 Air-Quality Impacts

This section discusses air-quality impacts from construction and operation of the proposed NEF and assesses potential air-quality impacts in the context of National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) established to protect human health and welfare with an adequate margin of safety (40 CFR Part 50).

4.2.4.1 Site Preparation and Construction

Air-quality impacts from site preparation and construction activities were evaluated using emission factors and air-dispersion modeling. The Industrial Source Complex Short-Term air-dispersion model (EPA, 1995a) was used to estimate both short-term and annual average air concentrations at the facility property boundary. Hourly meteorological observations from the Midland-Odessa National Weather Service Station for the years 1987 through 1991 were used to create an input file to the Industrial Source Complex Short-Term air-dispersion model (NCDC, 1998).

Emission estimates were used in this analysis and are provided in Table 2-2 of this EIS (LES, 2005a). The emission rates of *Clean Air Act* criteria pollutants and nonmethane hydrocarbons (a precursor of ozone, a criteria pollutant) for exhaust emissions from construction vehicles and for fugitive dust were estimated using emission factors provided in AP-42, the EPA's "Compilation of Air Pollutant Emission Factors" (EPA, 1995b). Total emission rates were used to scale the output from the Industrial Source Complex Short-Term air-dispersion model (air concentrations derived using a unit source term) to estimate both short-term and annual average air concentrations at the facility property boundary. Emissions were modeled in the Industrial Source Complex Short-Term air-dispersion model as a uniform area source with unit emission rate.

A maximum of 18 hectares (45 acres) would be involved in construction work at any one time (LES, 2005a). Emissions from a rectangular box area of 427 meters by 427 meters (1,401 feet by 1,401 feet) (corresponding to 18 hectares [45 acres] total) were simulated as an area source in the Industrial Source Complex Short-Term air-dispersion model. Emissions were assumed to occur 10 hours per day (from 8 a.m. to 6 p.m) and 5 days per week (Monday through Friday) for every year from 1987 through 1991. The modeling extends 20 kilometers (12.4 miles) from each side of the proposed NEF site boundary.

As presented in Table 4-1, air concentrations of the criteria pollutants predicted for vehicle emissions would be 3 to 20 times below the NAAQS (EPA, 2003). Particulate matter emissions from fugitive dust would also be below the NAAQS.

The predicted concentrations would be located inside the property boundary and would decline with distance from the site (e.g., for PM_{10}, a 144 ug/m^3 reading would result in a concentration of 48 ug/m^3 at a distance of 1.0 kilometer [0.6 mile]). These are conservative estimates because fugitive dust emissions were assumed to occur throughout the year, without implementation of mitigation measures.

Particulate matter less than 10 microns (PM_{10}) did exceed the PM_{10} limit in Hobbs, New Mexico, in 2003 (NMEDAQB, 2005). This prompted corrective actions by the State of New Mexico, as required by the NAAQS. This exceedance occurred due to a natural event—a dust storm. The impacts from the proposed NEF, however, would still be SMALL because the impacts would be localized to within the proposed NEF property boundary. Fugitive dust emissions could also occur during short time periods during construction. Mitigative measures would be employed to limit the emission of fugitive dust during construction. No fugitive dust emissions are anticipated during operations because soils would not be disturbed.

As a result of discussions between LES and the State of New Mexico, in a letter dated May 27, 2004, the New Mexico Environment Department Air Quality Bureau notified LES of its determination that a construction air quality permit under 20.2.72 NMAC is not required (LES, 2005b). The determination was based on information provided by LES in its Notice of Intent application to the New Mexico Environment Department Air Quality Bureau dated April 20, 2004.

Because the predicted air concentrations of expected vehicle emissions and fugitive dust are considerably less than the applicable NAAQS, the impacts to air quality from the construction of the proposed NEF would be considered SMALL.

Table 4-1 Predicted Property-Boundary Air Concentrations and Applicable National Ambient Air Quality Standards

		Max 1-hr	Max 3-hr	Max 8-hr	Max 24-hr	Annual[a]
Vehicle Emissions (μg/m³)						
HC	Modeled	< 500	226	85	34	3
	NAAQS	- - -	- - -	- - -	- - -	- - -
CO	Modeled	< 4,000	1,440	540	215	18
	NAAQS	40,000[b]	- - -	10,000[b]	- - -	- - -
NOx	Modeled	< 7,500	3,000	1,125	450	38
	NAAQS	- - -	- - -	- - -	- - -	100
SOx	Modeled	< 750	300	113	45	4
	NAAQS	- - -	1,310 (secondary)	- - -	365[b]	80
PM_{10}	Modeled	< 500	220	81	33	3
	NAAQS	- - -	- - -	- - -	150[b] (secondary)	50[c]
Fugitive Dust (μg/m³)						
PM_{10}	Modeled	< 2,400	1,000	360	144	12
	NAAQS	- - -	- - -	- - -	150[b] (secondary)	50[c]

HC - hydrocarbons; CO - carbon monoxide; NOx - nitrogen dioxide; SOx - sulfur oxides; PM_{10} - particulate matter less than 10 microns; NAAQS - National Ambient Air Quality Standards; μg/m³ - microgram per cubic meter; hr - hour; - - - – no standard
[a] Arithmetic mean.
[b] Not to be exceeded more than once per year.
[c] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m³.
Source: EPA, 2003.

4.2.4.2 Operations

The surrounding air quality would be affected by nonradioactive gaseous effluent releases during operation of the proposed NEF. Nonradioactive gaseous effluents include hydrogen fluoride and acetone. The proposed NEF would release approximately 1 kilogram (2.2 pounds) per year of hydrogen fluoride, 40 liters (11 gallons) of ethanol, and 610 liters (161 gallons) of methylene chloride per year

(LES, 2005a). The total amount of hazardous air pollutants emitted to the atmosphere would be less than 9.1 metric tons (10 tons) per year; therefore, a *Clean Air Act* Title V permit would not be required.

The following emission rates were estimated for criteria pollutants (from onsite boilers) (LES, 2005a):

- Volatile organic compounds - 0.8 metric ton (0.88 ton) per year.
- Carbon monoxide - 0.5 metric ton (0.55 ton) per year.
- Nitrogen dioxide - 5.0 metric tons (5.5 tons) per year.

The total amount is less than 91 metric tons (100 tons) per year; therefore, a *Clean Air Act* Title V permit would not be required.

In addition, there would be two diesel generators onsite for use as emergency power sources. The following emission rates from the two emergency diesel generators were estimated for criteria pollutants (LES, 2005a):

- Volatile organic compounds – 0.26 metric ton (0.29 ton) per year.
- Carbon monoxide – 0.85 metric ton (0.94 ton) per year.
- Nitrogen dioxide – 11.1 metric tons (12 tons) per year.
- Particulate matter (of less than 10 microns) – 0.1 metric ton (0.11 ton) per year.

Because the diesel generators have the potential to emit more than 91 metric tons (100 tons) per year of a regulated air pollutant, LES proposes to run these diesel generators only a limited number of hours per year for the above emission rates to avoid being classified as a *Clean Air Act* Title V source (LES, 2005a).

As a result of discussions between LES and the State of New Mexico, in a letter dated May 27, 2004, the New Mexico Environment Department Air Quality Bureau notified LES that the proposed NEF is subject to 20.2.73 NMAC, and that the application submitted by LES on April 20, 2004, will serve as the Notice of Intent in accordance with 20.2.73 NMAC (LES, 2005b). The New Mexico Environment Department Air Quality Bureau also stated that the two emergency diesel generators and surface-coating activities are exempt, provided all requirements specified in 20.2.72.202.B (3) and 20.2.202.B (6) NMAC, respectively, are met.

For the few NESHAP of concern (hydrofluoric acid, and methylene chloride) for the proposed NEF, all estimated levels are below the amounts requiring an application for permits (9.1 metric tons [10 tons] per year of a single and 22.7 metric tons [25 tons] per year of any combination of NESHAP). Therefore, the impacts to air quality from operations would be SMALL.

4.2.4.3 Mitigation Measures

Mitigation measures for air quality during construction would involve attempts to reduce the impacts from vehicle emissions. LES would maintain construction equipment and vehicles to ensure their emissions are below the NAAQS. During operation of the proposed NEF, exhaust-filtration systems would collect and clean all potentially hazardous gases prior to release into the atmosphere and use monitoring and alarm systems for all nonroutine process operations. In addition to these actions, LES would limit the number of hours per year the emergency diesel generators run, employ proper maintenance practices, and adhere to operational procedures to ensure the proposed NEF stays below applicable limits for the NESHAP of concern.

Due to the PM_{10} exceedance in Hobbs, New Mexico, described in section 3.5.3 of this EIS, the New Mexico Environment Department Air Quality Bureau is developing a Natural Events Action Plan that would implement Best Available Control Measures (BACMs) for Lea County. LES would review Lea County BACMs as they become available and would implement those that are applicable for the proposed NEF during construction and operation to minimize dust and particulate emissions.

4.2.5 Geology and Soils Impacts

This section discusses the assessment of potential environmental impacts on geologic resources and soils during site preparation and construction and operation of the proposed NEF. Impacts could result from planned excavation activities for the proposed NEF and the consumption of commercial mineral resources for use in roadbeds and as construction materials.

There are no known nonpetroleum mineral deposits on the proposed NEF site. Chapter 3 of this EIS describes site soil uses, which are suitable as range land and have been used for cattle grazing. The soils are not well suited for farming and are typical of regional soils.

4.2.5.1 Site Preparation and Construction

Site preparation and construction activities for the proposed NEF site have the potential to impact the site soils in the construction area. Only 81 hectares (200 acres), including 8 hectares (20 acres) for contractor parking and construction lay-down areas, within the 220-hectare (543-acre) site would be disturbed. The remainder would be left in a natural state for the life of the proposed NEF. Construction activities at the site would include surface grading and excavation of the soils for utility lines and rerouting of the CO_2 pipeline, stormwater detention/retention basins, and building and facility foundations.

The proposed NEF would be located on an area of flat terrain; cut and fill would be required to bring the site to final grade. Onsite soils are suitable for fill, although they could require wetting to achieve adequate compaction (Mactec, 2003). Present plans are for a total of 611,000 cubic meters (797,000 cubic yards) of soil to be cut and used as fill. The resulting terrain change over 73 hectares (180 acres) from gently sloping to flat would result in SMALL impacts; numerous such areas of flat terrain exist in the region due to natural erosion processes. Only onsite soils would be used in the site grading. Approximately 55,800 cubic meters (73,000 cubic yards) of clay would be brought onto the proposed NEF site from a nearby source for use as basin liner material.

Construction activities could cause some short-term impacts such as increases in soil erosion at the proposed NEF site. Soil erosion could result from wind action and precipitation, although there is limited rainfall in the vicinity of the proposed NEF. Several mitigative measures would be taken to minimize soil erosion and control fugitive construction dust.

Preliminary site geotechnical investigations indicate that facility footings could be supported by the firm and dense sandy subsurface soils (Mactec, 2003). Although not presently foreseen, if final design studies indicate the necessity to extend footings through the sand into the Chinle Formation, then more soils would be disturbed and the clay layer could be penetrated.

These same geotechnical investigations also considered the suitability of the site subsurface soils to support a septic leach field. Two test locations were used to establish a percolation rate of 3.3 minutes per centimeter (8.4 minutes per inch). The final design would require additional percolation testing at the design leach field locations and elevations to comply with applicable State and local regulations.

Because site preparations and construction result in only short-term effects to the geology and soils, the impacts would be SMALL.

4.2.5.2 Operations

During operations of the proposed NEF, the exposed surface soils could experience the same types of impacts as the undisturbed soils in the surrounding area. The primary impact to these soils would be wind and water erosion. However, this environmental impact would be SMALL as the rate of wind and water erosion of the exposed surface soils surrounding the proposed NEF site would likely be small.

Releases to the atmosphere during normal operation of the proposed NEF could contribute to a small increase in the amount of uranium and fluorides in surrounding soils as they are transported downwind. Section 4.2.4 notes that all estimated atmospheric releases of pollutants would be below the amounts requiring permits, and the impacts to air quality from operations would be SMALL. Section 4.2.12 presents the potential human health impacts from this deposition to the surrounding soils. Based on the discussion above, the proposed NEF would be expected to result in SMALL impacts on site geologic and soil resources.

4.2.5.3 Mitigation Measures

Application of construction BMPs and a fugitive dust control plan would lessen the short-term impacts from soil erosion by wind or rain during construction. LES would comply with National Pollutant Discharge Elimination System (NPDES) general permits. To mitigate the impacts of stormwater runoff on the soils, earthen berms, dikes, and sediment fences would be used as needed during construction, and permanent structures such as culverts and ditches would be stabilized and lined with rock aggregate/riprap to reduce water-flow velocity and prohibit scouring. Stormwater detention basins would be used during construction, and detention/retention basins would be used during operation. Implementation of the Spill Prevention Control and Countermeasures Plan would reduce impacts to soil by mitigating the potential impacts from chemical spills that could occur around vehicle maintenance and fueling locations, storage tanks, and painting operations during construction and operation. Waste-management procedures would be used to minimize the impacts to the surrounding soils from solid waste and hazardous materials that would be generated during construction and operation.

4.2.6 Water Resources Impacts

This section discusses the assessment of potential environmental impacts to surface water and groundwater during construction and operation of the proposed NEF. The discussion includes the potential impact to natural drainage on and around the proposed NEF site and the effect of the proposed NEF on the regional water supply.

4.2.6.1 Site Preparation and Construction

Because construction activities would disturb over 0.4 hectares (1 acre), an NPDES Construction Stormwater General Permit from U.S. Environmental Protection Agency (EPA) Region 6 and an oversight review by the New Mexico Environment Department Water Quality Bureau would be required. Stormwater runoff and wastewater discharges would be collected in detention/retention basins. The stormwater detention basin would allow infiltration into the ground as well as evaporation. In addition, the stormwater detention basin would have an outlet structure to allow overflow drainage. The retention basins, once constructed, would allow disposition of collected stormwater by evaporation only. No flood-control measures are proposed because the site grade is above the 500-year flood elevation, which is located in Monument Draw to the southwest of the proposed NEF site (LES, 2005a). Sanitary waste generated at the site would be handled by portable systems until such time that the site septic systems are available for use. Compliance with the permit would minimize the impacts to surface features and groundwater.

The NRC staff estimates that approximately 7,570 cubic meters (2 million gallons) of water would be used annually during the construction phase of the proposed NEF based on the design estimates for the formerly proposed Claiborne Enrichment Facility (NRC, 1994). Groundwater would be used for concrete formation, dust control, compaction of the fill, and revegetation. These usage rates are well within the excess capacities of Eunice or Hobbs water supply systems and would not affect local uses (Abousleman, 2004b; Woomer, 2004). Current capacities for the Eunice and Hobbs municipal water supply systems are about 6 million cubic meters (1.6 billion gallons) per year and 27.6 million cubic meters (7.3 billion gallons) per year, respectively. As a result, SMALL short-term impacts to the municipal water supply system would occur. In addition, a Spill Prevention Control and Countermeasures Plan would be implemented to address potential spills during construction activities.

Because there are no existing easily accessible water resources onsite and BMPs would be used to minimize the impacts of construction stormwater and wastewater within the site boundaries, the impacts to water resources during construction would be expected to be SMALL.

4.2.6.2 Operations

The proposed NEF site liquid effluent discharge rates would be relatively small. The proposed NEF wastewater flow rate from all sources would be expected to be about 29,049 cubic meters (7.6 million gallons) annually (LES, 2005a). This includes approximately 2,540 cubic meters (670,000 gallons) annually of wastewater from the liquid effluent treatment system, while domestic sewage and cooling tower and heating boiler blowdown waters constitute the remaining amount.

The liquid effluent treatment system and shower/hand wash/laundry effluents would be discharged onsite into a double-lined Treated Effluent Evaporative Basin, whereas the blowdown water from the cooling water tower and the heating boilers and Uranium Byproduct Cylinder (UBC) Storage Pad stormwater runoff would be discharged onsite to a single-lined retention basin. Runoff water from developed areas of the site other than the UBC Storage Pad would be collected in the unlined Site Stormwater Detention Basin. Domestic sewage would be discharged to onsite septic tanks and subsequently to an associated leach field system. No process waters would be discharged from the site. There is the potential for intermittent discharges of stormwater offsite. Figure 4-2 shows the onsite location of the water basins and septic tanks.

Approximately 174,000 cubic meters (46 million gallons) of stormwater would be expected to be released annually to the onsite detention/retention basins. In addition, about 617,000 cubic meters (163 million gallons) of annual runoff from the undeveloped site areas could be expected. Site drainage would be to the southwest with runoff not able to reach any natural water body before it evaporates.

<u>Treated Effluent Evaporative Basin</u>

Total annual effluent discharge to the Treated Effluent Evaporative Basin would be 2,540 cubic meters (670,000 gallons). The effluent would be disposed of by evaporation of all of the water and impoundment of any remaining dry solids. A water balance of the basin, including consideration of effluent and precipitation inflows and evaporation outflows, indicates that the basin would be dry for one to seven months of the year depending on annual precipitation rates (LES, 2005c). The volume of the basin is expected to be sufficient to contain all inflows for the life of the proposed facility. In the unlikely event of consecutive years of very high precipitation, it could become necessary for the site operators to develop strategies to prevent basin overflows. Because such an unlikely event could occur gradually over a long period of time (years), there would be sufficient time to take necessary actions.

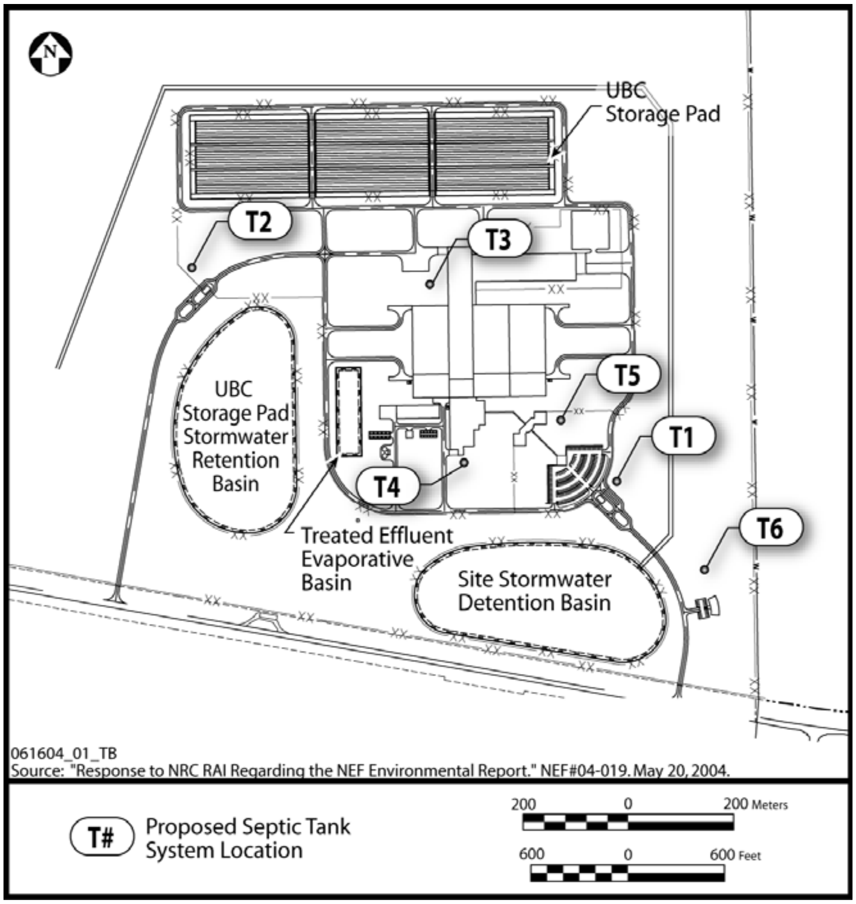

Figure 4-2 Basins and Septic Tank System Locations (LES, 2005a)

During the proposed NEF operation, only liquids meeting site administrative limits based on prescribed standards would be discharged into the Treated Effluent Evaporative Basin. It is expected that operation of the waste treatment system would result in 14.4×10^6 becquerels (390 microcuries) per year of uranium discharged to the Treated Effluent Evaporative Basin. These levels are small and would not impact area water resources because the basin design includes a liner. Effluents unsuitable for release to the basin could be recycled through the liquid effluent treatment system or processed into a solid and disposed of offsite in a suitable manner. The Treated Effluent Evaporative Basin would be expected to have only a SMALL impact on water resources. Section 4.2.12 describes potential impacts from atmospheric resuspension of the uranium when the basin is dry.

UBC Storage Pad Stormwater Retention Basin

Total annual effluent discharge from blowdown to the UBC Storage Pad Stormwater Retention Basin would be 19,300 cubic meters (5.1 million gallons) (LES, 2005a). The effluent would be disposed of by evaporation of all of the water with dry solids being retained in the basin. Dry solids consist principally of dissolved and suspended solids normally contained in the municipal water supplied to the operation and chemicals added to the heating boiler and cooling tower circulating water, and thus contained in the blowdown water, to assure efficient operation. A water balance of this basin, including consideration of effluent and precipitation inflows and evaporation outflows, indicates that the basin would be dry for 2 to 12 months of the year, depending on annual precipitation rates (LES, 2005c). The basin would have the capacity to hold all inflows for the life of the proposed NEF. UBCs (i.e., depleted uranium hexafluoride [DUF_6]-filled Type 48Y cylinders) would be surveyed for external contamination before being placed on the UBC Storage Pad and would be monitored while stored on the pad. External contamination would be removed prior to cylinder placement on the pad. Therefore, rainfall runoff to this basin would be expected to be free of radioactive contaminants and would not result in an exposure pathway. Sampling of stormwater and basin sediments, as discussed in Chapter 6, would be performed for chemicals and radioactivity. Because all of the water discharged to the lined UBC Storage Pad Stormwater Retention Basin would evaporate, the basin would have a SMALL impact on water resources.

Site Stormwater Detention Basin

The Site Stormwater Detention Basin would be unlined, and discharges would be through infiltration and evaporation. A water balance of this basin shows that it would be dry except during rainfall events (LES, 2005a). Most of the water discharged into the basin would seep into the ground before evaporating at an average rate of 17 centimeters (6.7 inches) per month.

Water seeping into the ground from the Site Stormwater Detention Basin could be expected to form a perched layer on top of the highly impermeable Chinle Formation clay similar to the “buffalo wallows” described in Chapter 3 of this EIS. The water would be expected to have limited downgradient transport due to the storage capacity of the soils and the upward flux to the root zone. A conservative estimate of the impact from this basin, which neglects soil storage capacity, evapotranspiration, and evaporation from the pond, results in a local groundwater velocity of the plume coming from the Site Stormwater Detention Basin of 252 meters (0.16 mile) per year. The cross-section (perpendicular to the flow direction) of this plume would be 2,850 square meters (30,700 square feet). The depth of the plume would be about 2.85 meters (9.3 feet) for a nominal plume width of 1,000 meters (3,280 feet).

The water quality of the basin discharge would be typical of runoff from building roofs and paved areas from any industrial facility. Except for small amounts of oil products and grease expected from normal onsite traffic that would readily adsorb into the soil, the plume would not be expected to contain contaminants. There are no groundwater users within 3.2 kilometers (2 miles) downgradient of the proposed NEF site, and there are no downgradient users of groundwater from the sandy soil above the Chinle Formation who could be impacted by site releases. Portions of the plume not evapotranspired and traveling downgradient could result in a minor seep at Monument Draw, approximately 4.8 kilometers (3 miles) southwest of the site. Accordingly, the Site Stormwater Detention Basin seepage would have a SMALL impact on water resources of the area.

Septic Tanks and Leach Fields

Water seeping into the ground from the septic systems could be expected to form a perched layer on top of the highly impermeable Chinle Formation similar to the “buffalo wallows” described in Chapter 3 of this EIS. The water can be expected to have limited downgradient transport because of the storage capacity of the soils and the upward flux to the root zone. A conservative estimate of the impact from the septic systems assumes all of the infiltrating water is transported downgradient, which neglects soil storage capacity, evapotranspiration, and evaporation. The local groundwater velocity of the plumes coming from the septic system would then be about 252 meters (0.16 mile) per year. The total cross-section (perpendicular to the flow direction) of the septic system plumes would be 116 square meters (1,250 square feet). The depth of the plumes was calculated to be about 1.16 meters (3.8 feet) for a nominal total plume width of 100 meters (328 feet).

The proposed septic systems are included in the groundwater discharge permit application filed with the New Mexico Environment Department Groundwater Quality Bureau (LES, 2005a). Sanitary wastewater discharged to the septic system would meet required levels for all contaminants stipulated in the permit

(LES, 2005a). There are no groundwater users within 3.2 kilometers (2 miles) downgradient (toward the southwest) of the proposed NEF site, and there are no downgradient users of groundwater from the sandy soil above the Chinle Formation who could be impacted by site releases. Contaminants would leach out of the septic system discharge as water is transported vertically and then downgradient. Portions of the plume not evapotranspired traveling downgradient could result in a minor seep at Monument Draw, approximately 4.8 kilometers (3 miles) southwest of the site. The septic systems would also be expected to have a SMALL impact on water resources.

4.2.6.3 Water Uses During Operation

The proposed NEF water supply would be obtained from the municipal supply systems of the cities of Eunice and Hobbs, New Mexico. The proposed NEF would consume water to meet potable, sanitary, and process consumption needs. None of this water would be returned to its original source. The waters originate from the Ogallala Aquifer north of Hobbs, New Mexico (Woomer, 2004). New potable water supply lines would be approximately 8 kilometers (5 miles) in length from Eunice, New Mexico, and approximately 32 kilometers (20 miles) in length from Hobbs, New Mexico, along county right-of-way easements along New Mexico Highways 18 and 234. The impacts of such activity would be short-term and SMALL (e.g., access roads to the highway could be temporarily diverted while the easement is excavated and the pipelines are installed) (Woomer, 2004).

Eunice and Hobbs, New Mexico, have excess water capacities of 66 and 69 percent, respectively. Average and peak water requirements for the proposed NEF operation would be expected to be approximately 240 cubic meters (63,423 gallons) per day and 2,040 cubic meters (539,000 gallons) per day, respectively. These usage rates are well within the excess capacities of both water systems and would not affect local uses (Abousleman, 2004b; Woomer, 2004). The annual proposed NEF water use would be less than the daily capacity of these systems. Figure 4-3 illustrates the relationships between the proposed NEF projected water uses and Eunice and Hobbs water demand and system capacities. The average and peak water use requirements would be approximately 0.26 and 2.2 percent, respectively, of the combined potable water capacity for Eunice and Hobbs of 92,050 cubic meters (24.3 million gallons) per day.

The proposed NEF operation would be expected to use on an average approximately 87,600 cubic meters (23.1 million gallons) of water annually. For the life of the facility, the proposed NEF could use up to 2.63 million cubic meters (695 million

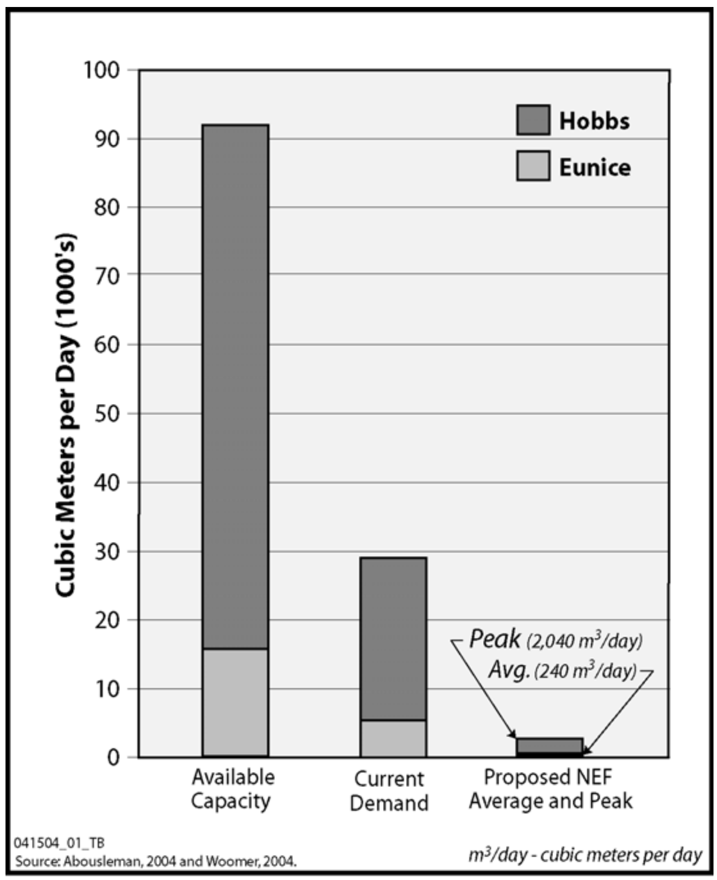

Figure 4-3 Eunice and Hobbs Water Capacities in Relation to the Proposed NEF Requirements (LES, 2005a; Abousleman, 2004b; Woomer, 2004)

gallons) of the Ogallala waters, encompassing both construction and operations use. This constitutes a small portion, 0.004 percent, of the 60 billion cubic meters (49 million acre-feet or 16 trillion gallons) of Ogallala reserves in the State of New Mexico territory (HPWD, 2004) and, therefore, the impacts to water resources would be SMALL.

The NRC staff conducted limited confirmatory groundwater modeling to evaluate further the potential impacts from the proposed NEF on regional groundwater supplies. In its evaluation, the staff used a mathematical model developed by the New Mexico Office of the State Engineer. This model has been used by the State to determine long-term usage impacts on available water in the portion of the Ogallala Aquifer within Lea County (Musharrafieh and Chudnoff, 1999). For the purposes of its evaluation, the staff conservatively assumed that the entire projected withdrawal for the proposed NEF would be from a single location (known as a "modeling cell") approximately 3.2 kilometers (2 miles) northeast of Hobbs in an area of local minimum saturated thickness of the Ogallala Aquifer. This was intended to simulate the proposed facility's use of groundwater from the Eunice and Hobbs municipal water supplies. Using the parameters previously applied by the State for their simulations of long-term impacts, and adding the proposed NEF's water withdrawals from the selected modeling location over a 30-year period (approximated as 2010-2040), a resulting 0.4 meter (1.2 feet) of additional drawdown at the selected location could be expected. This drawdown would decrease with distance so that at approximately 1.6 kilometers (1 mile) and 3.2 kilometers (2 miles) from the withdrawal location, the additional modeled drawdown would be from 0.12 to 0.15 meters (0.4 to 0.5 feet) (depending on direction) and from 0.03 to 0.09 meters (0.09 to 0.3 feet), respectively, after 30 years. At distances of approximately 13.7 to 15.3 kilometers (8.5 to 9.5 miles) from the assumed withdrawal location, the additional drawdown would be less than 0.003 meter (0.01) feet in all directions. The small potential impacts are confirmed by comparing this additional drawdown to the remaining saturated thickness, approximately 11.3 meters (37 feet), at this location at the end of the 30-year period of modeled withdrawal for LES use.

4.2.6.4 Mitigation Measures

Construction BMPs would limit the impacts from the installation of potable water supply lines and would also limit the impact of construction stormwater and wastewater to within the site boundaries. All construction activities would comply with NPDES Construction Stormwater General Permits and a groundwater discharge permit.

The Liquid Effluent Collection and Treatment System would be used throughout operations to control liquid waste within the facility including the collection, analysis, and processing of liquid wastes for disposal. Liquid effluent concentration releases to the Treated Effluent Evaporative Basin and the UBC Storage Pad Stormwater Retention Basin would be below the uncontrolled release limits set forth in 10 CFR Part 20. A Spill Prevention Control and Countermeasures Plan would minimize the impacts for infiltration of hazardous chemicals into any formation of perched water that could occur during operation. A Stormwater Pollution Prevention Plan would be implemented at the proposed NEF site. Staging areas would be established to manage waste materials, and a waste management and recycling program would be implemented to segregate and minimize industrial and hazardous waste generation.

Because the Ogallala Aquifer is being depleted and future demand for water in the region would exceed the recharge rate, the present local water supplies could be affected. The Lea County Regional Water Plan (LCWUA, 2000) includes mitigation actions to be taken to increase water supplies in the future and actions to deal with drought conditions should supplies be insufficient. Section 3.8.2 discusses the Lea County Regional Water Plan in more detail. LES would comply with any drought-related conditions that would be imposed through the Lea County Regional Water Plan or through other State or local actions. In addition, LES would use low-water-consumption landscaping techniques; low-flow toilets, sinks, and showers; and efficient water-using equipment at the proposed NEF site. Additional mitigative measures are identified in Chapters 5 and 6 of this EIS.

4.2.7 Ecological Resources Impacts

This section discusses the potential impacts of site preparation, construction, and operation of the proposed NEF on ecological resources.

Field studies conducted by LES at the proposed NEF site indicated that no communities or habitats have been defined as rare or unique, and none support threatened or endangered species (LES, 2005a). In addition, no State- or Federal-listed threatened or endangered species have been identified during these studies at the proposed NEF site.

The U.S. Fish and Wildlife Service (FWS) listed several candidate species of concern that may be found in the Lea County, New Mexico, area (FWS, 2004). These candidate species are proposed to be added to the list of endangered and threatened species or the agency wants to ensure that their decline does not go unchecked and to avoid actions that may affect their populations (FWS, 2004).

The proposed NEF site is undeveloped and currently serves as cattle grazing. There is no surface water on the site, and appreciable groundwater reserves are deeper than 340 meters (1,115 feet). The results of LES surveys in the fall of 2003 and spring and summer of 2004 suggest that the site supports a limited diversity of wildlife. The listed candidate species, namely the lesser prairie chicken (*Tympanuchus pallidicintus*), the sand dune lizard (*Sceloporun arenicolus*), and the black-tailed prairie dog (*Cynomys ludovicianus*), were not detected at the proposed NEF site, and it was concluded that the habitat of the proposed NEF site is unsuitable for any of these candidate species (EEI, 2004; LES, 2005a; Sias, 2004).

Two species of concern, the swift fox (*Vulpes velox*) and the western burrowing owl (*Athene cunicularia hypugea*), could be vulnerable to the proposed NEF activities (LES, 2005a). The swift fox could be vulnerable because the species' inquisitive nature allows it to adapt to areas of human activities. However, swift fox generally require 518 to 1,296 hectares (1,280 to 3,200 acres) of short- to mid-grass prairie habitat with abundant prey to support a pair. Habitat loss, rodent control programs, and other human activities that reduce the prey base could impact the viability of swift fox at the proposed NEF site (FWS, 1995).

The western burrowing owl is generally vulnerable to construction activities because of the possibility that its burrows, and possibly birds or eggs in the burrows, may be destroyed by machinery or structures. The western burrowing owl is generally tolerant of human activity provided it is not harassed. Burrowing owls are very site tenacious, and burrow fidelity is a widely recognized trait of burrowing owls. The presence of this species is strongly associated with prairie dog towns (The Nature Conservancy, 2004). The lack of evidence of the presence of prairie dog towns and western burrowing owl burrows at the proposed NEF site would negate the potential vulnerability of this species to the proposed NEF activities (LES, 2005a). Artificial burrows could not easily attract the species (Trulio, 1997). While the construction activities at the proposed NEF site could create artificial burrows (i.e., cavities within the riprap material), the lack of existing burrows and the absence of prairie dogs at the proposed NEF site would reduce the potential for burrowing owls to relocate to the new artificial burrows.

4.2.7.1 Site Preparation and Construction

Most of the potential ecological disturbances from the proposed NEF would occur during the construction phase of the site. Approximately 81 hectares (200 acres) of land would be disturbed along with 8 hectares

(20 acres) that would be used for temporary contractor parking and lay-down areas. Once the proposed NEF site construction was completed, the temporary contractor parking and lay-down areas would be restored to their natural condition and would be revegetated with native plant species and other natural, low-water-consumption landscaping to control erosion.

Construction disturbances would mostly affect the Plains Sand Scrub vegetation community. The dominant shrub species associated with this classification is shinnery oak with lesser amounts of sand sage, honey mesquite, and soapweed yucca. This diversity does not create a unique habitat in the area. The community is further characterized by the presence of forbs, shrubs, and grasses that have adapted to the deep sand environment that occurs in parts of southeastern New Mexico (NRCS, 1978).

The disturbed area represents about one-third of the total site area. This allows highly mobile resident wildlife located within the disturbed areas of the proposed NEF site an opportunity to relocate to the undisturbed onsite areas (139 hectares [343 acres]). The undisturbed areas are expected to be left in a natural state for the life of the proposed NEF site. Wildlife would also be able to migrate to adjacent suitable habitat bordering the proposed NEF site. On the other hand, less mobile species, such as small reptiles and mammals, could be impacted. Due to the limited diversity of wildlife and the relatively small area disturbed, the potential impacts of the proposed NEF site to these less mobile species would be SMALL.

The municipal water-supply piping, natural-gas-supply piping, and electrical transmission lines would be installed along existing county right-of-way easements next to local highways that have been previously disturbed and followed by re-vegetation. The existing shrub species would not have the potential to grow into the electrical transmission lines. Therefore, since the affected ecology along the easement would only be temporarily affected during construction, the ecological impacts along the county right-of-way easements would be SMALL.

The proposed NEF site is presently interrupted by a single access road that is void of vegetation. Because roadway maintenance practices are currently being performed by Wallach Concrete, Inc., and Sundance Services, Inc., along the existing access road, new or significant impacts to biota are not anticipated due to the use of the access road.

LES would use herbicides and pesticides only if weed or pest intrusion is significant. None of the construction activities would permanently affect the biota of the site. Standard land-clearing methods would be used during the construction phase. Stormwater detention basins would be built prior to land clearing and used as sedimentation collection basins during construction. Once the proposed NEF site was revegetated and stabilized, the basins would be converted to detention/retention basins. After completion of construction, any eroded areas would be repaired and stabilized with native grass species, pavement, and crushed stone. Ditches would be lined with riprap, vegetation, or other suitable materials, as determined by water velocity, to control erosion. In addition, water conservation would be considered in the application of dust-suppression sprays in the construction areas.

Due to the lack of rare or unique communities, habitats, or wildlife on the proposed NEF site and the short duration of the site preparation and construction phase, the impacts to ecological resources would be SMALL during construction. In a letter to the NRC on November 1, 2004, the New Mexico Department of Game and Fish supports the conclusion of no significant adverse effects (NMGF, 2004).

4.2.7.2 Operations

No additional lands beyond those disturbed during site preparation and construction would be affected by the proposed NEF operation. The undisturbed area is expected to be left in its natural state. Therefore, no additional impacts on local ecological resources beyond those described during construction would be expected during operations. The tallest proposed structure for the proposed NEF site is 40 meters (131 feet), which is lower than the height at which structures are required to be marked or lighted for aviation safety (FAA, 1992). This avoidance of lights, which attract wildlife species, and the low above-ground-level structure height, would reduce the relative potential for impacts on wild animals. Therefore, the impacts to birds would be SMALL. Due to the lack of direct discharge of water and the absence of an aquatic environment and the implementation of stormwater management practices, the impacts to aquatic systems would be SMALL.

None of the previously discussed wildlife species at the proposed NEF site discussed in section 3.9 have established migratory travel corridors because they are not migratory in this part of their range. Migratory species with potential to occur at the proposed NEF site include mule deer (*Odocoileus hemoionus*) and scaled quail (*Callipepla squamata*). They are highly mobile, and their travel corridors are linked to habitat requirements such as food, water, and cover. They may change from season to season and can occur anywhere within the species home range. Mule deer and scaled quail thrive in altered habitats, and travel corridors that would potentially be blocked by the proposed NEF would easily and quickly be replaced by an existing or new travel corridor. Therefore, the impacts to migratory wildlife would be SMALL.

The level of radiological safety required for the protection of humans is adequate for other animals and plants.[1] Therefore, no additional mitigation efforts would be necessary beyond those required to protect humans (IAEA, 1992). Section 4.2.12 includes a discussion of these impacts. The greatest exposures would be to the personnel handling the UBCs. The potentially highest exposures to wildlife are expected to be to small animals occupying the UBC Storage Pad. Effective wildlife management practices, periodic surveys of the UBCs, and mitigation would prevent permanent nesting and lengthy stay times on the UBC Storage Pad. Thus, the impacts (radiological and nonradiological) to local wildlife would be SMALL.

4.2.7.3 Mitigation Measures

LES would implement several BMPs to minimize the construction impacts to the proposed NEF site and would install appropriate barriers to minimize the impacts to wildlife during site preparation, construction, and operation. BMPs would also be instituted to control erosion and manage stormwater. The number of trenches and length of time they are open would be minimized to mitigate the effects of trenching work during construction. Other procedural steps that would be applied during trenching include digging trenches during cooler months (when possible) due to lower animal activity, keeping trenching and backfilling crews close together, ensuring trenches are not left open overnight, using escape ramps, and inspecting trenches and removing animals prior to backfilling.

[1]Acute doses of 0.1 Gy (10 rad) or less are very unlikely to produce persistent, measurable deleterious changes in populations or communities of terrestrial plants or animals. In addition, there is no convincing evidence from the scientific literature that chronic radiation dose rates below 1.0 mGy/day (0.1 rad/day) will harm animal or plant populations. These conclusions are based on a population of studies that were available at the time (IAEA, 1992; DOE, 2002). The International Atomic Energy Agency is continuing to review and discuss concepts for a radiological protection framework for the environment, to include appropriate effect levels and dose limits for biota.

LES would consult with the electric utility responsible for the new electric transmission line to address as applicable the guidance from the New Mexico Department of Game and Fish and other sources. These consultations would focus on guidelines for the protection of birds to mitigate the possibility of electrical shock (LES, 2005a).

LES would mitigate the relocation of the CO_2 pipeline under LES's wildlife management practices (LES, 2005a). Installation of the piping would have the same mitigation measures as for open trenches.

During operation, wildlife management practices would include managing open areas, restoring disturbed areas with native grasses and shrubs for the benefit of wildlife, and installing appropriate netting or other suitable material over the Treated Effluent Evaporative Basin and animal-friendly fencing around all basins. Landscaping techniques would employ native vegetation and if necessary, LES would take appropriate actions to implement weed control (LES, 2005b). The pond netting or other suitable material would be specifically designed to ensure that migratory birds are excluded from evaporative ponds that do not meet New Mexico Water Quality Control Commission surface-water standards for wildlife usage (LES, 2005a). However, LES would consult with the New Mexico Department of Game and Fish during design of mitigating features (LES, 2005b). LES would also monitor the basin waters during plant operations to ensure the risk to birds and wildlife is minimized.

The size of the socioeconomic impacts are defined as follows in this EIS:

- *Employment/economic activity – Small is <0.1- percent increase in employment; moderate is between 0.1- and 1.0-percent increase in employment; and large is defined as >1-percent increase in employment.*
- *Population/housing impacts – Small is <0.1-percent increase in population growth and/or <20-percent of vacant housing units required; moderate is between 0.1- and 1.0-percent increase in population growth and/or between 20 and 50 percent of vacant housing units required; and large impacts are defined as >1-percent increase in population growth and/or >50 percent of vacant housing units required.*
- *Public services/financing – Small is <1-percent increase in local revenues; moderate is between 1- and 5-percent increase in local revenues large impacts are defined as >5-percent increase in local revenues.*

Sources: NRC,1996; DOE, 1999.

4.2.8 Socioeconomic Impacts

This section presents the potential socioeconomic impacts from the construction and operation of the proposed NEF on employment and economic activity, population and housing, and public services and finances within the 120-kilometer (75-mile) region of influence. The socioeconomic impacts are estimated using data contained in the Environmental Report and Regional Input-Output Modeling System (RIMS II) multipliers obtained for the region of influence from the U.S. Bureau of Economic Analysis (LES, 2005a; BEA, 2004).

4.2.8.1 Site Preparation and Construction

Employment and Economic Activity

Estimated employment during the 8-year construction period would average 397 jobs per year. The highest employment would occur in the second through fifth construction years with employment peaking at 800 jobs in the fourth year (LES, 2005a). Most of the construction jobs (about 75 percent) are expected to pay between $34,000 and $49,000 annually, and average slightly more than $39,000 (LES, 2005a). The pay for these jobs would be considerably higher than the median household income of Lea County and the region of influence. The average construction wage would be about 15 percent higher than median incomes in New Mexico and on par with household incomes in Texas.

Initial employment would consist predominately of structural trades with the majority of these workers coming from the local area. As construction progresses, there would be a gradual shift from structural trades to mechanical and electrical trades. The majority of these higher paying skilled jobs would be expected to be filled outside of the immediate area surrounding the proposed site but within the 120-kilometer (75-mile) region of influence because of the region's rural road system that would allow long-distance commuting.

The nearly 400 new construction jobs (8-year average) would represent about 19 percent of the Lea, Andrews, and Gaines Counties construction labor force and 4.4 percent of the construction labor force of the combined eight-county region.

Facility construction would take approximately 8 years to complete and cost $1.24 billion (in 2004 dollars), excluding escalation, contingencies, and interest (LES, 2005a). LES estimates that it would spend about $411 million locally on construction expenditures over an 8-year period—about one-third on wages and benefits and two-thirds on goods and services.

The direct spending or local purchases made by LES would generate indirect impacts in other local industries—additional output, earnings, and new jobs. Estimating these indirect impacts is typically done using a regional input-output model and multipliers. The multipliers measure the total (direct and indirect) changes in output (i.e., spending, earnings, and employment). Although there are alternative regional input-output models, the total economic impacts of constructing the proposed NEF are estimated using the U.S. Bureau of Economic Analysis RIMS II model (BEA, 1997). This model is widely used in both private and public sector applications including the NRC in licensing of nuclear-electricity-generating facilities.

According to the RIMS II analysis (in 2004 dollars), the approximate $50.3 million in average annual construction spending would generate additional annual output of $67.9 million and earnings of $18.7 million for each year the facility is under construction (Appendix F). In addition, spending on goods, services, and wages would create 582 indirect jobs on average. Figure 4-4 shows the predicted distribution of jobs over the 8-year construction period. In the first year of construction, total direct and indirect jobs would be about 760, rising to nearly 2,000 in the fourth construction year and then declining rapidly as construction of the facility nears completion. The economic impacts of construction to the region of influence would be considered MODERATE.

<u>Population and Housing</u>

During construction of the proposed NEF, about 15 percent of the construction work force would be expected to take up residency in the surrounding community (LES, 2005a). Sixty-five percent of these workers would bring families consisting on average of a spouse and one school-age child (USCB, 2002). The total population increase in the area at peak construction would be about 280 residents and half as many on average over the 8-year construction period (LES, 2005a). In later stages of construction (i.e., the years 2012 and 2013), an increase in the local population of only 50 people would be expected. With approximately 15 percent of the housing units (owner and rental occupied) in the region of influence currently unoccupied and the relatively small number of people expected to move into the local area, there would not be any measurable impact related to demand for additional housing during facility construction. Thus, the impacts to population and housing would be SMALL.

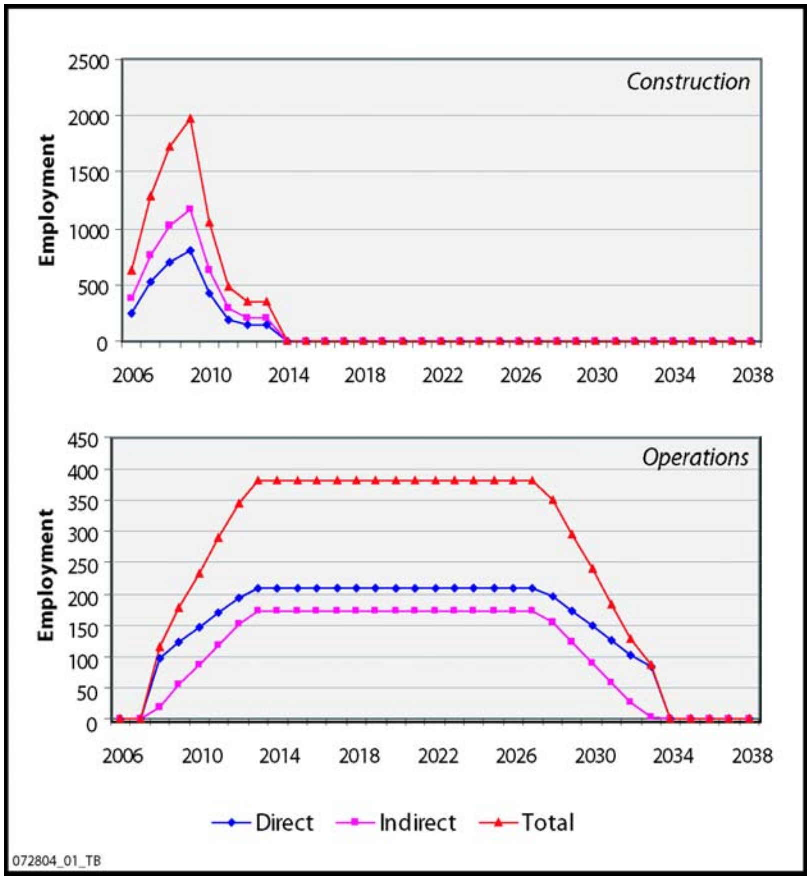

Figure 4-4 Estimated Total Employment (Direct and Indirect) over the Construction and Operation Phases of the Proposed NEF

Public Services and Financing

The increase in employment and population in the region of influence would require additional public services (e.g., schools, fire and police protection, medical services) and means to finance these services. The increase in numbers of school-age children would be expected to be 80 at peak construction and 40 on average. Given the number of schools in the vicinity of the proposed NEF (see Chapter 3 of this EIS), the impact to the education system would be SMALL (less than one new student per grade).

LES estimates that it would pay in 2004 dollars between $158.4 and $194.6 million in gross receipts, income, and property taxes to the State of New Mexico and Lea County over the 8-year construction life and the approximate 20-year operating life of the proposed NEF (LES, 2005a). Gross receipts taxes paid by local businesses could approach $3.1 million during the eight-year construction period (LES, 2005a). Household income taxes from earnings (direct and indirect) are estimated to be about $4.1 million annually during construction (LES, 2005a). The tax revenue impacts of site preparation and construction activities to Lea County and the city of Eunice would be MODERATE given the size of current property tax collections and gross receipts taxes received from the State of New Mexico.

4.2.8.2 Operations

Employment and Economic Activity

The proposed NEF operating work force would consist of an estimated 210 people with an average salary of approximately $50,100 (LES, 2005a). As discussed in Chapter 3 of this EIS, this average salary compares to average household and per capita incomes in the region of influence of $30,572 and $14,264, respectively. Total payroll during operations in 2004 dollars would be expected to total more than $10.9 million in salaries and wages with another $3.3 million in benefits (LES, 2005a). Ten percent of the positions are expected to be in management, 20 percent in professional occupations, 60 percent in various skilled positions, and 10 percent in administrative positions. All positions would require at least a high school diploma plus training, which would be provided by LES in partnership with local institutions (see section 4.2.8.3) (LES, 2004a).

Local annual spending by LES on goods and services and on wages would be approximately $9.9 million and $10.9 million in 2004 dollars, respectively. This local spending during operations would generate indirect impacts on the local economy. The approximate $20.8 million in annual operations spending would generate an estimated $24 million in additional output, $5.8 million in additional earnings, and 173 indirect jobs during peak operations (Appendix F). Figure 4-4 summarizes operations jobs over the operating life of the facility. At peak production, total operations employment due to the presence of the facility would be more than 381 jobs—210 direct and 173 indirect. The labor force in Lea, Andrews, and Gaines Counties totals over 33,000 and the labor force is well over 100,000 for the 8 counties within the region of influence. The impact on local employment during operations would be MODERATE (approximately 1 percent of the jobs in Lea, Andrews, and Gaines Counties). The number of skilled positions that would be filled by workers moving into the area from outside the region of influence is undetermined; however, with appropriate training all operations positions could eventually be filled with workers from the eight-county area.

Population and Housing

The population increase during the operations phase would be expected to be less than that experienced during construction. Therefore, the potential impact to population and housing would be expected to be SMALL.

Public Services and Financing

The creation of permanent jobs would lead to some additional demands for public services. However, this increase in demands would be SMALL in the region of influence given the expected level of in-migration.

During peak operations, LES would expect to pay about $492,000 annually to the State of New Mexico and about $127,000 to the city of Eunice and Lea County in gross receipt taxes (2004 dollars). New Mexico corporate income taxes depend on company earnings, but LES estimates that income taxes would range between $124 and $145 million over the facility's operating life. Payments in-lieu-of-taxes depend on the value of the property and would approach $1 million annually at peak operations (LES, 2005a). Finally, income taxes from earnings paid (direct and indirect) would be about $2.1 million annually during operations. Gross receipts taxes paid by local businesses could approach $1 million annually. The tax revenue impacts of the proposed NEF operations to Lea County and the city of Eunice would be MODERATE given the size of current property tax collections and gross receipts taxes received from the State of New Mexico.

4.2.8.3 Mitigation Measures

Educational programs coordinated by LES with local colleges would help develop a pool of qualified local workers (LES, 2004b). LES is on record as stating that it would provide extensive training for employees by working in partnership with local educational institutions. Discussions and planning with leaders of the public and higher education institutions in Eunice and Hobbs are ongoing (LES, 2005b). LES has partnered with the New Mexico Junior College to develop technical and other programs at the college and to sponsor scholarships for the students. Additionally, the Eunice public school system is implementing a science curriculum, and a similar curriculum is being considered by the Hobbs public school superintendent. The courses developed from the combination of partnerships could provide the basic technical training for a skilled position at the proposed NEF or for any other nuclear facility. LES would need to provide position-specific technical training appropriate for position the person qualified and was hired to fill.

4.2.9 Environmental Justice Impacts

For each of the areas of technical analysis presented in this EIS, a review of impacts to the human and natural environment was conducted to determine if any minority or low-income populations could be subject to disproportionately high and adverse impacts from the proposed action. The review includes potential impacts from the construction and operation of the proposed NEF.

Through the scoping process, affected members of the African American/Black, Hispanic/Latino, and Indian tribe communities were contacted and asked to express their concerns about the project and to discuss how they perceived the construction and operation of the proposed NEF would affect them. These discussions elicited the following concerns:

- Potential loss of property values for houses owned by nearby residents.
- Potential groundwater conflicts.
- Potential radiological contamination (probably airborne given the locations involved) of persons near the proposed NEF.
- Potential transportation routes.

For each area of analysis, impacts were reviewed to determine if any potential adverse impacts to the surrounding population would occur as a result of the proposed NEF construction and operations. If potential adverse impacts were identified, a determination was made as to whether minority or low-income populations would be disproportionately affected. Table 4-2 presents a summary of the potential exceptional vulnerabilities of minority and low-income communities in the region.

Adverse impacts are defined as negative changes to the existing conditions in the physical environment (e.g., land, air, water, wildlife, vegetation, human health, etc.) or negative socioeconomic changes. Disproportionate impacts are defined as impacts that may affect minority or low-income populations at levels appreciably greater than effects on non-minority or non-low-income populations. These impacts are discussed in the following subsections.

Table 4-2 Exceptional Circumstances Leading to Minority/Low-Income Communities Vulnerability

	Exceptional Circumstances of Minority and Low-Income Communities			
Circumstance	**Hispanic/Latino**	**African American/Black**	**American Indian**	**Low-Income**
Residences/ Locations	Possibly closest to proposed NEF, but at a minimum 4.3 km (2.6 mi) distance.	Possibly closest to proposed NEF, but at a minimum 4.3 km (2.6 mi) distance.	Possibly closest to proposed NEF, but at a minimum 4.3 km (2.6 mi) distance.	Possibly closest to proposed NEF, but at a minimum 4.3 km (2.6 mi) distance.
Use of Water	None identified (use city water).	None identified (use city water).	None identified (use city water).	None identified (use city water).
Use of Other Natural Resources	None identified.	None identified.	None identified.	None identified.
Exceptional Preexisting Health Conditions	None identified.	None identified.	None identified.	None identified.
Occupations/ Cultural Practices/ Activities	None identified.	None identified.	None conducted in area.	None identified.

km - kilometers.
mi - miles.

4.2.9.1 Impacts to the Land Use, Visual and Scenic, Air Quality, Geology and Soils, Ecological Resources, Noise, and Traffic

Land disturbances and changes to land forms could result from such activities as the construction of roads and buildings at the proposed NEF site. Fugitive dust and noise emissions from such activities, if not properly controlled (and if the wind were from the east), might also be a minor issue at the nearest houses, which could have minority or low-income residents and are about 4.3 kilometers (2.6 miles) away from the proposed NEF. These impacts would be most likely to occur where most construction activity would take place, in and around the proposed NEF, which is either vacant or low-density industrial land.

Noise, dust, and other emissions associated with the construction and operation of the proposed NEF would not be expected to affect the nearest residents and would only slightly and temporarily affect wildlife. Vegetation and wildlife would be expected to be affected only within the 81-hectare (200-acre) area disturbed at the site, the access road, and the current and relocated CO_2 pipeline corridors crossing the site. The impacts to land use would be expected to be SMALL. The scenic qualities to neighbors of the proposed NEF site would be SMALL because the area around it is already devoted to industrial purposes and has low scenic value.

A significant increase in traffic on New Mexico Highway 234, New Mexico Highway 18, and Texas Highway 176 would occur during the initial phase of construction, and this period of inconvenience would be short. Although traffic would increase, all travelers on New Mexico Highway 234, including those workers traveling to the site, would be affected. No disproportionate impact on minority or low-income residents would be expected.

4.2.9.2 Impacts from Restrictions on Access

Access to the proposed NEF site would be restricted once construction begins. However, the land is used for cattle grazing and zoned industrial, and has very little other productive economic, cultural, or recreational use. The restricted land area is small in size when compared to the overall size of the raw land inventory in the county and even in the local area.

Inquiries to Indian tribes with some historical ties to the area have not identified any cultural resource or service that would impact the Indian tribes. A survey of the proposed NEF site found seven archaeological sites. LES has committed to protect and avoid disturbing any cultural artifacts that might be found during construction or operations. For this reason, the impacts from restrictions on access to the proposed NEF would be SMALL.

4.2.9.3 Impacts to Water Resources

No surface-water impacts or contamination would be expected, and no groundwater conflicts between the site and the region's other water users would be anticipated. Although the facility would use up to 2.63 million cubic meters (695 million gallons) of water from the Ogallala Aquifer during its operation, this is a small portion of the 60 billion cubic meters (49 million acre-feet or 16 trillion gallons) Ogallala reserves in the New Mexico portion of the aquifer. Water requirements would be well within the excess capacities of the Eunice and Hobbs water supply systems and the impacts would be SMALL. No disproportionate impact on minority or low-income residents would be expected.

4.2.9.4 Human Health Impacts from Transportation

Section 4.2.1.1 discusses the transportation impacts of the proposed NEF. The transportation analysis found that construction impacts would be short term and would be SMALL to MODERATE. During operation, the transportation impacts would be SMALL. Minority and low-income populations are not expected to be affected any differently from others in the community. In particular, neither the construction phase nor the operations phase is expected to generate significant additional traffic congestion in the south part of Hobbs or along the Highway 18 corridor (NMDOT, 2005a, Hobbs, 2005, Lea County, 2005). Therefore, no disproportionately high and adverse effects are expected for any particular segments of the population, including minority and low-income populations that could live along the proposed transportation routes.

4.2.9.5 Human Health Impacts from Operation of the Proposed NEF

Human health impacts of the proposed NEF for normal operations are discussed in section 4.2.12 and for accidents in section 4.2.13. Although minority and possibly low-income populations live relatively near the proposed NEF site (i.e., within a 5-kilometer [3-mile] radius including the nearest residence, which is about 4.3 kilometers [2.6 miles] from the proposed NEF), it is unlikely that normal operations would affect them with radiological and nonradiological health impacts or other risks. These risks during normal operations would be small for any offsite population at any site location discussed in this EIS. Inquiries by the NRC staff to the local Hispanic/Latino and African American/Black communities, and to the States of New Mexico and Texas found no activities, resource dependencies, preexisting health conditions, or health service availability issues resulting from normal operations at the proposed NEF that would cause a health impact for the members of minority or low-income communities (either as an individual facility or combined with the impacts of other nearby facilities). Therefore, it is unlikely that any minority or low-income population would be disproportionately and adversely affected by normal operations of the proposed NEF.

In addition, inquiries to the New Mexico and Texas Departments of Health produced no data that identified any exceptional health problems among low-income and minority residents in the Eunice-Hobbs-Andrews area. It was not possible to identify any unusual incidences of birth defects, chronic diseases, or cancer clusters in Lea or Andrews Counties, the smallest area for which published health information is available. Age-adjusted incidence of cancer is slightly lower in Lea County than in New Mexico as a whole, but it is not clear that the difference is statistically significant and the income and ethnicity of individuals with chronic diseases is not available. The same is true of Andrews County in comparison with Texas. Hispanic populations in both States show lower age-adjusted cancer incidence than the majority population, but the differences are not statistically significant in most cases. While sufficient data do not exist that show any unique health conditions among the local minority and low-income populations, there is also no evidence that the proposed NEF would compound any preexisting health problems of nearby residents or visitors in the Eunice vicinity (see Chapter 3 of this EIS).

Section 4.2.13 discusses potential accident scenarios for the proposed NEF that would result in potentially significant releases of radionuclides to air or soil, and some effects to offsite populations. NRC regulations and operating procedures for the proposed NEF are designed to ensure that the accident scenarios in section 4.2.13 would be highly unlikely. The most significant accident consequences would be those associated with the release of uranium hexafluoride (UF_6) caused by rupturing an over-filled and/or over-heated cylinder. Such an accident would result in exposures above regulatory limits at the site boundaries and seven fatalities in the exposed population. These exposures and fatalities could happen if the wind was from the south at the time of the accident and sent the plume toward Hobbs and Lovington, New Mexico. In this scenario, minority and low-income populations would not be more obviously at risk than the majority population.

There is no mechanism for disproportionate environmental effects through accidents on minority residents near the proposed NEF. Section 4.2.13 shows that even the most severe hypothetical accident scenario would result in an exposure five times less than the 0.05 sieverts (5 rem) exposure limit for a credible intermediate-consequence accident event to any individual located outside the controlled area defined in 10 CFR § 70.61. Therefore, the risk to any population, including low-income and minority communities, would be considered SMALL.

4.2.9.6 Impacts of Housing Market on Low-Income Populations

The population in the region of influence would be expected to grow slightly due to the proposed NEF construction by as many as 280 persons during the peak construction period. Some of these persons would be expected to live in the cities of Hobbs, Eunice, or Andrews. There is a substantial vacancy rate in the local housing market; however, due to population increase and the proposed NEF-driven increase in regional purchasing power, there would be a slight increase in demand for housing in the local area. This increase should have a modest positive effect on housing demand and the nominal value of existing homes. Any negative effect on housing values would likely be offset by this increase in demand. Due to the number of workers who would be expected to move to the area, however, the impact on housing prices would be SMALL. It is likely that the 210 operations workers would want to be nearer to the proposed NEF than the construction work force.

4.2.9.7 Positive Socioeconomic Impacts

The proposed NEF would cost approximately $1.24 billion (in 2004 dollars) to build and could provide added tax income to local governments. These revenues would benefit the local community including its low-income members. The current labor force can supply some of the construction labor and services required to build the proposed NEF, but it cannot currently supply the specialized skills needed for the proposed NEF operations. However, most community members would share to some degree in the economic growth expected to be generated by the proposed NEF. No one group is likely to be disproportionately benefitted, with the possible exception of educated individuals who are currently underemployed. Targeted technical training programs could increase the pool of eligible local workers, as discussed in section 4.2.8.3.

4.2.9.8 Summary

Table 4-3 summarizes the potential impacts on minority and low-income populations. Examination of the various environmental pathways by which low-income and minority populations could be disproportionately affected reveals no disproportionately high and adverse impacts from either construction or normal operations of the proposed NEF. In addition, no credible accident scenarios exist in which such impacts could take place. The NRC staff has concluded that no disproportionately high and adverse impacts would occur to minority and low-income populations living near the proposed NEF or along likely transportation routes into and out of the proposed NEF as a result of the proposed action. Thus, when considering the effect of the proposed NEF on environmental justice through direct environmental pathways, the impacts would be considered SMALL.

Table 4-3 Potential Impacts of the Proposed Action on Minority and Low-Income Populations

Potential Impact[a]	Potentially Affected Minority Population or Low-Income Community	Level of Impact
Land Use	Hispanic/Latino	SMALL
Historic and Cultural Resources	Indian Tribes	SMALL
Visual and Scenic Resources	Low-Income and Minority Populations near Proposed NEF Site	SMALL
Air Quality	Hispanic/Latino	SMALL
Geology and Soils	Hispanic/Latino	SMALL
Water Resources	Hispanic/Latino	SMALL
Ecological Resources	None	SMALL
Socioeconomic and Community Resources: Employment Population Housing Values	All Minorities, Low-Income	SMALL to MODERATE (but generally beneficial and not disproportionate)
Recreation	Low-Income and Minority Populations	SMALL
Economic Structure	Low-Income and Minority Populations	SMALL to MODERATE (and beneficial)

Potential Impact[a]	Potentially Affected Minority Population or Low-Income Community	Level of Impact
Noise	Low-Income and Minority Populations near Proposed NEF Site	SMALL
Transportation	Hispanic/Latino, African American/Black, Low-Income	MODERATE (but not disproportionate)
Human Health Radiological Nonradiological	Low-Income and Minority Populations near Proposed Transport Routes and Downwind of the Proposed NEF Site	SMALL

[a] All other potential impacts would be SMALL and not disproportionate.

4.2.10 Noise Impacts

This section discusses the noise impacts from the construction and operation of the proposed NEF. The effects of noise on human health can be considered from both physiological and behavioral perspectives. Historically, physiological hearing loss was considered the most serious effect of exposure to excessive or prolonged noises, with such effects largely related to human activities in the workplace and near construction activities. Excessive noises would also repel wildlife and affect their presence. Noise levels at the proposed NEF site are generated predominately by traffic movements and, to a much lesser extent, by commercial, industrial, and across-State-line-related traffic.

4.2.10.1 Site Preparation and Construction

During preparation and construction at the site, noise from earth-moving and construction activities would add to the noise environment in the immediate area. Construction activities would be expected to occur during normal daytime working hours. It should be noted that no specific Federal, State, tribal, or local standards regulate noise from daytime construction activities. Noise sources include the movement of workers and construction equipment, and the use of earth-moving heavy vehicles, compressors, loaders, concrete mixers, and cranes. Table 4-4 provides a list of construction equipment and corresponding noise levels at a reference distance of 15 meters (50 feet) and the attenuated noise levels associated with increasing distance from those sources.

Table 4-4 Attenuated Noise Levels (Decibels A-Weighted[a]) Expected for Operation of Construction Equipment

Source	Distance from Source					
	15 m (50 ft)	**30 m (98 ft)**	**45 m (148 ft)**	**60 m (197 ft)**	**120 m (394 ft)**	**360 m (1,181 ft)**
Heavy Truck	85	79	76	73	68	56
Dump Truck	84	78	75	72	67	55
Concrete Mixer	85	79	76	73	68	56
Jackhammer	85	79	76	73	68	56
Scraper	85	79	76	73	68	56
Dozer	85	79	76	73	68	56
Generator (< 25 KVA)	82	76	73	70	64	52
Crane	85	79	76	73	68	56
Loader	80	74	71	68	62	50
Paver	85	79	76	73	68	56
Excavator	85	79	76	73	68	56
Claw Shovel	93	87	83	81	75	66
Pile Driver	95	89	86	83	77	65

[a] The most common single-number measure is the A-weighted sound level, often denoted dBA. The A-weighted response simulates the sensitivity of the human ear at moderate sound levels (Bruce et al., 2003).
KVA - kilovolt amps; ft - feet; m - meters.
Source: Thalheimer, 2000.

The noise estimates are based on noise produced by single sources. Multiple sources generate additional noise, and that noise is additive but not in a simple linear way (Bruce et al., 2003). For example:

- Two 90-decibel noise sources make 93 decibels.
- Four 90-decibel noise sources make 96 decibels.
- Eight 90-decibel noise sources make 99 decibels.
- Sixteen 90-decibel noise sources make 102 decibels.
- Each doubling of identical noise sources results in a 3-decibel increase in noise.

A conservative estimate of construction site noise has been developed by assuming an average of about 20 heavy equipment items of various types operating in the same general area over a 10-hour workday. Hourly average noise levels during the active workday would average 90 to 104 decibels A-weighted at 15 meters (50 feet) from the work site. This value is consistent with the noise exposures among construction workers at industrial, commercial, and institutional construction sites. Employees who work in close proximity to the equipment would be exposed to noise levels of 81 to 108 decibels A-weighted (Sutter, 2002). For comparison, the NRC staff projected 110 decibels A-weighted for the earlier proposed LES facility near Homer, Louisiana (NRC, 1994).

Distance attenuation and atmospheric absorption would reduce construction noise levels at greater distances. Estimated noise levels would be about 86 decibels A-weighted at 120 meters (394 feet), 77 decibels A-weighted at 360 meters (1,181 feet), 64 decibels A-weighted at 1.6 kilometers (1 mile), and 59 decibels A-weighted at 2.6 kilometers (1.6 miles). Actual noise levels probably would be less than these estimates due to terrain and vegetation effects. There are no residences closer than 4.3 kilometers (2.6 miles) of the project site, and nighttime construction activity, while it could occur, is not anticipated.

The nearest manmade structures of the proposed NEF to the site boundaries, excluding the two driveways, would be the Site Stormwater Detention Basin and the Visitor's Center at the southeast corner of the site. The southern edge of the Site Stormwater Detention Basin would be approximately 15.2 meters (50 feet) from the south perimeter fence and approximately 53.3 meters (175 feet) from New Mexico Highway 234. The eastern edge of the Visitor's Center would be approximately 68.6 meters (225 feet) from the east perimeter fence (LES, 2005a).

The highest noise levels are predicted to be within the range of 84 to 98 decibels A-weighted at the south fence line during construction of the Site Stormwater Detention Basin and between 68 to 86 decibels A-weighted at the east fence line during construction of the Visitor's Center. These projected noise level ranges are within the U.S. Department of Housing and Urban Development (HUD) unacceptable sound pressure level guidelines (HUD, 2002). Noise levels exceeding 85 decibels A-weighted are considered as "clearly unacceptable" and could call for efforts to improve the conditions. However, these predicted high noise levels would be expected to occur only during the day and only during the construction phase. Also, these levels are associated with the use of specific equipment, such as claw shovels or pile drivers (Table 4-4). Because the site is bordered by a main trucking thoroughfare, a landfill, an industrial facility, and a vacant property, these intermittent noise levels would not be expected to impact any sensitive receptors surrounding the site. Noise levels at the nearest residence location (approximately 4.3 kilometers [2.6 miles] away) would be negligible.

There would be an increase in traffic noise levels from construction workers and material shipments. These short-term noise impacts would be SMALL and may be limited to workday mornings and afternoons.

4.2.10.2 Operations

The location of the enrichment facilities of the proposed NEF relative to the site boundaries and sensitive receptors would mitigate noise impacts to members of the public. Based on the Almelo Enrichment plant in the Netherlands, noise levels during operations would average 39.7 decibels A-weighted with a peak level of 47 decibels A-weighted at the site boundaries (LES, 2005a). These noise levels are below the HUD guidelines of 65 decibels A-weighted for industrial facilities with no nearby residences (HUD, 2002). The noise sources would be far enough away from offsite areas (i.e, the nearest residence is 4.3 kilometers [2.6 miles] from the site) that their contribution to offsite noise levels would be SMALL. Some noise sources (e.g., public address systems, and testing of radiation and fire alarms) could have onsite impacts. Such onsite noise sources would be intermittent and are not expected to disturb members of the public outside of facility boundaries.

Noise from traffic associated with the operation of this type of facility would likely produce a very small increase in the noise level that would be limited to daytime. The roads mostly impacted during operations would be New Mexico Highway 234 and New Mexico Highway 18. These two highways already convey varying amounts of truck traffic (NMDOT, 2005b; Hobbs, 2005), and the impacts due to the proposed NEF operation would be SMALL (LES, 2005a).

4.2.10.3 Mitigation Measures

During construction, LES would maintain noise-suppression systems in proper working condition on the construction vehicles and could limit the operation of construction equipment to daylight hours to help mitigate noise (however, construction could occur during nights and weekends, if necessary [LES, 2005a]). For the operating facility, noise generation from gas centrifuges and other processes would be primarily limited to the inside of buildings. The relative distance to the site boundaries would also mitigate noise impacts to members of the public. Both phases (construction and operation) would also adhere to Occupational Safety and Health Administration (OSHA) standards in 29 CFR § 1926.52 for occupational hearing protection (OSHA, 2004).

4.2.11 Transportation Impacts

This section discusses the potential impacts from transportation to and from the proposed NEF site. Transportation impacts would involve the movement of personnel and material during both construction and operation of the proposed NEF and includes:

- Transportation of construction materials and construction debris.
- Transportation of the construction work force.
- Transportation of the operational work force.
- Transportation of feed material (including natural UF_6 and supplies for the enrichment process).
- Transportation of the enriched UF_6 product.
- Transportation of process wastes (including radioactive wastes) and DUF_6 waste.

Transportation impacts are discussed below for site preparation and construction, and operations. Transportation impacts associated with decommissioning are discussed in section 4.3.11.

4.2.11.1 Site Preparation and Construction

The construction of the proposed NEF would cause an impact on the transportation network surrounding the site due to the daily commute of up to 800 construction workers during the peak years of construction (LES, 2004c). During the 8 years of construction, there would be an average of approximately 400 workers. The commute of the peak number of construction workers could increase the daily traffic on New Mexico Highway 234 from 1,823 vehicles per day (Table 3-21 of Chapter 3) to 3,423 vehicles per day (1,823 plus 2 trips for each of 800 vehicles). This increased traffic volume represents 40 to 50 percent of the design volume of New Mexico Highway 234. The design volume is approximately 6,000 vehicles per day or 1,500 to 2,000 vehicles per hour (NMDOT, 2005a). New Mexico Highway 234 has been identified as requiring maintenance improvements (i.e., resurfacing and shoulder improvements) regardless of whether the proposed NEF is constructed. Funding allocation for the maintenance improvements would be dependent on further action by the State of New Mexico.

For New Mexico Highway 18, which is a four-lane highway that intersects New Mexico Highway 234 in Eunice, New Mexico, the New Mexico Department of Transportation estimates that the current traffic volume is currently 6,000 vehicles per day. The design capacity of New Mexico Highway 18 is approximately 20,000 vehicles per day. Traffic slowdowns and delays do not typically occur except sometimes within the city of Hobbs between 3:00 pm to 4:00 pm during the school year and 4:45 pm to 5:30 pm during the week as part of rush hour. Highway 18 would act as the primary link between the proposed NEF and the primary population centers in, and to the north of, Hobbs. Workers traveling from north of Hobbs to the proposed NEF would also have access to the South Bypass around Hobbs, which is currently lightly used. No plans are currently in place to make any upgrades to New Mexico Highway 18 (NMDOT, 2005b; Lea County, 2005; Hobbs, 2005).

Because traffic volume would remain below the design capacities of New Mexico Highways 18 and 234 and it is not anticipated that any traffic slowdowns or delays would occur except at the entrance of the proposed NEF during shift changes, the impacts to overall traffic patterns and volumes would be SMALL to MODERATE to New Mexico Highway 234 and SMALL to New Mexico Highway 18.

In addition to the increased traffic that might result from the construction along New Mexico Highway 234, there would be an increased potential for traffic accidents. Assuming a 64-kilometer (40-mile) round-trip commute (LES, 2005a) (i.e., the round trip distance between the city of Hobbs and the proposed NEF site), 800 vehicles would travel an estimated 51,500 kilometers (32,000 miles) daily for 250 days per year. This average round-trip distance was assumed because Hobbs, New Mexico, is the closest principal business center to the proposed NEF site. Based on the vehicle accident rate of 34.86 injuries and 3.02 fatalities per 100 million vehicle miles in Lea County (UNM, 2003), 3 injuries and less than 1 fatality could occur during the peak construction employment year. The increased traffic due to commuting construction workers would have a SMALL to MODERATE impact on the volume of traffic on New Mexico Highway 234.

Approximately 3,400 trucks would arrive and depart the site in each of the 3 peak years of construction (about 14 trucks per day) (LES, 2005a). Assuming an average round-trip distance of 64 kilometers (40 miles), 209,214 vehicle kilometers (130,000 vehicle miles) per year would accrue, resulting in less than one injury and less than one fatality from the construction truck traffic. The impacts from the truck traffic to and from the site would have only a SMALL impact on overall traffic.

Approximately 6,500 loads of clay using 15-metric-ton (16.5-ton) trucks from a nearby quarry could be brought to the proposed NEF site for the construction of the two lined basins. Because the round trip distance would be approximately 3.2 kilometers (2 miles) using private access roads (i.e., no public vehicular traffic), the impacts from the hauling of the clay would be from truck emissions. The risk from these truck emissions over the duration of the clay shipments would be less than 6×10^{-6} fatalities. Therefore, due to the very small risk for a fatality, these impacts would be SMALL.

Two construction access roadways off New Mexico Highway 234 would be built to support construction (LES, 2005a). The materials delivery construction access road would run north from New Mexico Highway 234 along the west side of the proposed NEF site. The personnel construction access road would run north from New Mexico Highway 234 along the east side of the proposed NEF site. Both roadways would eventually be converted to permanent access roads upon completion of construction. As a result, impacts from the access road construction would be SMALL.

4.2.11.2 Operations

Operation impacts could occur from the transport of personnel, nonradiological materials and radioactive material to and from the proposed NEF site. The impacts from each are discussed below.

<u>Transportation of Personnel</u>

There would be minimal impact on traffic (an increase of 10 percent) based on an operational work force of 210 workers (LES, 2005a) and assuming 1 worker per vehicle. Given this traffic volume and assuming a round-trip distance of 64.4 kilometers (40 miles), less than one injury and less than one fatality would result from traffic accidents per year. Operations at the proposed NEF would require 21 shift changes per week to provide personnel for continuous operation. Based on 5 shifts worked per employee, approximately 4.2 employees would be required to staff each position resulting in about 50 positions per shift on an average, or 50 vehicles per shift (LES, 2005a), assuming no carpooling. This traffic would have a SMALL impact on the traffic on New Mexico Highways 18 and 234.

Transportation of Nonradiological Materials

The transportation impacts of nonradiological materials would include the delivery of routine supplies necessary for operation and the removal of nonradiological wastes. Supplies delivered to and waste removed from the site would require 2,800 and 149 truck trips, respectively, on an annual basis (LES, 2005a). Supplies would range from janitorial supplies to laboratory chemicals. This traffic would have a SMALL impact on the traffic on New Mexico Highway 234. Assuming a round-trip distance of 64.4 kilometers (40 miles) for the supplies and 8 kilometers (5 miles) for the waste removal, 113,000 vehicle miles per year would occur resulting in less than one injury and less than one fatality per year of operation. The 64.4-kilometer (40-mile) distance is reflective of receiving janitorial and laboratory chemical supplies from the Hobbs, New Mexico, area since this is the principal business community for Lea County, New Mexico. The 8-kilometer (5-mile) distance would be the round-trip distance from the proposed NEF site to the Lea County Landfill, the proposed destination for all of the nonhazardous and nonradioactive waste generated by the proposed NEF.

Transportation of Radiological Materials

Transportation of radiological materials would include shipments of feed material (natural UF_6), product material (enriched UF_6), DUF_6, radioactive wastes, and empty cylinders. LES did not propose rail transportation as a means of shipping radioactive material and wastes (LES, 2005a); however, the NRC staff believes that shipment by rail could be possible in the foreseeable future. Therefore, impacts of both truck and rail shipments are presented below. The transportation of the radiological materials issubject to NRC and U.S. Department of Transportation (DOT) regulations. All the materials shipped to or from the proposed NEF can be shipped in Type A containers. The product (enriched UF_6) is considered by the NRC to be fissile material and would require additional fissile packaging considerations such as using an overpack surrounding the shipping container. However, when impacts are evaluated, the effects of the overpackage are not incorporated into the assessment and result in a set of conservative assumptions.

In addition to the potential radiological impacts from the shipment of UF_6, chemical impacts from an accident involving UF_6 could affect the surrounding public. When released from a shipping cylinder, UF_6 would react to the moisture in the atmosphere to form hydrofluoric acid and uranyl fluoride.

The potential impacts from these shipments, other than normal truck traffic on New Mexico Highway 234, were analyzed using two computer codes: WebTragis (ORNL, 2003) and RADTRAN 5 (Neuhauser and Kanipe, 2003). WebTragis is a web-based version of the Transportation Routing Analysis Geographic Information System (Tragis) used to calculate highway, rail, or waterway routes within the United States. RADTRAN 5 is used to calculate the potential impacts of radiological shipments using the routing information generated by WebTragis. Appendix D presents details of the methodology, calculations, and results of the analyses. The potential chemical impacts have been analyzed in previously published EISs by U.S. Department of Energy (DOE) (DOE 2004a; DOE, 2004b).

RADTRAN 5 presents results from several different types of impacts. The term “Incident-Free” includes potential impacts of transportation without a release of radioactive material from shipping. The impacts include health impacts (fatalities) from traffic accidents, health impacts (latent cancer fatalities) from the vehicle exhaust emissions, and health impacts (latent cancer fatalities) from the direct radiation from a shipment passing by the public. These impacts were estimated based on one year of shipments and are presented for both the general public surrounding the transportation routes and the maximally exposed individual. Risks are calculated based on a population density located within 800 meters (0.5 mile) of the transportation route. The accident results contain the impacts from a range of accidents severe enough to release radioactive material to the environment and represent the risk (the impact of the accident times the probability of the accident occurring). It was conservatively assumed that the once the container is breached, the material that is released is assumed to be airborne and respirable.

The potential chemical impacts are presented in a scenario in which an accident has occurred with a fire under stable meteorological conditions (Pasquill stability Class E and F, see section 3.5.2.3 of Chapter 3 of this EIS). The impacts are categorized according to the number of persons with the potential for adverse health effects and the number of persons with the potential for irreversible adverse health effects. The impact on the maximally exposed individual is also presented.

Latent Cancer Fatality from Exposure to Ionizing Radiation

A latent cancer fatality (LCF) is a death from cancer resulting from, and occurring an appreciable time after, exposure to ionizing radiation. Death from cancer induced by exposure to radiation may occur at any time after the exposure takes place. However, latent cancers would be expected to occur in a population from one year to many years after the exposure takes place. To place the significance of these additional LCF risks from exposure to radiation into context, the average individual has approximately 1 chance in 4 of dying from cancer (LCF risk of 0.25).

The U.S. Environmental Protection Agency has suggested (Eckerman et al., 1999) a conversion factor that for every 100 person-Sievert (10,000 person-rem) of collective dose, approximately 6 individuals would ultimately develop a radiologically induced cancer. If this conversion factor is multiplied by the individual dose, the result is the individual increased lifetime probability of developing an LCF. For example, if an individual receives a dose of 0.00033 Sieverts (0.033 rem), that individual's LCF risk over a lifetime is estimated to be 2×10^{-5}. This risk corresponds to a 1 in 50,000 chance of developing a LCF during that individual's lifetime. If the conversion factor is multiplied by the collective (population) dose, the result is the number of excess latent cancer fatalities.

Because these results are statistical estimates, values for expected latent cancer fatalities can be, and often are, less than 1.0 for cases involving low doses or small population groups. If a population group collectively receives a dose of 50 Sieverts (5,000 rem), which would be expressed as a collective dose of 50 person- Sievert (5,000 person-rem), the number of potential latent cancer fatalities experienced from within the exposure group is 3. If the number of latent cancer fatalities estimated is less than 0.5, on average, no latent cancer fatalities would be expected.

Source: NRC, 2005a; NRC, 2004b.

<u>Radiological Shipments by Truck</u>

Impacts in this section include the traffic impacts from the truck traffic as well as the radiation exposure from the radiological shipments involving UF_6, triuranium octaoxide (U_3O_8), and other low-level radioactive wastes. Figure 4-5 shows the various shipping routes assuming the shipments would follow routes that are used for highway routing controlled quantities. These routes are designated by the U.S. Department of Transportation to minimize the potential impacts to the public from the transportation of radioactive materials.

The NRC staff evaluated the number of shipments of each type of material based on the amount and type of material being transported to and from the site. The feed material (natural UF_6) would arrive onsite in up to 690 Type 48Y cylinders or 890 Type 48X cylinders per year delivered from Metropolis, Illinois, or Port Hope, Ontario, Canada (LES, 2005a). There would be one Type 48X or one 48Y cylinder per truck (up to three per day). The product (enriched UF_6) would be shipped in 350 Type 30B cylinders to any of three fuel manufacturing plants located in Richland, Washington; Wilmington, North Carolina; or Columbia, South Carolina. Up to five Type 30B cylinders could be shipped on one truck; however, LES proposes to ship only three cylinders per truck (LES, 2005a). Therefore, 117 truck shipments per year (approximately 1 every 3 days) would leave the site.

In addition, 350 Type 30B cylinders would be brought to the site every year so that they could be filled with enriched UF_6 and shipped back offsite. Assuming 12 empty cylinders per truck, 30 truck deliveries would be required per year (about 1 every 2 weeks).

The impacts of transporting the depleted uranium to a conversion facility were also analyzed. Conversion could be performed either at a DOE or a private conversion facility. Currently DOE conversion facilities are being constructed at Paducah, Kentucky, and Portsmouth, Ohio. For the purpose of this analysis, it is assumed that the private conversion facility will be located at Metropolis, Illinois. As discussed previously in section 2.1.9, LES suggested the construction of a DUF_6 to U_3O_8 conversion facility near Metropolis, Illinois. The existing ConverDyn plant at Metropolis, Illinois, converts natural U_3O_8 (yellowcake) from mining and milling operations into UF_6 feed for enrichment facilities, such as the proposed NEF, and UF_4 for other uses (ConverDyn, 2004). Construction of a private DUF_6 to U_3O_8 conversion facility near the ConverDyn plant in Metropolis, Illinois, would allow the

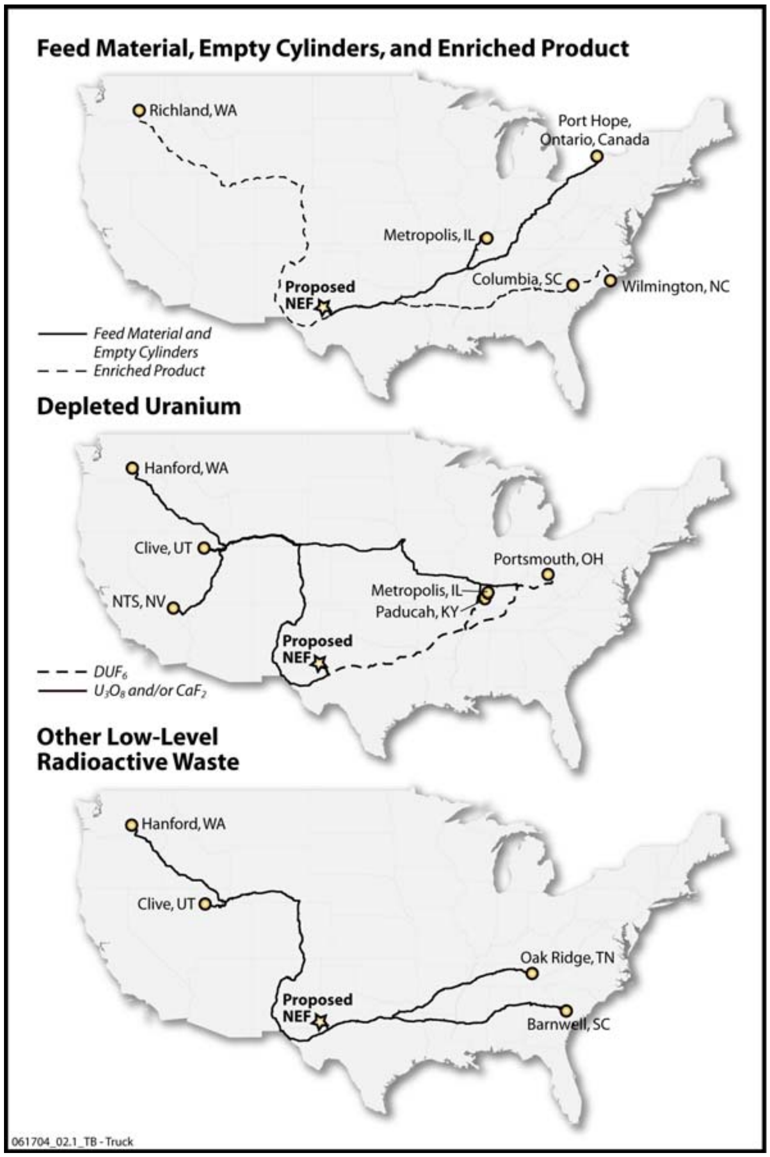

Figure 4-5 Proposed Transportation Routes via Truck for Radioactive Shipments

hydrogen fluoride produced during the DUF_6 to U_3O_8 conversion process to be reused to generate more UF_6 feed material while the U_3O_8 would be shipped for final disposition. The NRC staff has determined that construction of a private DUF_6 to U_3O_8 conversion plant near Metropolis, Illinois, would have similar environmental impacts as construction of an equivalent facility anywhere in the United States. The advantage of selecting the Metropolis, Illinois, location is the proximity of the ConverDyn U_3O_8 to UF_6 conversion facility and, for the purposes of assessing impacts, the DOE conversion facility in nearby Paducah, Kentucky, for converting DOE-owned DUF_6 to U_3O_8. Because the proposed private plant would be similar in size and the effective area would be the same as the Paducah conversion plant, the environmental impacts would be similar.

The DUF_6 would be placed in Type 48Y cylinders for temporary onsite storage with eventual shipment offsite. The NRC staff estimates that approximately 627 truck shipments (one cylinder per truck) would be needed annually to transport the DUF_6 to a conversion facility where the waste would be converted into U_3O_8.

If DOE performs the conversion, they could transport the U_3O_8 from Paducah, Kentucky, and Portsmouth, Ohio to Envirocare near Clive, Utah, or to the Nevada Test Site for disposal. The U_3O_8 from Metropolis, Illinois, could be shipped to Envirocare. If an adjacent conversion facility to the proposed NEF (i.e., outside the State of New Mexico) is used, then the U_3O_8 could be shipped to Envirocare.

The hydrofluoric acid generated during the process of converting the DUF_6 to U_3O_8 might be reused in the process of generating UF_6 or neutralized to CaF_2 for potential disposal at the same site as the U_3O_8. The conversion process would generate over 6,200 metric tons (6,800 tons) of U_3O_8 and 5,200 metric tons (5,700 tons) of CaF_2 annually. Assuming that this material would be shipped in 11.3 metric ton (25,000 pound) capacity bulk bags, 547 bulk bags of U_3O_8 and 461 bulk bags of CaF_2 would annually be required to ship this waste to a disposal site, assuming one bulk bag per truck.

The empty Type 48Y cylinders that were used to transport the DUF_6 to the conversion facility would be shipped back to the feed material suppliers in Metropolis, Illinois, or Port Hope, Ontario. In this analysis, the NRC staff assumed that these shipments would occur from the proposed NEF (63 empty cylinders per year) and an adjacent, private conversion facility (627 empty cylinders per year) over the same routes used for the feed materials. The empty Type 48Y cylinders would contain solid residues, or heels, that would remain after evacuating the UF_6 from the cylinders. The heels would contain radioisotopic daughter products produced by the UF_6. Half the number of feed product shipments would be needed to transport the empty cylinders back to the feed material suppliers. (Full cylinders would be shipped one per truck and empty cylinders would be returned two per truck.)

Other radiological waste of approximately 87,000 kilograms (191,800 pounds) per year (LES, 2005a), would be shipped offsite requiring eight truck shipments per year to GTS-Duratek in Oak Ridge, Tennessee, for processing or to either Envirocare near Clive, Utah, or U.S. Ecology in Hanford, Washington, or Barnwell, South Carolina, for disposal. The NRC staff included the Barnwell, South Carolina, site to encompass the range of sites which could be available in the future. The resulting total number of trucks containing radiological shipments (i.e., both incoming and outgoing material) would be about six per day, which would have a minimal impact on New Mexico Highway 234 traffic.

Table 4-5 presents a summary of the potential impacts for one year of shipments via truck, calculated by RADTRAN 5. The results are presented in terms of a range of values for each type of shipment. The range represents the lowest to highest impacts for the various proposed shipping routes. For example, for the feed material, the values represent one year of shipments from both Metropolis, Illinois, and Port Hope, Ontario, Canada. If some feed materials were provided from Metropolis and the remaining from

Port Hope, the impacts would be somewhere between the low and high values (impacts could be evaluated by taking the fraction of material from Metropolis times the impacts from Metropolis plus the fraction of material from Port Hope times the impacts from Port Hope). Also included in the table are the range of impacts summed over the shipments of the feed, product, depleted uranium, waste, and empty cylinders.

For the members of the general public, the largest impacts are from the nonradiological incident-free transportation of the radioactive materials (less than 1 fatality from traffic accidents and about 2 latent cancer fatalities from the vehicle emissions.) For the radiological impacts, the risk of latent cancer fatalities from postulated accidents would be no greater than 0.3 per year. This is about two orders of magnitude higher than the direct radiation received from the incident-free transportation due to the fact that during a postulated accident, the inhalation of the radioactive material is much more significant than the direct radiation. However, due to the low total annual latent cancer fatalities values due to accidents (less than 0.5), no radiation-induced latent cancer fatalities would be expected to occur to members of the public.

Radiological Shipments by Rail

Impacts in this section include the traffic impacts from rail traffic as well as radiation exposure from radiological shipments involving UF_6, U_3O_8, and other low-level radioactive wastes. For rail shipments it was assumed that the contents of four trucks would be carried by one railcar (based on the analysis results presented in DOE, 2004a and DOE, 2004b). The feed material (natural UF_6) would arrive onsite in 173 or 223 deliveries per year (see Figure 4-6). The feed material would arrive in either Type 48X or Type 48Y cylinders delivered from Metropolis, Illinois, or Port Hope, Ontario, Canada. The product (enriched UF_6) would be shipped in 350 Type 30B cylinders to any of three fuel manufacturing plants in Richland, Washington; Wilmington, North Carolina; or Columbia, South Carolina, in 30 shipments per year. Up to 12 cylinders could be shipped in one railcar. In addition, 350 Type 30B cylinders would be brought to the site every year so that they could be filled with enriched UF_6 and shipped offsite. It was assumed that one rail delivery of these cylinders would be made per year.

The DUF_6 would be placed in Type 48Y cylinders for either temporary storage onsite or shipment offsite. If the DUF_6 were shipped offsite, 158 rail shipments with four cylinders per railcar would be used to transport the cylinders to Paducah, Kentucky; Portsmouth, Ohio; or Metropolis, Illinois, where it would be converted into U_3O_8. After conversion, the U_3O_8 would be shipped from either Paducah or Portsmouth to Envirocare in Clive, Utah, or the Nevada Test Site for disposal or it would be shipped to Envirocare from Metropolis in gondola railcars with four bulk bags per car. The hydrofluoric acid generated during the process of converting the DUF_6 to U_3O_8 could be reused in the process of generating UF_6 or neutralized to CaF_2 for potential disposal at the same site as the U_3O_8. If the DUF_6 were converted to the more chemically stable form of U_3O_8 at an adjacent conversion facility to the proposed

Table 4-5 Summary of Impacts to Humans from Truck Transportation for One Year of Radioactive Shipments[a]

Type of Material	Range of Impact	Incident-Free							Accident (Risk of LCF to the General Population)
		General Population			Occupational Workers			Maximum Individual In-Transit (Increased Risk of LCF)	
		Traffic Accidents (Fatalities)	LCF		Traffic Accidents (Fatalities)	LCF			
			Vehicle Emissions	Direct Radiation		Vehicle Emissions	Direct Radiation		
Feed Material	Low	1×10^{-1}	3×10^{-1}	1×10^{-3}	3×10^{-2}	4×10^{-3}	2×10^{-3}	5×10^{-9}	8×10^{-2}
	High	2×10^{-1}	1	3×10^{-3}	6×10^{-2}	1×10^{-2}	9×10^{-3}	7×10^{-9}	2×10^{-1}
Product	Low	2×10^{-2}	8×10^{-2}	1×10^{-4}	6×10^{-3}	9×10^{-4}	8×10^{-4}	4×10^{-10}	7×10^{-2}
	High	4×10^{-2}	8×10^{-2}	2×10^{-4}	1×10^{-2}	1×10^{-3}	1×10^{-3}	4×10^{-10}	8×10^{-2}
Disposition of Depleted uranium	Low	8×10^{-2}	4×10^{-2}	6×10^{-4}	2×10^{-2}	3×10^{-3}	4×10^{-4}	2×10^{-9}	9×10^{-9}
	High	2×10^{-1}	4×10^{-1}	2×10^{-3}	5×10^{-2}	7×10^{-3}	3×10^{-3}	5×10^{-9}	6×10^{-2}
Waste	Low	1×10^{-3}	5×10^{-3}	3×10^{-7}	4×10^{-4}	6×10^{-5}	1×10^{-5}	1×10^{-12}	4×10^{-5}
	High	3×10^{-3}	5×10^{-3}	4×10^{-7}	8×10^{-4}	1×10^{-4}	2×10^{-5}	1×10^{-12}	5×10^{-5}
Empty Cylinders	Low	6×10^{-2}	2×10^{-1}	2×10^{-3}	2×10^{-2}	2×10^{-3}	5×10^{-3}	9×10^{-9}	3×10^{-2}
	High	9×10^{-2}	4×10^{-1}	4×10^{-3}	2×10^{-2}	4×10^{-3}	1×10^{-2}	9×10^{-9}	9×10^{-2}
Total Impacts	Low	3×10^{-1}	6×10^{-1}	3×10^{-3}	7×10^{-2}	1×10^{-2}	8×10^{-3}	2×10^{-8}	2×10^{-1}
	High	6×10^{-1}	2	9×10^{-3}	2×10^{-1}	2×10^{-2}	3×10^{-2}	2×10^{-8}	5×10^{-1}

[a] Risks are calculated based on a population density located within 800 meters (0.5 mile) of the transportation route.
LCF - latent cancer fatalities.

NEF, the conversion products of U_3O_8 and CaF_2 would be shipped to a disposal site in 137 and 116 gondola railcars, respectively.

Similar to the truck scenario, the empty Type 48Y cylinders would be shipped back to the feed material suppliers from the proposed NEF and an adjacent, private conversion facility. Half the number of feed product shipments would be needed to transport the empty cylinders back to the feed material suppliers.

Other radiological waste of approximately 87,000 kilograms (191,800 pounds) per year (LES, 2005a) would be shipped offsite requiring two rail shipments per year to either Envirocare, Barnwell, South Carolina; GTS-Duratek in Oak Ridge, Tennessee (for processing only); or U.S. Ecology in Hanford, Washington.

Table 4-6 presents a summary of the potential impacts for one year of shipments via rail, calculated by RADTRAN 5. The results are presented in terms of a range of values for each type of shipment. The range represents the potential impacts from the lowest to highest impact for the various proposed shipping routes. Also included in the table are the range of impacts summed over the shipments of the feed, product, depleted uranium, waste, and empty cylinders.

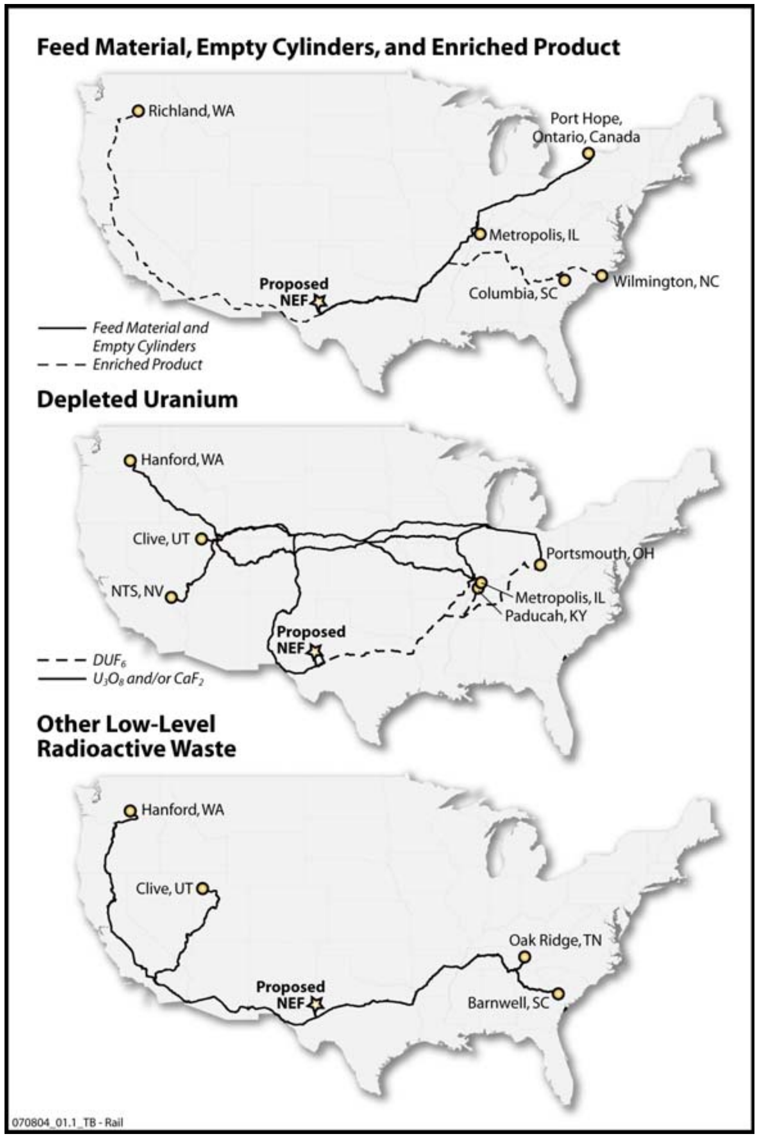

Figure 4-6 Proposed Transportation Routes via Rail for Radioactive Shipments

For shipments by rail, the largest impacts to the general public result from nonradiological, incident-free shipments. The impact of these rail shipments is smaller than the impact of nonradiological, incident-free truck shipments, because fewer rail shipments than truck shipments would occur. However, rail transport impacts to occupational workers would be greater than impacts from truck transport, because the number of rail workers is assumed to be greater (five workers for rail and two workers for trucks).

Table 4-6 Summary of Impacts to Humans from Rail Transportation for One Year of Radioactive Shipments[a]

Type of Material	Range of Impact	Incident-Free							Accident (Risk of LCF to the General Population)
		General Population			Occupational Workers			Maximum Individual In-Transit (Increased Risk of LCF)	
		Traffic Accidents (Fatalities)	LCF		Traffic Accidents (Fatalities)	LCF			
			Vehicle Emissions	Direct Radiation		Vehicle Emissions	Direct Radiation		
Feed Material	Low	6×10^{-2}	1×10^{-2}	6×10^{-2}	6×10^{-2}	4×10^{-4}	7×10^{-4}	5×10^{-9}	1×10^{-1}
	High	1×10^{-1}	4×10^{-2}	8×10^{-2}	1×10^{-1}	7×10^{-4}	1×10^{-3}	7×10^{-9}	3×10^{-1}
Product	Low	1×10^{-2}	5×10^{-3}	1×10^{-2}	1×10^{-2}	8×10^{-5}	2×10^{-4}	9×10^{-10}	1×10^{-1}
	High	2×10^{-2}	5×10^{-3}	1×10^{-2}	2×10^{-2}	1×10^{-4}	2×10^{-4}	9×10^{-10}	2×10^{-1}
Disposition of Depleted Uranium	Low	3×10^{-2}	5×10^{-3}	6×10^{-3}	3×10^{-2}	2×10^{-4}	5×10^{-5}	5×10^{-10}	1×10^{-8}
	High	8×10^{-2}	2×10^{-2}	1×10^{-2}	8×10^{-2}	5×10^{-4}	3×10^{-3}	1×10^{-9}	4×10^{-1}
Waste	Low	8×10^{-4}	2×10^{-4}	2×10^{-4}	8×10^{-4}	5×10^{-6}	4×10^{-6}	2×10^{-11}	4×10^{-5}
	High	1×10^{-3}	3×10^{-4}	2×10^{-4}	1×10^{-3}	7×10^{-6}	4×10^{-6}	2×10^{-11}	8×10^{-5}
Empty Cylinders	Low	3×10^{-2}	7×10^{-3}	3×10^{-2}	3×10^{-2}	2×10^{-4}	1×10^{-3}	3×10^{-9}	6×10^{-2}
	High	5×10^{-2}	2×10^{-2}	3×10^{-2}	5×10^{-2}	3×10^{-4}	1×10^{-3}	3×10^{-9}	1×10^{-1}
Total Impacts	Low	1×10^{-1}	3×10^{-2}	1×10^{-1}	1×10^{-1}	8×10^{-4}	2×10^{-3}	9×10^{-9}	3×10^{-1}
	High	3×10^{-1}	8×10^{-2}	1×10^{-1}	3×10^{-1}	2×10^{-3}	6×10^{-3}	1×10^{-8}	1

[a] Risks are calculated based on a population density located within 800 meters (0.5 mile) of the transportation route.
LCF - latent cancer fatalities.

Import and Export Impacts

With the exception of Port Hope in Ontario, Canada, LES has identified only domestic locations for the transportation of feed material to and enriched uranium from the proposed NEF (LES, 2004a). Further, LES has stated that at least 70% of its production from the first 10 years of operation has been contracted with U.S. nuclear utility companies (NRC, 2005b). However, it is possible that the proposed NEF could import feed materials from overseas suppliers or export enriched product to overseas purchasers. In this case, the proposed NEF would need to comply with licensing and other requirements for import and export activities in 10 CFR Part 110. Any import or export activity would also need to be conducted in accordance with transportation security requirements in 10 CFR Part 73. Transportation security for the proposed NEF is addressed in its Physical Security Plan. The discussion below summarizes expected transportation impacts associated with potential import/export activities along routes to three possible seaports: Wilmington, North Carolina and Charleston, South Carolina for the east coast; and Seattle, Washington for the west coast.

In this EIS, the NRC staff performed analyses for the transportation of enriched uranium from the proposed NEF to fuel fabrication facilities in Wilmington, North Carolina; Columbia, South Carolina; and Richland, Washington. These analyses are representative of enriched uranium shipments from the proposed NEF to the seaports listed above, because the truck and rail routes that would be used in transporting enriched uranium to these seaports have similar distances and population densities to the routes analyzed for shipments to the three non-port locations.

The NRC staff also performed analyses for the transportation of feed material to the proposed NEF from Port Hope, Ontario, Canada and transportation of U_3O_8 from the proposed NEF to Hanford, Washington. These analyses are considered representative of feed material shipments from the seaports to the proposed NEF, because the distances, population densities, and expected external radiation doses for such shipments would not be significantly different from those already analyzed.

Therefore, for shipments of both feed material and enriched uranium to or from seaports, transportation impacts (incident-free and accidents) would be SMALL and not be significantly different from transportation impacts discussed in this section.

Chemical Impacts from Transportation Accidents

This section presents the chemical impacts from potential transportation accidents involving UF_6 and U_3O_8. If UF_6 is released to the atmosphere, it reacts with water vapor in the air to form hydrofluoric acid and uranyl fluoride (UO_2F_2). These products are chemically toxic to humans. Hydrofluoric acid is extremely corrosive and can damage the lungs and cause death if inhaled at high enough concentrations. Uranium compounds, in addition to being radioactive, can have toxic chemical effects (primarily on the kidneys) if it enters by way of ingestion and/or inhalation (DOE, 2004a; DOE, 2004b).

Results from chemical impact analyses performed by DOE (DOE, 2004a; DOE, 2004b) were used to estimate the chemical impacts associated with the proposed NEF. In two EISs that assessed the construction and operation of a DUF_6 conversion facility, DOE presented an evaluation of the chemical impacts resulting from transportation accidents involving DUF_6. The results are applicable because the chemical impact analysis performed by DOE is independent of the shipping route and the amount of enrichment. Chemical impacts would be only dependent on the amount of UF_6 being transported and not on enrichment. In addition, the proposed NEF would use the same containers (Type 48Y cylinders) that DOE evaluated.

DOE evaluated the potential chemical impacts to the public from a hypothetical severe transportation accident (both truck and rail) that involves a fire (DOE, 2004a; DOE, 2004b). The results shown in Table 4-7 are based on the assumption that the accident occurred. The probability that the accident could happen is very remote. Since the accident location is not known, DOE evaluated the impacts for three different population densities. In addition, DOE presented the number of people that could be affected by two levels of effects (potential for adverse health effects and irreversible adverse health effects). The assumptions supporting the impacts summarized in the table are provided in Appendix D, section D.5.

Table 4-7 Potential Chemical Consequences to the Population from Severe Transportation Accidents

Source	Mode	Rural	Suburban	Urban
Number of Persons with the Potential for Adverse Health Effects[b]				
DUF_6	Truck	6	760	1,700
	Rail	110	13,000	28,000
Depleted U_3O_8 (in bulk bags)	Truck	0	12	28
	Rail	0	47	103
Number of Persons with the Potential for Irreversible Adverse Health Effects[a, b]				
DUF_6	Truck	0	1	3
	Rail	0	2	4
Depleted U_3O_8 (in bulk bags)	Truck	0	5	10
	Rail	0	17	38

[a] Exposure to hydrofluoric acid or uranium compounds is estimated to result in fatality to approximately 1 percent or less of those persons experiencing irreversible adverse effects.
[b] An adverse health effect includes respiratory irritation or skin rash associated with lower chemical concentrations. An irreversible adverse health effect generally occur at higher chemical concentrations and are permanent in nature.
Source: DOE, 2004a; DOE, 2004b.

For transporting DUF_6 by truck, up to 1,700 people could suffer adverse health effects, depending on where the accident occurs. Up to three people in an urban setting could suffer irreversible adverse health effects that could include death, impaired organ function (such as central nervous system or lung damage), and other effects that could impair daily functions. For transporting depleted U_3O_8 in bulk bags from a DUF_6 conversion facility to a low-level radioactive waste disposal facility by truck, up to 28 people could potentially suffer adverse health effects and up to 10 people could potentially suffer irreversible adverse health effects if an accident occurs in an urban setting.

For rail, the chemical impacts of an accident would be higher than for transportation by truck because of the larger quantity of material being transported in a shipment (four times greater by rail than by truck). Up to 28,000 people could experience adverse health effects for an accident in an urban setting that involves a rail shipment of DUF_6, with four additional people potentially suffering irreversible effects. When transporting depleted U_3O_8 in bulk bags by rail (four times the quantity than by truck), up to 103 people could suffer adverse health effects with 38 people potentially suffering irreversible effects if an accident occurs in an urban setting.

Due to the range in potential impacts of chemical exposure if an accident occurs during transportation, the impacts could be from SMALL to MODERATE, depending on the location (rural, suburban, or urban).

4.2.11.3 Summary of Transportation Impacts

There is the potential for one fatality as a result of construction worker traffic to and from the site during each of the three peak years of construction. In addition, the overall traffic would almost double on New Mexico Highway 234 during the peak construction period. New Mexico Highway 18 has the available capacity to absorb additional traffic created by construction and operations related to the proposed NEF without adverse effects. Any potential traffic impacts at the entrance to the proposed NEF could be mitigated by varying the starting and quitting times of the construction workers and by incorporating additional traffic safety measures such as building turning lanes. Per NMAC, Chapter 18, Title 31 Part 6 regulations, the NMDOT could require LES and/or Lea County to perform a traffic study and coordinate with the NMDOT to determine the specific safety improvements to be taken. Therefore, the increased traffic due to commuting construction workers would have a SMALL to MODERATE impact on the volume of traffic on New Mexico Highway 234 and a SMALL impact on New Mexico Highway 18. The impacts from truck traffic to and from the site would have only a SMALL impact on the overall traffic.

Tables 4-5 and 4-6 present the various impacts from either truck or rail transport of radioactive materials on a yearly basis. There is a potential for less than one fatality to either the general public or occupational workers from traffic accidents using either truck or rail transport. The emissions of either trucks or trains could result in about two latent cancer fatalities. Incident-free direct radiation could result in less than one latent cancer fatality to either the general public or occupational workers. The accident risk was assessed to be less that one latent cancer fatality to the general public resulting from accidents involving either a truck or rail. The impacts from the truck and rail traffic to and from the site would have a SMALL to MODERATE impact on overall traffic.

Table 4-7 presents the potential chemical consequences as the result of hypothetical severe transportation accidents. By evaluating the impacts for three different population densities (i.e., rural, suburban, or urban), potential impacts due to chemical exposures as the result of a transportation accident would range from SMALL to MODERATE depending on the location of the accident.

4.2.11.4 Mitigation Measures

A dust-suppression program would be implemented to control dust that would be created from construction traffic. BMPs would be used to maintain temporary roads to minimize the risk of accidents. Bare earthen areas would be stabilized, and earthen materials would be removed from paved areas and contained during excavation activities to ensure that traffic is not impeded. Open-bodied trucks would be covered when in motion. Temporary access roads and parking areas would be upgraded to permanent structures upon completion of construction. Only approved transport vehicles, containers, and casks would be used. Equipment operators would be qualified in the equipment they would operate. Procedures would be in place for manifesting all materials that enter and exit the facility including radiological materials and wastes. To mitigate for traffic-impacts during construction, LES would implement work shifts and would encourage car pooling to minimize the impact to traffic (LES, 2005a).

The NMDOT would review any access permit application, as noted in Table 1-3. If a permit is issued, the NMDOT would likely assign mitigation measures specific to the proposed NEF (e.g., turning lanes) (NMDOT, 2005b). These NMDOT actions are predicated on the granting of an NRC license to LES for the construction, operation, and decommissioning of the proposed NEF.

4.2.12 Public and Occupational Health Impacts

Except for transportation impacts, this section presents the environmental impacts to the surrounding public and the proposed NEF site work force from site preparation and construction and operation of the facility for both radiological and nonradiological (i.e., hazardous chemical) exposures. For members of the public, this EIS considered the affected population would be within an 80-kilometer (50-mile) radius of the proposed NEF site with the primary exposure pathway being from gaseous effluents. Workers at the proposed NEF site could also be affected by airborne or gaseous releases in addition to direct chemical and radiation exposure due to handling UF_6 cylinders, working near the enrichment equipment, and decontaminating cylinders and equipment.

Because there is a distinct separation between the construction and operational phases for buildings processing uranium at the proposed NEF, the construction phase impacts would likely be exclusively nonradiological. Even with the overlap in time between the construction and operational phases, this segregation can still be applied for the assessment of public and occupational health impacts due to very limited similarities between the sources of the impacts during each phase. For the most part, the construction phase does not involve radioactive material or the same hazardous chemicals that are employed during the operational phase. However, near the conclusion of the construction phase, hazardous chemicals that are directly associated with the assembly and installation of the enrichment process equipment would be used, presenting similar chemical hazards as those present in the operational phase.

4.2.12.1 Site Preparation and Construction

<u>Nonradiological Impacts</u>

The proposed action involves a major construction activity with the potential for industrial accidents related to construction vehicle accidents, material-handling accidents, falls, etc., that could result in temporary injuries, long-term injuries and/or disabilities, and even fatalities. The proposed activities are not anticipated to be any more hazardous than those for a major industrial construction or demolition project.

To estimate the number of potential fatal and nonfatal occupational injuries from the proposed action, data on fatal and nonfatal occupational injuries per worker per year were collected from the U.S. Department of Labor's Bureau of Labor Statistics. Nonfatal occupational injury rates specific to New Mexico for the year 2002 and State of New Mexico fatal occupational injury rates for the year 2000 for both the construction and manufacturing industries were used to calculate each of the rates for the proposed NEF (DOL, 2004). Table 4-8 presents the rates and the estimated fatal and nonfatal injuries associated with the construction of the proposed NEF.

The expected fatal and nonfatal injuries are based on a peak labor force of 800 employees and a total work force of 3,175 person-years performing construction and excavation work over the time of site preparations and construction activities for the years of 2006 to 2013 (LES, 2005a). Nonfatal workday injuries are expected to occur for an estimated 6 percent of the work force. The expected number of fatalities that could occur in a year is estimated to be less than 1 (0.3). Over the 8-year construction period, this has the potential for approximately two fatalities. Precautions would be taken to prevent industrial injuries and fatalities including adherence to policies and worker-safety procedures.

Table 4-8 Expected Occupational Impacts Associated with Construction of the Proposed NEF

Category	Injury Rate (Injuries per 100 Worker per Year)	Expected Injuries per Year for All Workers	
		Peak Year	Average[a]
Nonfatal Injuries	6.1[b]	~49	~24
Fatal Injuries	7.4×10^{-4}	0.6	0.3

[a] Construction injuries based on a total construction period from 2006 to 2013 with a total 3,175 worker-years of involvement.
[b] Incidence rate for entire construction or miscellaneous manufacturing industry activity in New Mexico for the year 2002.
Sources: DOL, 2004; LES, 2005a.

In addition, impacts from criteria pollutants have been considered. Criteria pollutants would result from the combustion engines used in heavy equipment. The impacts to human health from air pollutants would be SMALL as shown in section 4.2.4.

Radiological Impacts

Construction workers building those portions of the proposed NEF next to completed Cascade Halls would have the potential of being exposed to uranium material. Segregation of the areas to prevent construction workers from entering operational areas of the facility would minimize their exposures to those of the general office staff with annual doses of less than 0.05 millisieverts (5 millirem).

4.2.12.2 Operations

This section evaluates the potential environmental impacts to members of the public and workers from the proposed NEF. The evaluation process involved applying the methodology from Appendix C and reviewing information and site-specific data provided from LES, technical reports and safety analyses related to the potential hazards, and other independent information sources.

Nonradiological Impacts

The potential nonradiological impacts during operations of the proposed NEF are associated with the hazardous chemicals that are necessary for the operation and maintenance of the equipment as well as components of the facility's effluent releases (LES, 2005a). The hydrogen fluoride and methylene chloride are regulated under NESHAP in accordance with EPA and State of New Mexico regulations where the impacts to the public would be SMALL. Occupational exposure to the airborne release of hydrogen fluoride would be no greater than at the point of discharge with a concentration of 3.9 micrograms per cubic meter (LES, 2005a). This concentration level is significantly below the OSHA and National Institute for Occupational Safety and Health limits for an 8-hour work shift of 2.5 milligrams per cubic meter; thus the associated occupational chemical impacts would also be SMALL (DHHS, 2004).

Many of the chemicals proposed for use are common to industrial facilities and include cleaning agents (acetone, ethanol, and methylene chloride), lubricants (i.e., Fomblin® oil), maintenance fluid, and laboratory-related chemicals (i.e., anhydrous sodium carbonate). The quantity of hazardous material and resulting wastes would be low enough for the proposed NEF to be considered a small-quantity generator for solid hazardous and mixed wastes under the *Resource Conservation and Recovery Act* (RCRA).

Other nonradiological occupational impacts include potential industrial injuries and fatalities. Table 4-9 shows the occupational injury and fatality rates within the State of New Mexico based on values associated with similar manufacturing industries and, for comparison, the reported occupational injury rates for the Capenhurst facility (LES, 2005a). Based on the past operational history of the Capenhurst and Almelo facilities, the chances of a fatality during operation of the proposed NEF are considered unlikely at 4×10^{-4} fatalities per year.

Table 4-9 Expected Occupational Impacts Associated with the Operation of the Proposed NEF

Category	Injury Rate (Injuries per 100 Worker per Year)	Injuries per Year for All Workers	
		Average[b]	Reported[c]
Nonfatal Injuries	3.8[a]	~8	~5
Fatal Injuries	1.9×10^{-4}	$\sim4\times10^{-4}$	0

[a] Incidence rate for miscellaneous manufacturing industry activity in the State of New Mexico for the year 2002.
[b] Operational injuries based on a total operation period from 2008 to 2028 with a constant work force of 210 employees.
[c] Reported average injuries per year from Capenhurst facility for injuries at the A3, E22, and E23 plants (total of 2.96 million separative work units [SWU]) during the years 1999-2003.
Sources: DOL, 2004; LES, 2005a.

The overall nonradiological impacts resulting from the operation of the proposed NEF would be SMALL for members of the public and workers.

Radiological Impacts

Exposure to uranium may occur from routine operations as a result of small controlled releases to the atmosphere from the uranium enrichment process lines and decontamination and maintenance of equipment, releases of radioactive liquids to surface water as well as a result of direct radiation from the process lines, storage, and transportation of UF_6. Direct radiation and skyshine (radiation reflected from the atmosphere) in offsite areas due to operations within the Separations Building would be expected to be undetectable because most of the direct radiation associated with the uranium would be almost completely absorbed by the heavy process lines, walls, equipment, and tanks that would be employed at the proposed NEF, and would have to travel a significant distance to reach the nearest member of the public.

Under the proposed action, the major source of occupational exposure would be expected to be direct radiation from the UF_6 with the largest exposure source being the empty Type 48Y cylinders with residual material, full Type 48Y cylinders containing either the feed material or the DUF_6, Type 30B product cylinders, and various traps that help minimize UF_6 losses from the cascade.

Atmospheric releases would be expected to be a source of public exposure. Such releases would be primarily controlled through the Technical Services Building and Separations Building gaseous effluent vent systems. Table 4-10 shows the expected isotopic release mix resulting from the annual gaseous release of 10 grams (0.022 pounds) of uranium and for the bounding annual gaseous release of approximately 9×10^6 becquerels (240 microcuries) of uranium (LES, 2005a). For gaseous effluents resulting from the sublimation of UF_6, no significant amount of radioactive particulate material (uranium or its radioactive decay daughters) would be expected to be introduced into the process ventilation system and released to the environment after gaseous effluent vent system filtration.

Table 4-10 Annual Effluent Releases

	Estimated Releases[a]		Bounding Releases	
Radionuclide	**TSB GEVS kBq/year (:Ci/year)**	**SB GEVS kBq/year (:Ci/year)**	**TSB GEVS kBq/year (:Ci/year)**	**SB GEVS kBq/year (:Ci/year)**
^{234}U	77.7 (2.10)	45.5 (1.23)	2,738 (74.0)	1,591 (43.0)
^{235}U	3.59 (0.097)	2.11 (0.057)	125.8 (3.4)	74.0 (2.0)
^{236}U	0.48 (0.013)	0.30 (0.008)	17.0 (0.46)	11.1 (0.3)
^{238}U	77.7 (2.10)	45.5 (1.23)	2,738 (74.0)	1,591 (43.0)
Total	159.5 (4.31)	93.6 (2.53)	5,619 (151.9)	3,267 (88.3)

[a] Equivalent to 10 grams (0.022 pounds) of uranium.

GEVS - gaseous effluent vent system; SB - Separations Building; TSB - Technical Service Building; kBq - kilobecquerels; :Ci - microcuries.

Source: LES, 2005a.

Dose Evaluation Methods

Radioactive material released to the atmosphere, surface water, and groundwater is dispersed during transport through the environment and could be transferred to humans through inhalation, ingestion, and direct exposure pathways. Therefore, evaluation of impacts requires consideration of potential receptors, source terms, environmental transport, exposure pathways, and conversion of estimates of intake to radiation dose. The dose evaluation applies the methodology, assumptions, and data presented in Appendix C to calculate the potential impacts to members of the public. A summary of the Appendix C results for public exposure follows.

Public Exposure Impacts

Radioactive material would be released to the atmosphere from the proposed NEF site through stack releases from the Technical Service Buildings and Separations Building gaseous effluent vent systems and from the potential resuspension of contaminated soil within the Treated Effluent Evaporative Basin. While a member of the public would not be expected to spend a significant amount of time at the site boundary closest to the UBC Storage Pad, this possibility is included in this impact assessment. Thus, the analyses estimated the potential dose to a hypothetically maximally exposed individual located at the proposed NEF site boundary along with members of the public who may be present or live near the proposed NEF. The expected exposure pathways include inhalation of airborne contaminants and direct exposure from material deposited on the ground. In addition, members of the public may also consume food containing deposited radionuclides and inadvertently ingest re-suspended soil from the ground or on local food sources (e.g., leafy vegetables, carrots, potatoes, and beef from nearby grazing livestock).

Table 4-11 presents potential effective dose equivalents for the maximally exposed individuals and the general population. The general population within 80 kilometers (50 miles) of the proposed NEF would receive a collective dose of 0.00014 person-sieverts (0.014 person-rem), equivalent to 8.4×10^{-6} latent cancer fatalities from normal operations.

Table 4-11 Radiological Impacts to Members of the Public Associated with Operation of the Proposed NEF

Receptor	Location from NEF Stacks	Airborne Pathway CEDE[a]	Direct Radiation[b]	Annual Dose	LCF
Population, person-Sv (person-rem)	Within 80.5 km (50 mi) of Proposed NEF	1.4×10^{-4} (1.4×10^{-2})	N/A	1.4×10^{-4} (1.4×10^{-2})	8.4×10^{-6}
Highest Boundary (Stack Releases), mSv (mrem)	Northern Boundary 1,010 m (0.6 mi)	5.3×10^{-5} (5.3×10^{-3})	0.189 (18.9)	0.189 (18.9)	1.1×10^{-5}
Nearest Resident[c], mSv (mrem)	4,300 m (2.6 mi) West	1.3×10^{-5} (1.3×10^{-3})	N/A	1.3×10^{-5} (1.3×10^{-3})	7.9×10^{-10}
Lea County Landfill Worker, mSv (mrem)	917 m (0.57 mi) Southeast	1.9×10^{-5} (1.9×10^{-3})	N/A	1.9×10^{-5} (1.9×10^{-3})	1.1×10^{-9}
Wallach Concrete, Inc., mSv (mrem)	1,867 m (1.16 mi) North-Northwest	2.2×10^{-5} (2.2×10^{-3})	0.021 (2.1)	0.021 (2.1)	1.3×10^{-6}
Sundance Services, Inc., mSv (mrem)	1,706 m (1.06 mi) North-Northwest	2.6×10^{-5} (2.6×10^{-3})	0.026 (2.6)	0.026 (2.6)	1.6×10^{-6}
WCS, mSv (mrem)	1,513 m (0.94 mi) East-Northeast	9.3×10^{-6} (9.3×10^{-4})	0.021 (2.1)	0.017 (1.7)	1.0×10^{-6}

[a] Committed effective dose equivalent.
[b] Direct radiation from the maximum number of UBCs over the lifetime of the proposed NEF.
[c] Includes airborne contamination from the Treated Effluent Evaporative Basin.
LCF - latent cancer fatalities; m - meters; mi - miles; km - kilometers; mSv - millisieverts; Sv - sieverts; mrem - millirem.

It is possible that contaminated soil at the bottom of the Treated Effluent Evaporative Basin could be resuspended into the air. To analyze the potential for health impacts due to resuspension, the NRC staff assumed that 0.57 kilograms (1.3 pounds) per year of uranium for 30 years would settle into the Treated Effluent Evaporative Basin soil (LES, 2005a). As a result, 27.4×10^{6} becquerels (7.4 millicuries) of uranium was assumed to accumulate in the basins. The contaminated soil would have a resuspension factor of 4×10^{-6} per hour. This could result in an additional annual effective dose of 1.7×10^{-6} millisieverts (1.7×10^{-4} millirem) to the nearest resident, with the largest offsite dose at the south site boundary of 1.7×10^{-5} millisieverts (1.7×10^{-3} millirem) (LES, 2005a). The resuspension factor for soils could be as high as 9×10^{-5} per hour for areas that are fairly open to the prevailing winds (DOE, 1994). Because the Treated Effluent Evaporative Basin would be excavated below ground with a net or other suitable material covering the basin, the ability of prevailing winds to resuspend contaminated soils would be expected to be less than that assumed by LES, and the resulting impacts are considered conservative.

Normal operations at the proposed NEF would have SMALL impacts to public health. The total annual dose from all exposure pathways would be significantly less than the regulatory requirement of 1 millisieverts (100 millirem) (10 CFR § 20.1301). The most significant impact would be from direct radiation exposure to receptors close to the UBC Storage Pad (filled and empty Type 48Y cylinders). The results are based on very conservative assumptions, and it is anticipated that actual exposure levels would be less than those presented in Table 4-11. All exposures are significantly below the 10 CFR Part 20 regulatory limit of 1 millisieverts (100 millirem) and 40 CFR Part 190 regulatory limit of 0.25 millisieverts (25 millirem) for uranium fuel-cycle facilities. Members of the public who are located at least a few miles from the UBC Storage Pad would have annual direct radiation exposures combined with exposure through inhalation result in SMALL impacts significantly less than 0.01 millisieverts (1 millirem).

Occupational Exposure Impacts

Tables 4-12 and 4-13 provide the estimated occupational dose rates and annual exposures to representative workers within the proposed NEF site.

Table 4-12 Estimated Occupational Dose Rates for Various Locations or Buildings Within the Proposed NEF

Location	Dose Rate, mSv per hour (mrem per hour)
Plant General Area (excluding Separations Building Modules)	< 0.0001 (< 0.01)
Separations Building Module - Cascade Halls	0.0005 (0.05)
Separations Building Module - UF_6 Handling Area and Process Services Area	0.001 (0.1)
Empty Used UF_6 Shipping Cylinder[a]	0.1 on Contact (10.0) 0.010 at 1 m (3.3 ft) (1.0)
Full UF_6 Shipping Cylinder	0.05 on Contact (5.0) 0.002 at 1 m (3.3 ft) (0.2)

[a] Refer to section C.3.2 for an explanation regarding why the dose rate for an empty used UF_6 cylinder is higher than a full UF_6 cylinder.
ft - feet; m - meters; mSv - millisieverts; mrem - millirem.
Source: LES, 2005a.

Table 4-13 Estimated Occupational Annual Exposures for Various Occupations for the Proposed NEF

Position	Annual Dose Equivalent[a] mSv (mrem)
General Office Staff	< 0.05 (< 5.0)
Typical Operations and Maintenance Technician	1 (100)
Typical Cylinder Handler	3 (300)

[a] The average worker exposure at the Urenco Capenhurst facility during the years 1998 through 2002 was approximately 0.2 millisieverts (20 mrem).
mSv - millisieverts; mrem - millirem.
Source: LES, 2005a.

The proposed NEF personnel-monitoring program would monitor for internal exposure from intake of soluble uranium (LES, 2005d). LES would also apply an annual administrative limit of 10 millisieverts (1,000 millirem) that includes external radiation sources and internal exposure from no more than 10 mg of soluble uranium in a week. Appendix C also provides historical data for past occupational exposures at U.S. and European enrichment facilities. Tables C-10, C-11, and C-12 of Appendix C demonstrate that LES estimated occupational exposures are consistent with the historical data.

The occupational exposure analysis and the historical exposure data from Capenhurst, Almelo, and U.S. enrichment facilities, demonstrate that a properly administered radiation protection program at the proposed NEF would maintain the radiological occupational impacts below the regulatory limits of 10

CFR § 20.1201. Therefore, the impacts from occupational exposure at the proposed NEF would be SMALL.

4.2.12.3 Mitigation Measures

Plant design features such as controls and processes would be incorporated into the proposed NEF to minimize the gaseous and liquid effluent releases, and to maintain the impacts to workers and the surrounding population below regulatory limits. This would include maintaining system process pressures that are sub-atmospheric, reclaiming any off-gasses to recover as much UF_6 as possible, and subsequently passing effluents through prefilters, high-efficiency particulate air filters, and activated carbon filters. All emissions would be monitored, and alarm systems would activate and shutdown facility systems/processes if contaminants exceed prescribed limits. Procedures would ensure that a UF_6 cylinder is handled only when the material is in the solid state; liquid wastes are processed through precipitation, ion exchange, and evaporation; all onsite stormwater is directed to basins within the proposed NEF boundaries; and environmental monitoring and sampling is performed to ensure compliance with regulatory discharge limits. An as-low-as-reasonably-achievable (ALARA) program would be implemented in addition to routine radiological surveys and personnel monitoring. BMPs associated with compliance with 20 CFR Part 1910 regarding OSHA standards would be implemented.

4.2.13 Public and Occupational Health Impacts from Accidents During Operations

The operation of the proposed NEF would involve risks to workers, the public, and the environment from potential accidents. The regulations in 10 CFR Part 70, Subpart H, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material," require that each applicant or licensee evaluate, in an Integrated Safety Analysis, its compliance with certain performance requirements. Appendix C of this EIS summarizes the methods and results used by the NRC to independently evaluate the consequences of potential accidents identified in LES's Integrated Safety Analysis. The accidents evaluated are a representative selection of the types of accidents that are possible at the proposed NEF.

The analytical methods used in this consequence assessment are based on NRC guidance for analysis of nuclear fuel-cycle facility accidents (NRC, 1990; NRC, 1991; NRC, 1998; NRC, 2001). With the exception of the criticality accident, the hazards evaluated involve the release of UF_6 vapor from process systems that are designed to confine UF_6 during normal operations. As described below, UF_6 vapor poses a chemical and radiological risk to workers, the public, and the environment. LES has committed to various preventive and mitigative measures to significantly reduce these risks.

4.2.13.1 Selection of Representative Accident Scenarios

The Safety Analysis Report and Emergency Plan (LES, 2005d; LES, 2004c) describe potential accidents that could occur at the proposed NEF. Potential transportation accidents and consequences are discussed in section 4.2.11. Accident descriptions are provided for two groups according to the severity of the accident consequences: high consequence events and intermediate consequence events (as presented in Table C-13 of Appendix C). The accident types are summarized in the Emergency Plan as follows:

<u>High Consequence Events</u>

- Natural Phenomena.
  - Earthquake.
  - Tornado.
- Open sample manifold purge valve and blind flange.
- Pump exhaust plugged (worker).

- Flood.
- Inadvertent nuclear criticality.
- Fires propagating between areas.
- Fires involving excessive transient combustibles.
- Heater controller failure.
- Over-filled cylinder heated to ambient conditions.
- Product liquid sampling autoclave heater failure followed by reheat.
- UF_6 sub-sampling unit hot box heater controller failure.
- Empty UF_6 cold trap (UF_6) release.
- Cylinder valve/connection failure during pressure test.
- Chemical dump trap failure.
- Worker evacuation.

Intermediate Consequence Events

- Carbon trap failure.
- Pump exhaust plugged (public).
- Spill of failed centrifuge parts.
- Dropped contaminated centrifuge.
- Fire in ventilated room.

In this EIS, a range of possible accidents was selected for detailed evaluation to bound the potential human health accidents. The representative accident scenarios selected vary in severity from high- to intermediate-consequence events and include accidents initiated by natural phenomena, operator error, and equipment failure. The accident scenarios evaluated are as follows:

- Generic inadvertent nuclear criticality.
- Hydraulic rupture of a UF_6 cylinder in the blending and liquid sampling area.
- Natural phenomena hazard—earthquake.
- Fire in a UF_6 handling area.
- Process line rupture in a product low-temperature takeoff station.

The accident analyses described in this section assume that the probability of an accident is 100 percent to maximize the environmental consequences, as shown in Table 4-14.

4.2.13.2 Accident Consequences

The five accident scenarios were analyzed using the methodology presented in Appendix C.

Table 4-14 presents the consequences from the accidents, assuming such accidents would, in fact, occur. The accident consequences vary in magnitude and include accidents initiated by natural phenomena,

Table 4-14 Summary of Health Effects Resulting from Accidents at the Proposed NEF

Accident	Worker [a]		Environment at Restricted Area Boundary	Individual at Controlled Area Boundary, SW direction		Collective Dose		
	[U] mg/m^3 (rem)	[HF], mg/m^3	[U] mg/m^3	[U] mg/m^3 (rem)	[HF], mg/m^3	Direction	person-rem	LCFs
Inadvertent Nuclear Criticality	High[b]		0.66[c]	(0.14[d])	---	West	44	0.03
Hydraulic Rupture of a UF_6 Cylinder	Low		44	250 (0.97)	86	North	12,000	7[e]
Earthquake	High[b]		0.11	0.64 (0.0017)	0.13	North	19	0.008
Fire in a UF_6 Handling Area	59 (0.020)	20	0.012	0.070 (0.000072)	0.024	North	0.92	0.0006
Process Line Rupture	17 (0.022)	5.8	0.0035	0.020 (0.000078)	0.0069	North	0.97	0.0006

[a] Worker exits after 10 minutes.
[b] High consequence could lead to a fatality.
[c] Pursuant to 10 CFR § 70.61(c)(3), this value is the sum of the fractions of individual fission product radionuclide concentrations over 5,000 times the concentration limits that appear in 10 CFR Part 20, Appendix B, Table 2.
[d] The dose to the individual at the Controlled Area Boundary is the sum of internal and external doses from fission products released from the Technical Services Building gaseous effluent vent systems stack.
[e] Though the consequences of the rupture of a liquid-filled UF_6 cylinder would be HIGH, redundant heater controller trips would make this event highly unlikely to occur.
U - uranium.
HF - hydrogen fluoride.
LCF - latent cancer fatalities.
mg - milligram.
mg/m^3 - milligrams per cubic meter.
To convert rem to sievert, multiply by 0.01.

operator error, and equipment failure. Analytical results indicate that accidents at the proposed NEF pose acceptably low risks after incorporation of Items Relied on for Safety. Items Relied on for Safety would include such things as passive engineered controls, active controls, and administrative controls. Items Relied on for Safety are required to meet the performance requirements of 10 CFR Part 70, Subpart H. To reduce the consequence and likelihood of accidents, LES has proposed a number of mitigative and preventive measures. The most significant accident consequences are those associated with the release of UF_6 caused by rupturing an over-filled and/or over-heated cylinder. The proposed NEF design reduces the likelihood of this event by using redundant heater controller trips. Accidents at the proposed NEF would pose SMALL to MODERATE impacts to workers, the environment, and the public.

4.2.13.3 Mitigation Measures

NRC regulations and LES's operating procedures for the proposed NEF are designed to ensure that the high and intermediate accident scenarios would be highly unlikely. The NRC staff's Safety Evaluation Report assesses the safety features and operating procedures required to reduce the risks from accidents. The combination of responses by Items Relied on for Safety that mitigate or prevent emergency conditions, and the implementation of emergency procedures and protective actions in accordance with the proposed NEF Emergency Plan, would limit the consequences and reduce the likelihood of accidents that could otherwise extend beyond the proposed NEF boundaries.

DOE Role in Accepting DUF_6

"A future decision to extend operations or expand throughput [of the proposed DOE conversion facilities] might also result from the fact that DOE could assume management responsibility for DUF_6 in addition to the current [DOE] inventory. Two statutory provisions make this possible. First, Sections 161v. [42 USC 2201(v)] and 1311 [42 USC 2297b-10] of the Atomic Energy Act of 1954 [P.L. 83-703], as amended, provide that DOE may supply services in support of U.S. Enrichment Corporation (USEC). In the past, these provisions were used once to transfer DUF_6 cylinders from USEC to DOE for disposition in accordance with DOE orders, regulations, and policies. Second, Section 3113 (a) of the USEC Privatization Act [42 USC 2297h-11(a)] requires DOE to accept low-level radioactive wastes, including depleted uranium that has been determined to be low-level radioactive wastes, for disposal upon request and reimbursement of costs by USEC or any other person licensed by the NRC to operate a uranium enrichment facility. This provision has not been invoked, and the form in which depleted uranium would be transferred to DOE...is not specified. However, DOE believes depleted uranium transferred under this order...would most likely be in the form of DUF_6."

Additionally, Section 311 of Public Law 108-447 amended Section 3113 of Public Law 102–486 (42 U.S.C. 2297h–11) by adding a new paragraph (4) to subsection (a). The new paragraph establishes in the event that a licensee requests DOE to accept for disposal depleted uranium pursuant to this subsection, DOE shall be required to take title to and possession of such depleted uranium at an existing DOE DUF_6 storage facility.

Sources: DOE, 2004a; DOE, 2004b; Congress, 2004.

4.2.14 Waste Management Impacts

This section describes the analysis and evaluation of the solid, hazardous, and radioactive waste management program at the proposed NEF including impacts resulting from temporary storage, conversion, and disposal of the DUF_6. An evaluation of mixed waste is also addressed in this section because LES is required by RCRA regulations to manage mixed wastes at the proposed NEF.

Due to the nature, design, and operation of a gas centrifuge enrichment facility, the generation of waste materials can be categorized by three distinct facility operations: (1) construction, which generates typical construction wastes associated with an industrial facility; (2) enrichment process operations, which generate gaseous, liquid, and solid waste streams; and (3) generation and temporary storage of DUF_6 (section 4.3 of this chapter discusses decommissioning wastes). Waste materials include radioactive waste (i.e., DUF_6 and material contaminated with UF_6), designated hazardous materials (as defined in 40 CFR Part 261), and nonhazardous materials (any other wastes not identified as radioactive or hazardous). Hazardous materials include any fluids, equipment, and piping contaminated as defined in 40 CFR Part 261 that would be generated due to the construction, operation, and maintenance programs.

The handling and disposing of waste materials is governed by various Federal and State regulations. To satisfy the Federal and State regulations, LES must have waste management programs for the collection, removal, and proper disposal of waste materials. The LES waste management program is intended to minimize the generation of waste through reduction, reuse, or recycling (LES, 2005a). This program would assist in identifying process changes that can be made to reduce or eliminate mixed wastes, methods to minimize the volume of regulated wastes through better segregation of materials, and the substitution of nonhazardous materials as required under RCRA regulations. Based on the available information and waste data from similar facilities, the waste-management impacts are assessed for site preparation and construction, operations, and DUF_6 disposition.

4.2.14.1 Solid Waste Management During Site Preparation and Construction

Solid nonhazardous wastes generated during site preparation and construction would be very similar to wastes from other construction sites of industrial facilities. These wastes would be transported offsite to an approved local landfill. Approximately 3,058 cubic meters (4,000 cubic yards) per year of packing material, paper, and scrap lumber would be generated (LES, 2005a). In addition, there would also be scrap structural steel, piping, sheet metal, etc., that would not be expected to pose any significant impacts to the surrounding environment because most could be recycled or directly placed in an offsite landfill.

Nonhazardous wastes would be transported to the Lea County Landfill for disposal. This landfill is expected to receive approximately 8,000 cubic meters (10,464 cubic yards) of uncompacted waste daily, or 2,288,000 cubic meters (2,992,591 cubic yards) annually by year 9 (2006) of its operation according to its permit application (LCSWA, 1996). The proposed NEF construction activities would begin in 2006. Therefore, the total volume of construction wastes from the proposed NEF over 8 years would be less than solid waste landfill receipts in three days of operation from all other sources.

The generation of hazardous wastes (i.e., waste oil, greases, excess paints, and other chemicals) associated with the construction of the facility due to the maintenance of construction equipment and vehicles, painting, and cleaning would be packaged and shipped offsite to licensed facilities in accordance with Federal and State environmental and occupational regulations. Table 4-15 shows the hazardous wastes that would be expected from construction of the proposed NEF. The quantity of all construction-generated hazardous and nonhazardous waste material would result in SMALL impacts that can be effectively managed.

Table 4-15 Hazardous Waste Quantities Expected During Construction

Waste Type	Annual Quantity
Paint, Solvents, Thinners, Organics	11,360 liters (3,000 gallons)
Petroleum Products – Oils, Lubricants	11,360 liters (3,000 gallons)
Sulfuric Acid (Batteries)	380 liters (100 gallons)
Adhesives, Resins, Sealers, Caulking	910 kilograms (2,000 pounds)
Lead (Batteries)	91 kilograms (200 pounds)
Pesticide	380 liters (100 gallons)

Source: LES, 2005d.

4.2.14.2 Solid Waste Management During Operations

Gaseous effluents, liquid effluents, and solid wastes would be generated during normal operations. Appropriate treatment systems would be established to control releases or collect the hazardous material for onsite treatment or shipment offsite. Gaseous releases would be minimized, liquid wastes would be kept onsite, and solid wastes would be appropriately packaged and shipped offsite for further processing or final disposition. The impacts from gaseous and liquid effluents are described in sections 4.2.4, 4.2.6, and 4.2.12. This section presents the onsite and offsite impacts from the management of solid wastes and cites impacts from other *National Environmental Policy Act* (NEPA) assessments when appropriate.

The operation of the proposed NEF would generate approximately 172,500 kilograms (380,400 pounds) of solid nonradioactive waste annually, including approximately 1,900 liters (500 gallons) of hazardous liquid wastes (LES, 2005a). Approximately 87,000 kilograms (191,800 pounds) of radiological and mixed waste would be generated annually, of which approximately 50 kilograms (110 pounds) would be mixed waste.

Solid wastes during operations would be segregated and processed based on whether the material can be classified as wet solid or dry solid wastes and segregated into radioactive, hazardous, or mixed-waste categories. The radioactive solid wastes would be Class A low-level radioactive wastes as defined in 10 CFR Part 61, appropriately packaged, and shipped to a commercial licensed low-level radioactive wastes disposal facility or shipped for further processing for volume reduction. The annual volume of nonradioactive solid wastes generated at the proposed NEF would be 1,184 cubic meters (1,549 cubic yards) assuming a standard container with a volume of 7.65 cubic meters (10 cubic yards) holds 553 kilograms (0.61 tons) of nonhazardous wastes (NJ, 2004). Nonhazardous wastes would be transported to the Lea County Landfill for disposal. This landfill is expected to have received uncompacted gate receipts of approximately 16,000 cubic meters (20,927 cubic yards) per day, or 4,576,000 cubic meters (5,985,182 cubic yards) per year in 2013, according to its permit application that assumes a 10-percent increase in gate receipts per year (LCSWA, 1996). The nonradioactive solid waste generation from the proposed NEF would potentially increase the volume of wastes impounded at the landfill by less than 0.03 percent. Therefore, impacts to the Lea County Landfill could be considered accounted for in the assumed 10-percent annual increase in gate receipts previously documented in the landfill's permit application. Based on the quantities of solid wastes and the application of industry-accepted procedures, the impacts from solid wastes would be SMALL.

Because over 20 years' worth of disposal space is currently available in the United States for Class A low-level radioactive wastes (GAO, 2004), the impact of low-level radioactive wastes generation would be SMALL on disposal facilities. EPA and New Mexico regulations, including 20.4.1 *New Mexico Administrative Code* 20.4.1, "Hazardous Waste Management," would be the guiding laws to manage hazardous wastes (LES, 2005a).

4.2.14.3 DUF_6 Waste-Management Options

As discussed in Chapter 2 of this EIS, until a conversion facility is available, UBCs (i.e., DUF_6-filled Type 48Y cylinders) would be temporarily stored on the UBC Storage Pad. Storage of UBCs at the proposed NEF could occur for up to 30 years during operations and before removal of DUF_6 from the site through one of the disposition options (see text box *DUF_6 Disposition Options Considered*). However, LES has committed to a disposal path outside of the State of New Mexico which would be utilized as soon as possible and would aggressively pursue economically viable paths for UBCs as soon as they become available (LES, 2005a).

> ***DUF_6 Disposition Options Considered***
>
> *Option 1a: Private Conversion Facility (LES Preferred Option). Transporting the UBCs from the proposed NEF to an unidentified private conversion facility outside the region of influence. After conversion to U_3O_8, the wastes would then be transported to a licensed disposal facility for final disposition.*
>
> *Option 1b: Adjacent Private Conversion Facility. Transporting the UBCs from the proposed NEF to an adjacent private conversion facility. This facility is assumed to be adjacent to the site and would minimize the amount of DUF_6 onsite by allowing for ship-as-you-generate waste management of the converted U_3O_8 and associated conversion byproducts (i.e., CaF_2). The wastes would then be transported to a licensed disposal facility for final disposition.*
>
> *Option 2: DOE Conversion Facility. Transporting UBCs from the proposed NEF to a DOE conversion facility. For example, the UBCs could be transported to one of the DOE conversion facilities either at Paducah, Kentucky, or Portsmouth, Ohio (DOE, 2004a; DOE, 2004b). The wastes would then be transported to a licensed disposal facility for final disposition.*

Temporary Onsite Storage Impacts

Proper and active cylinder management, which includes routine inspections and maintaining the anti-corrosion layer on the cylinder surface, has been shown to limit exterior corrosion or mechanical damage necessary for the safe storage of DUF_6 (DNFSB, 1995a; DNFSB, 1995b; DNFSB, 1999). DOE has stored DUF_6 in Type 48Y or similar cylinders at the Paducah and Portsmouth Gaseous Diffusion Plants and the East Tennessee Technical Park in Oak Ridge, Tennessee, since approximately 1956. Cylinder leaks due to corrosion led DOE to implement a cylinder management program (ANL, 2004). Past evaluations and monitoring by the Defense Nuclear Facility Safety Board of DOE's cylinder maintenance program confirmed that DOE met all of the commitments in its cylinder maintenance implementation plan, particularly through the use of a systems engineering process to develop a workable and technically justifiable cylinder management program (DNFSB, 1999). Thus, an active cylinder maintenance program by LES would assure the integrity of the UBCs for the period of time of temporary onsite storage of DUF_6 on the UBC Storage Pad.

The principal impacts would be the radiological exposure resulting from the radioactive material temporarily stored in 15,727 UBCs under normal conditions and the potential release (slow or rapid) of

DUF_6 from the UBCs due to an off-normal event or accidents (operational, external, or natural hazard phenomena events). These radiation exposure pathways are analyzed in sections 4.2.12 and 4.2.13, and based on these results, the impacts from temporary storage would be SMALL to MODERATE. The annual impacts from temporary storage would continue until the UBCs are removed from the proposed NEF site.

Option 1a: Private Conversion Facility Impacts

Under Option 1a, the Type 48Y cylinders, or UBCs, would be transported from the proposed NEF to an unidentified private facility (potentially ConverDyn facility in Metropolis, Illinois). After being converted to U_3O_8, the waste would be further transported to a licensed disposal facility. The impacts of conversion at a private conversion facility or at DOE conversion facilities are similar because it is assumed that the facility design of a private conversion facility would be similar to the DOE conversion facilities.

The transportation of the Type 48Y cylinders from the proposed NEF to the conversion facility would have environmental impacts. Appendix D provides the transportation impact analysis of shipping the Type 48Y cylinders, and section 4.2.11 summarizes the impacts. The selected routes would be from Eunice, New Mexico, to Metropolis, Illinois.

If the private conversion facility cannot immediately process the Type 48Y cylinders upon arrival, potential impacts would include radiological impacts proportional to the time of temporary storage at the conversion facility. The DOE has previously assessed the impacts of temporary storage during the operation of a DUF_6 conversion facility (DOE, 2004a; DOE, 2004b). The proposed action is not expected to change the impacts of temporary storage of Type 48Y cylinders at the conversion facility site from that previously considered in these DOE conversion facility Final EISs. Therefore, the NRC staff has concluded that the environmental impacts of temporary storage at the private conversion facility are bounded by the environmental impacts previously evaluated in the DOE conversion facility Final EISs. At the Paducah and Portsmouth conversion facilities, the maximum collective dose to a worker would be 0.055 person-sieverts (5.5 person-rem) per year and 0.03 person-sieverts (3 person-rem) per year, respectively. There would be no exposure to noninvolved workers or the public because air emissions from the cylinder preparation and maintenance activities would be negligible (DOE, 2004a; DOE, 2004b).

Because Metropolis, Illinois, lies just across the Ohio River from the Paducah conversion facility site (within 6.4 kilometer [4 miles]), if a private conversion facility is built at Metropolis, Illinois, then the public and occupational health impacts from this conversion facility would be bounded by the impacts from the Paducah conversion facility because both conversion facilities would be located in the same area and would be approximately the same size. In addition, other impacts to resources such as land use, historic and cultural, visual, air quality, geology, water quality, ecology, noise, and waste management, would be similar to the Paducah conversion facility. Therefore, the NRC staff considers the impacts for these resources from the construction and operation of a conversion facility at Metropolis, Illinois, to be bounded by the impacts previously considered in the Paducah conversion facility Final EIS (DOE, 2004a). Because the impacts to resources discussed above and the health impacts are within regulatory requirements, the impacts from the private conversion facility would be SMALL.

Option 1b: Adjacent Private Conversion Facility Impacts

The conversion facility could be constructed adjacent to the proposed NEF. For the purposes of analyzing impacts, “adjacent” is defined as being within at least 6.4 kilometers (4 miles) of the proposed

NEF. Although no adjacent conversion facility site has been identified, there would be advantages (i.e., transportation and speed of processing) to having a conversion facility adjacent to the proposed NEF. With an adjacent conversion facility, transfer and conversion could be completed within days of the filling of the Type 48Y cylinder, thus minimizing the amount of DUF_6 onsite. Once the waste was converted to U_3O_8, depleted uranium and the associated waste streams would subsequently be transported to a licensed disposal facility for final disposition. Such immediate waste-management action would allow for no buildup of DUF_6 wastes at the proposed NEF and would removes the impacts and risks associated with the temporary storage of UBCs at the proposed NEF and the potential conversion facility.

Because the operations would be the same as for the DOE conversion facilities, the environmental impacts from normal operations of an adjacent conversion facility would be representative of the impacts of the DOE facilities (occupational) and the proposed NEF (members of the public). Therefore, the maximum occupational and member of the public annual exposures would be approximately 6.9 millisieverts (690 millirem) and 5.3×10^{-5} millisieverts (5.3×10^{-3} millirem), respectively. The impacts due to accidents would be bounded by the proposed NEF's highest accident consequence—the hydraulic rupture of a UF_6 cylinder. This maximum accident impact could be a collective dose of 120 person-sieverts (12,000 person-rem) or equivalent to 7 latent cancer fatalities. Similarly as presented in section 4.2.13.3 for the proposed NEF, the combination of responses by Items Relied on for Safety that mitigate or prevent emergency conditions, and the implementation of emergency procedures and protective actions in accordance with an Emergency Plan, would limit the consequences and reduce the likelihood of accidents that could otherwise extend beyond an adjacent private conversion facility boundaries.

Based on water use at the existing conversion facility at Portsmouth, Ohio (DOE, 2004b), and allowing for the decreased throughput of a facility built to handle only the proposed NEF's output, such a facility's operational water needs could be approximately 200 cubic meters per day (19 million gallons per year), approximately 82 percent of the water use of the proposed NEF. If such a facility were built in nearby Andrews County, Texas, the water would be withdrawn from the Ogallala Aquifer. Therefore, the water resource impacts would be SMALL.

Other impacts to resources such as land use, historic and cultural, visual and scenic, geology, ecology, socioeconomics, and environmental justice would be similar to the proposed NEF because they would be located in the same area and would be approximately the same size. Therefore, the NRC staff considers the impacts for these resources from the construction and operation of an adjacent conversion facility to be bounded by the impacts considered in this EIS for the proposed NEF. Based on the description and design parameters of the Portsmouth DOE conversion facility, the adjacent conversion facility would likely affect a similar area of land, employ a similar number of workers, and involve a building of a similar size. Due to similar construction methods and design, impacts to resources at the adjacent conversion facility, such as air quality, water quality, noise, and waste management, would be similar to the Portsmouth conversion facility (DOE, 2004b). Because the radiological impacts are within regulatory requirements, the impacts from an adjacent conversion facility would be SMALL.

Option 2: DOE Conversion Facilities Impacts

Under option 2, the Type 48Y cylinders would be transported from the proposed NEF to either of the DOE's conversion facilities (Paducah, Kentucky, or Portsmouth, Ohio). After being converted to U_3O_8, the waste would be further transported to a licensed disposal facility. The transportation of the Type 48Y cylinders from the proposed NEF to the conversion facility would have environmental impacts. Appendix D provides the transportation impact analysis of shipping the Type 48Y cylinders, and section 4.2.11 summarizes the impacts. The selected routes are from Eunice, New Mexico, to Paducah, Kentucky, and Portsmouth, Ohio.

If the DOE conversion facility could not immediately process the UBCs upon arrival, potential impacts would include radiological impacts proportional to the time of temporary storage at the conversion facility. The DOE has previously assessed the impacts of UBC storage during the operation of a DUF_6 conversion facility (DOE, 2004a; DOE, 2004b) and bound the impacts of temporary storage of LES's UBCs at the conversion facility site. At the Paducah and Portsmouth conversion facilities, the maximum collective dose to a worker (i.e., a worker at the cylinder yard) would be 0.055 person-sieverts (5.5 person-rem) per year and 0.03 person-sieverts (3 person-rem) per year, respectively. There would be no exposure to noninvolved workers or the public because air emissions from the cylinder preparation and maintenance activities would be negligible (DOE, 2004a; DOE, 2004b).

To assess the impacts of the proposed NEF generated DUF_6 on the DOE's conversion facilities, one must understand the relative amount of additional material as compared to the DOE's existing DUF_6 inventory. The Paducah conversion facility would operate for approximately 25 years beginning in 2006 to process 436,400 metric tons (481,000 tons) (DOE, 2004a). The Portsmouth conversion facility would operate for 18 years also beginning in 2006 to process 243,000 metric tons (268,000 tons) (DOE, 2004b). Based on the projected maximum amount of DUF_6 generated by the proposed NEF (197,000 metric tons [217,000 tons]), this would represent 81 percent of the Portsmouth (243,000 metric tons [268,000 tons]) and 45 percent of the Paducah (436,400 metric tons [481,000 tons]) existing inventories. The proposed NEF would produce approximately 7,800 metric tons (8,600 tons) of DUF_6 per year at full production capacity (LES 2005a). This value represents 43 percent of the annual conversion capacity of the Paducah facility (18,000 metric tons [20,000 tons] per year) and 58 percent of the Portsmouth facility (13,500 metric tons [15,000 tons] per year). The proposed NEF maximum DUF_6 inventory could extend the time of operation by approximately 11 years for the Paducah conversion facility or 15 years for the Portsmouth conversion facility.

With routine facility and equipment maintenance, and periodic equipment replacements or upgrades, DOE indicates that the conversion facilities could be operated safely beyond this time period to process the DUF_6 such as that originating at the proposed NEF. In addition, DOE indicates the estimated impacts that would occur from prior conversion facility operations would remain the same when processing DUF_6 such as the proposed NEF wastes. The overall cumulative impacts from the operation of the conversion facility would increase proportionately with the increased life of the facility (DOE, 2004a; DOE, 2004b).

Table 4-16 presents a summary of the potential treatment and disposition pathways for the Paducah and Portsmouth conversion facilities that could also be appropriate for conversion of the DUF_6 originating at the proposed NEF. Based on the above assumptions and data, Tables 4-17 and 4-18 show the environmental impacts from the conversion of the DUF_6 from the proposed NEF at an offsite location such as Portsmouth or Paducah. The additional impacts for converting the proposed NEF DUF_6 at these conversion facilities would be SMALL.

Table 4-16 Conversion Waste Streams, Potential Treatments, and Disposition Paths

Conversion Product	Annual Waste Stream Portsmouth	Annual Waste Stream Paducah	Treatment	Proposed Disposition	Optional Disposition
Depleted U_3O_8	10,800 MT (11,800 tons)	14,300 MT (15,800 tons)	Loaded into bulk bags and loaded into rail or truck[a].	Envirocare.	Nevada Test Site[a].
CaF_2	18 MT (20 tons)	24 MT (26 tons)	Similar to depleted U_3O_8.	Sale to commercial CaF_2 supplier.	Envirocare[a].

Conversion Product	Annual Waste Stream Portsmouth	Paducah	Treatment	Proposed Disposition	Optional Disposition
70% HF Acid	2,500 MT (2,800 tons)	3,300 MT (3,600 tons)	HF acid should be commercial grade.	Sale to commercial HF acid supplier.	Neutralization by CaF_2.
49% HF Acid	5,800 MT (6,300 tons)	7,700 MT (8,500 tons)	HF acid should be commercial grade.	Sale to commercial HF acid supplier.	Neutralization by CaF_2.
Type 48Y Cylinders[b]	~1,000 cylinders 1,777 MT (1,300 tons)	~1,100 cylinders 1,980 MT (2,200 tons)	Emptied cylinders would have a stabilizing agent added to neutralize residual fluorine, be stored for 4 months, crushed to reduce size, sectioned, and packaged in intermodal containers.	Envirocare.	Nevada Test Site[c].

[a] U_3O_8 would be loaded into bulk bags (lift liners, 25,000-pound [11,340-kilogram] capacity) and loaded into gondola railcars (8 to 9 bags per car, depending on the car selected) or on a commercial truck (one bag per truck).
[b] Empty cylinders to be disposed if not used as U_3O_8 disposal containers.
[c] For DUF_6 converted at DOE facilities, final disposition at the Nevada Test Site is an option.
HF - hydrogen fluoride; MT - metric ton.
Sources: DOE, 2004a; DOE, 2004b.

Table 4-17 Radiological Impacts from an Offsite DUF_6 Conversion Facility During Normal Operations

	Occupational		Members of the Public	
Radiation Doses	**Dose, mSv per year (mrem per year)**	**Collective Dose, person-Sv per year (person-rem per year)**	**MEI Dose, mSv per year (mrem per year)**	**Collective Dose, person-Sv per year (person-rem per year)**
Portsmouth Conversion Facility	0.75 (75)	0.101 (10.1)	$<2.1\times10^{-7}$ ($<2.1\times10^{-5}$)	6.2×10^{-7} (6.2×10^{-5})
Portsmouth Cylinder Yard	5.10-6.00 (510-600)	0.026-0.030 (2.6-3.0)	N/A	N/A
Paducah Conversion Facility	0.75 (75)	0.107 (10.7)	$<3.9\times10^{-7}$ ($<3.9\times10^{-5}$)	4.7×10^{-7} (4.7×10^{-5})
Paducah Cylinder Yard	4.30-6.90 (430-690)	0.034-0.055 (3.4-5.5)	N/A	N/A
Cancer Risks	**Average Risk[a] (LCF per year)**	**Collective Risk[a] (LCF per year)**	**MEI Risk[a] (LCF per year)**	**Collective Risk[a] (LCF per year)**
Portsmouth Conversion Facility	5×10^{-5}	6×10^{-3}	1×10^{-11}	4×10^{-8}

Portsmouth Cylinder Yard	3×10^{-4} – 4×10^{-4}	2×10^{-3}	N/A	N/A
Paducah Conversion Facility	5×10^{-5}	6×10^{-3}	2×10^{-11}	3×10^{-8}
Paducah Cylinder Yard	3×10^{-4} – 4×10^{-4}	2×10^{-3} – 3×10^{-3}	N/A	N/A

[a] DOE risk values adjusted for a conversion factor of 6×10^{-4} LCF per person-rem.
LCF - latent cancer fatalities; Sv - sieverts; mSv - millisieverts; mrem - millirem; MEI - maximally exposed individual.
Sources: DOE, 2004a; DOE, 2004b.

Table 4-18 Radiological Impacts from an Offsite DUF_6 Conversion Facility Under Accident Conditions

		Onsite Worker		Members of the Public	
Accident	**Frequency (per year)**	**MEI Dose, Sv (rem) PORTS/PGDP**	**Population, person-Sv (person-rem) PORTS/PGDP**	**MEI Dose, Sv (rem) PORTS/PGDP**	**Population, person-Sv (person-rem) PORTS/PGDP**
Corroded Cylinder	$>1.0\times10^{-2}$	0.00078 / 0.00078 (0.078/0.078)	0.014 / 0.024 (1.4 / 2.4)	0.00078 / 0.00078 (0.078/0.078)	0.0012 / 0.0024 (0.12 / 0.24)
Failure of U_3O_8 Container While in Transit	$>1.0\times10^{-2}$	0.0053 / 0.0053 (0.53 / 0.53)	0.096 / 0.17 (9.6 / 17)	0.0053 / 0.0053 (0.53 / 0.53)	0.0051 / 0.01 (0.51 / 1.0)
Earthquake	1.0×10^{-4} to 1.0×10^{-6}	0.30 / 0.40 (30 / 40)	5.3 / 12.7 (530 / 1,270)	0.30 / 0.40 (30 / 40)	0.30 / 0.73 (30 / 73)
Rupture of UBC – Fire	1.0×10^{-4} to 1.0×10^{-6}	0.0002 / 0.0002 (0.02 / 0.02)	0.051 / 0.080 (5.1 / 8.0)	0.0002 / 0.0002 (0.02 / 0.02)	0.23 / 0.21 (23 / 21)
Tornado	1.0×10^{-4} to 1.0×10^{-6}	0.075 / 0.075 (7.5 / 7.5)	1.3 / 2.3 (130 / 230)	0.075 / 0.075 (7.5 / 7.5)	0.17 / 0.34 (17 / 34)

Sv - sieverts; MEI - maximally exposed individual; PORTS - Portsmouth Gaseous Diffusion Plant; PGDP - Paducah Gaseous Diffusion Plant.
Sources: DOE, 2004a; DOE, 2004b.

4.2.14.4 Impacts from Disposal of the Converted Waste

Under option 1a or 1b, once converted to U_3O_8, the waste would subsequently be transported to a licensed commercial disposal facility for final disposition, as discussed in section 2.1.9 of this EIS. Section 4.2.11 of this chapter discusses the impacts of transporting the waste to a licensed disposal facility for final disposition. The impacts due to transportation would be SMALL.

The environmental impacts at the shallow disposal sites considered for disposition of low-level radioactive wastes would have been assessed at the time of the initial license approvals of these disposal facilities or as a part of any subsequent amendments to the license. For example, under its Radioactive Materials License issued by the State of Utah, the Envirocare disposal facility is authorized to accept depleted uranium for disposal with no volume restrictions (Envirocare, 2004). Several site-specific factors contribute to the acceptability of depleted uranium disposal at the Envirocare site, including highly saline groundwater that makes it unsuitable for use in irrigation and for human or animal consumption, saline soils unsuitable for agriculture, and low annual precipitation (NRC, 2005c). As Utah is an NRC Agreement State and Envirocare has met Utah's low-level radioactive waste licensing requirements, which are compatible with 10 CFR Part 61, the impacts from the disposal of depleted uranium generated by the proposed NEF at the Envirocare facility would be SMALL.

The quantity of depleted uranium generated as a result of the proposed NEF's operations would also affect the available disposal capacity for such material. Since the depleted U_3O_8 to be generated by the conversion of the proposed NEF's depleted tails would be a Class A low-level radioactive waste, it would need to be disposed of in a facility licensed to accept Class A waste. In a June 2004 report, the Government Accountability Office reported that sufficient disposal capacity exists at currently licensed low-level radioactive waste disposal facilities for Class A low-level radioactive wastes generated for more than the next 20 years (GAO, 2004). Therefore, the potential impact on national disposal space that would be incurred due to the proposed NEF's operations would be considered SMALL.

In addition to shallow disposal, LES also presented the potential for disposition in an abandoned mine as a geologic disposal site. Although no existing mine is currently licensed to receive or dispose of low-level radioactive waste nor has any application been made to license such a facility, the postulated radiological impacts from such a disposal site are also presented in this section. The analysis of the radiological impacts from the disposal of the converted wastes as U_3O_8 in a geologic disposal site was previously presented in the EIS for the Claiborne Enrichment Center (NRC, 1994). Two postulated geologic disposal sites (i.e., an abandoned mine in granite or in sandstone/basalt) were evaluated for impacts from contaminated well or river water. The pathways included drinking the water or the consumption of crops irrigated by the well water or of fish from a contaminated river. The potential impacts from the disposal of the proposed NEF-generated U_3O_8 for similar geologic disposal sites would be proportional to the quantity of material postulated from the Claiborne Enrichment Center enrichment facility. In the year of maximum exposure, the estimated doses for both scenarios and for both potential mine sites for the proposed NEF-generated U_3O_8 are presented in Table 4-19. All estimated impacts for either geologic disposal site would not result in an annual dose exceeding an equivalent of 0.25 millisieverts (25 millirem) to the whole body provided in 10 CFR § 61.41; thus, the overall disposal impacts would be SMALL.

Table 4-19 Maximum Annual Exposure from Postulated Geologic Disposal Sites[a]

Scenario	Pathway	Granite Site		Sandstone/Basalt Site	
		millisieverts	millirem	millisieverts	millirem
Well	Drinking Water	3×10^{-4}	3×10^{-2}	2×10^{-7}	2×10^{-5}
	Agriculture	4×10^{-3}	4×10^{-1}	3×10^{-6}	3×10^{-4}
River	Drinking Water	9×10^{-13}	9×10^{-11}	3×10^{-11}	3×10^{-9}
	Fish Ingestion	2×10^{-12}	2×10^{-10}	5×10^{-11}	5×10^{-9}

[a] Values based on models and analysis presented in Appendix A of NRC, 1994.

4.2.14.5 Mitigation Measures

LES would implement a materials waste recycling plan to limit the amount of nonhazardous waste generation. LES would perform a waste assessment to determine waste-reduction opportunities and what materials would best be recycled. Employee training would be performed regarding the materials to be recycled and the use of recycling bins and containers. For low-level radioactive wastes, the cost of disposal necessitates the need for a waste-minimization program that includes decontamination and reuse of these materials when practicable. The use of chemical solutions for decontamination processes would be limited to minimize the volume of mixed waste that would be generated (LES, 2005a). An active DUF_6 cylinder management program would maintain "optimum storage conditions" to mitigate the potential for adverse events. Surveys of the UBC Storage Pad would be regularly conducted to inspect parameters that are outlined in Table 5-2 of Chapter 5 of this EIS.

4.3 Decontamination and Decommissioning Impacts

This section summarizes the potential environmental impacts of decontamination and decommissioning of the site through comparison with normal operational impacts. Decontamination and decommissioning involves the removal and disposal of all operating equipment while leaving the structures and most support equipment decontaminated to free release levels in accordance with 10 CFR Part 20. Decommissioning activities are generally described in section 2.1.8 of this EIS based on the information provided by LES in the Safety Analysis Report (LES, 2005d). However, a complete description of actions taken to decommission the proposed NEF at the expiration of its NRC license period cannot be fully determined at this time. In accordance with 10 CFR § 70.38, LES must prepare and submit a Decommissioning Plan to the NRC at least 12 months prior to the expiration of the NRC license for the proposed NEF. LES would submit a final decommissioning plan to the NRC prior to the start of decommissioning. This plan would be the subject of further NEPA review, as appropriate, at the time the Decommissioning Plan is submitted to the NRC. Decontamination and decommissioning activities would be conducted to comply with all applicable Federal and State regulations in effect at the time of these activities.

The Cascade Halls would undergo decontamination and decommissioning sequentially over a nine-year period (LES, 2005d). Cascade Halls 1 and 2 in Separations Building Module 1 are scheduled to be the first enrichment cascades to operate and would be the first to undergo decontamination and decommissioning. Cascade Halls 3 through 6 would follow in turn. Once all the UF_6 containment and processing equipment was removed, the building and generic support equipment would be decontaminated to free release levels and abandoned in place.

Decontamination and decommissioning activities would be accomplished in three phases over nine years. The first phase would require about two years and include:

- Characterization of the proposed NEF site.
- Development of the Decommissioning Plan.
- NRC review and approval of the Decommissioning Plan.
- Installation of decontamination and decommissioning equipment on the site of the proposed NEF.

The primary environmental impacts of the decontamination and decommissioning of the proposed NEF site include changes in releases to the atmosphere and surrounding environment, and disposal of industrial trash and decontaminated equipment. The types of impacts that may occur during decontamination and decommissioning would be similar to many of those that would occur during the initial construction of the facility. Some impacts, such as water usage and the number of truck trips, could increase during the decontamination and disposal phase of the decommissioning but would be less than the construction phase, thus bounded by the impacts in sections 4.2.4 through 4.2.11.

During the first phase of the decontamination and decommissioning period, electrical and water use would decrease as enrichment activities are terminated and preparations for decontamination and decommissioning are implemented. Environmental impacts of this phase are expected to be SMALL as normal operational releases have stopped. During the second phase of the decontamination and decommissioning process, water use would increase and aluminum and low-level radioactive wastes would be produced. Contaminated decontamination and decommissioning solutions would be treated in a liquid waste disposal system that would be managed as during normal operations.

A significant amount of scrap aluminum, along with smaller amounts of steel, copper, and other metals, would be recovered during the decontamination and decommissioning process. For security and convenience, the uncontaminated materials would likely be smelted to standard ingots and, if possible, sold at market price. The contaminated materials would be disposed of as low-level radioactive wastes after appropriate destruction for Confidential and Secret Restricted Data components. No credit is taken for any salvage value that might be realized from the sale of potential assets during or after decommissioning.

Low-level radioactive wastes produced during the decontamination and decommissioning process would consist of the remains of crushed centrifuge rotors, trash, citric cake, sludge from the liquid effluent treatment system, and contaminated soils from the Treated Effluent Evaporative Basin. The total volume of radioactive waste generated during the decontamination and decommissioning period would be estimated to be 5,000 cubic meters (6,600 cubic yards). This waste would be disposed of in a licensed low-level waste disposal facility. Releases to the atmosphere would be expected to be minimal compared to the small normal operational releases. The final step in the decontamination and decommissioning process, the radiation surveys, does not involve adverse environmental impacts. The proposed NEF site would then be released for unrestricted use as defined in 10 CFR § 20.1402

4.3.1 Land Use

Because the site of the proposed NEF is located in a sparsely populated semi-arid area of New Mexico surrounded by several industrial installations, the site would most likely retain its industrial status, and it is unlikely that any changes would be made during decommissioning for other purposes after the closure and decommissioning of the facility. Therefore, the impacts would be SMALL.

4.3.2 Historical and Cultural Resources

Because no further disturbance of land surface would accompany decommissioning activities, there would be no impact on cultural resources. Mitigation measures established by the historic properties treatment plan would remain in effect or be renegotiated prior to decontamination and decommissioning. The impacts would remain SMALL.

4.3.3 Visual and Scenic Resources

If the buildings and structures of the proposed NEF were allowed to remain, then the scenic qualities of the area would remain the same as described in section 4.2.3 of this chapter. Any cleared areas could be revegetated with natural species after decommissioning is complete. The impacts would remain SMALL.

4.3.4 Air Quality

During the decontamination phase of the facility, transportation and heavy vehicles would produce exhaust emissions and dust as they move on the road and around the proposed NEF site. The exhaust emissions would be minimal and would not cause any noticeable change in air quality in the area. Dust from the heavy equipment used for decommissioning and from re-entrainment of dust and dirt that is carried or deposited on the road by vehicles hauling trash and recycled material would have the most significant impact on air quality. Fugitive dust should be less than that generated during construction because the buildings and stormwater detention/retention basins would remain. The use of BMPs during the decontamination and decommissioning of the facility would ensure that proper dust control and mitigation measures are implemented.

The current state-of-the-art technologies in decontamination and decommissioning of radiologically contaminated equipment require the use of a limited amount of solvents to fully clean some metallic and nonmetallic equipment. The quantity of solvents required has been dramatically reduced in recent years and, assuming a similar trend, would be further reduced when the proposed NEF undergoes decontamination and decommissioning. Nevertheless, there is the potential for emission of solvents during the decontamination phase if solvent cleaning methods are employed. These emissions would be of short duration (i.e., a few weeks) and expected to be below the levels requiring an application for a Clean Air Act Title V permit for a single NESHAP of concern (9.1 metric tons [10 tons]) and any combination of NESHAP (22.7 metric tons [25 tons]). Gaseous effluent volume that occurs during decontamination and decommissioning would be slightly reduced because the operational process off-gas inputs to the stack would be shut down. The BMP dust-control measures are expected to be similar to measures taken during construction, and the air-quality impacts due to decontamination and decommissioning activities should be equal to or less than the SMALL air-quality impacts from construction and operation of the proposed NEF site.

4.3.5 Geology and Soils

The proposed NEF site terrain would remain after license termination. There would be no impacts to the geology and soils from decontamination and decommissioning activities other than the potential to use a portion of the site for equipment laydown and disassembly. This could require the removal of existing vegetation from this area; however, less land clearing would be expected than during construction. Therefore, the impacts would be SMALL.

4.3.6 Water Resources

Potable water use is expected to vary during the decommissioning phase, particularly during the middle of the 9-year decommissioning program. This would be caused by the increased use of water for equipment decontamination and rinsing. Liquid effluents from decontamination operations during decommissioning would be higher than liquid effluents from decontamination operations during normal operations. These effluents would include the spent citric acid solution used to decontaminate equipment and recover uranium and other metals. Spent citric acid solution would be treated through the liquid effluent treatment system and removed from the waste stream before discharge to the Treated Effluent Evaporative Basin during the operation phase of the proposed NEF. Water use during decontamination and decommissioning would be less than or equal to the water consumption during operations.

The site has no permanent surface water. Runoff from the buildings, roads, and parking areas would be routed to two stormwater detention/retention basins for evaporation. During decontamination and decommissioning, the mud or soil in the bottom of the detention/retention basins would be sampled for contamination and properly disposed of, if it is found to contain contaminants in excess of regulatory limits. The basin excavations and berms would be leveled to restore the land to a natural contour (LES, 2005a).

The Treated Effluent Evaporative Basin would remain in operation throughout most of the decontamination phase. Liquids used to clean and decontaminate buildings and equipment would be treated in the liquid effluent treatment system before being discharged to the Treated Effluent Evaporative Basin. Upon completion of the large-scale decontamination, the Treated Effluent Evaporative Basin would be isolated and allowed to evaporate. The sludge and soil in the bottom of the Treated Effluent Evaporative Basin would be tested and disposed of in accordance with regulatory requirements such that the area would be released for unrestricted use as defined in 10 CFR § 20.1402. Therefore, the water resources during decommissioning would not be affected any differently than during operations, the impacts to water resources would remain SMALL.

4.3.7 Ecological Resources

After operation, the site ecology would have adapted to the existence of the proposed NEF. Decommissioning the facility would remove vegetation and temporarily displace animals close to the structures. As is the case during operations, the basins could not support permanent aquatic communities, because they do not permanently hold water. Direct impacts on vegetation during decontamination and decommissioning of the proposed NEF would include removal of existing vegetation from the area required for equipment laydown and disassembly. This disturbed area would be significantly less than the 81 hectares (200 acres) disturbed during construction, and such decontamination and decommissioning impacts would be bounded by the construction activities. Replanting the disturbed areas with native species after completion of the decontamination and decommissioning activities would restore the site to a condition similar to the preconstruction condition. For these reasons, the impacts on the local ecology would continue to be SMALL during decontamination and decommissioning of the proposed NEF.

Because the Decommissioning Plan would restore the basins to a natural contour and leave the buildings and adjacent land the same as during operation of the proposed NEF, this would result in permanent elimination of a small percentage of wildlife habitat from the area (about 73 hectares [180 acres] of the 220-hectare [543-acre] site). This would have a SMALL impact on the wildlife population in the general area due to the extensive open range land surrounding the proposed NEF.

4.3.8 Socioeconomics

The cost for decontamination and decommissioning of the proposed NEF would be approximately $941.6 million in 2004 dollars. The majority of this cost estimate ($778 million) is the fee for disposal of the DUF_6 generated during operation assuming the DUF_6 would not be disposed of prior to decommissioning.

As operations cease, some operational personnel would gradually migrate to decommissioning activities. These workers would require additional training before such work begins. Approximately 10 percent of the operations work force would be transferred to decontamination and decommissioning activities (LES, 2004a). Removal, decontamination, and disposal of the enrichment equipment, while labor intensive, is not a difficult operation and would not require the same highly skilled labor as operation of the enrichment cascade. Thus, the pay scale of the decommissioning crew would be lower on average than that planned for the full operation of the proposed NEF. As the enrichment cascades are shutdown, the skilled operator and technicians would be replaced with construction crews skilled in dismantling and decontaminating the systems. Since no additional employment would be expected, the economic impact of decontamination and decommissioning would be expected to be SMALL.

At the conclusion of both the operations phase and the decontamination and decommissioning phase, the reduction in direct and indirect employment at the proposed NEF would impose socioeconomic dislocations in the immediate area surrounding the region of influence. The extent of such impacts (small, moderate, or large) would depend on other businesses in the area and whether or not a stable, continuing community existed at the time of decommissioning. For example, if the proposed NEF becomes the major employer in the Eunice, New Mexico, area, its closure could have a SMALL to MODERATE impact. If, however, alternative businesses are located in the area, the loss of an estimated 210 jobs would have only a SMALL impact on the local community. Similarly, the loss of tax revenue would have a SMALL to MODERATE economic impact.

4.3.9 Environmental Justice

The NRC staff's review of environmental and socioeconomic impacts during decommissioning show that all environmental impacts (sections 4.3.1 through 4.3.7 and sections 4.3.10 through 4.3.13) are less than or equal to the level that would be experienced during construction and operations and would be SMALL. In particular, the impact of traffic during decommissioning would be slightly greater than during operations, but less than during construction, which would result in a SMALL impact of transportation on minority and low-income communities in the region. A staff review of the locations, practices, and previous health conditions of the minority and low income populations within 80 kilometers (50 miles) of the proposed NEF site provides no indication that any of these environmental impacts would fall disproportionately on low-income or minority populations, so the environmental impacts on them also would be SMALL. If the proposed NEF becomes the major employer in the Eunice, New Mexico, area, its closure could have a SMALL to MODERATE impact. The NRC staff’s review of socioeconomic impacts during decommissioning (section 4.3.8) states if alternative businesses are located in the area, the loss of an estimated 210 jobs would have only a SMALL impact on the local community. However, even in the former case there is no reason to believe that low-income and minority populations would be disproportionately represented among the proposed NEF personnel or businesses dependent on them, so there is no reason to believe that low-income and minority populations would be disproportionately affected.

4.3.10 Noise

Noise during decommissioning would be generated by heavy construction equipment, the movement of large pieces of scrap metal, and the destruction of classified equipment. The noise levels would be similar to those experienced during the construction of the plant. Levels of 110 decibels within the fenced area and around 70 decibels immediately offsite would be expected. The activity would be expected to occur during daytime and would be intermittent during decommissioning. Nighttime noise levels would drop to preconstruction levels due to the reduction in nighttime traffic volume related to worker shift changes. The maximally exposed individuals would be workers operating the equipment and they would be provided with suitable hearing protection. The overall noise impacts would be similar to or less than the SMALL noise impacts from the construction of the proposed NEF site.

4.3.11 Transportation

Traffic during the initial portion of the decontamination and decommissioning activities would be slightly greater than traffic during normal operations, but not as great as during construction. Vehicular traffic would be less than the amount experienced during either the construction or the operational phase of the plant. The roads would be able to sustain the traffic volume easily; however, the number of heavy trucks would be substantial for brief periods of time as waste materials were removed and, therefore, transportation impacts for construction are bounding.

If the DUF_6 has not been removed previously, it would be shipped offsite during decommissioning. As shown in Table 2-5 of Chapter 2 of this EIS, the operation of the proposed NEF would generate up to 15,727 Type 48Y cylinders of DUF_6 during its operation. Type 48Y cylinders would be shipped with one cylinder per truck or four cylinders per railcar.

Assuming that all of the material is shipped during the first eight years of decommissioning (the final radiation survey and decontamination would occur during year nine), the proposed NEF would ship approximately 1,966 trucks per year. If the trucks are limited to weekday, nonholiday shipments, approximately 10 trucks or 2-1/2 railcars per day would leave the site for the DUF_6 conversion facility. Section 4.2.11 of this chapter presents the impacts of shipping DUF_6 to the conversion facility, which would be considered SMALL.

4.3.12 Public and Occupational Health

The current decontamination and decommissioning plans call for cleaning the structures and selected facilities to free-release levels and allowing them to remain in place for future use. Allowing the buildings to remain in place would reduce the potential number of workers required for decommissioning, which would reduce the number of injured workers. If residual contamination is discovered, it would be decontaminated to free-release levels or removed from the site and disposed of in a low-level radioactive wastes facility. Occupational exposures during decontamination and decommissioning would be bounded by the potential exposures during operation (approximately 3.0 millisieverts [300 millirem] per year) because standard quantities of uranium material (i.e., UF_6 in Type 48Y cylinders) could be handled, at least during the portion of the decontamination and decommissioning operations that purges the gaseous centrifuge cascades of UF_6. Once this decontamination operation is completed, the quantity of UF_6 would be residual amounts and significantly less than handled during operations. Because systems containing residual UF_6 would be opened, decontaminated (with the removed radioactive material processed and packaged for disposal), and dismantled, an active environmental monitoring and dosimetry (external and internal) program would be conducted to maintain ALARA doses and doses to individual members of the public as required by 10 CFR Part 20. Therefore, the impacts to public and occupational health would be SMALL.

4.3.13 Waste Management

The waste management and recycling programs used during operations would apply to decontamination and decommissioning. Materials eligible for recycling would be sampled or surveyed to ensure that contaminant levels would be below release limits. Staging and laydown areas would be segregated and managed to prevent contamination of the environment and creation of additional wastes. Therefore, the impacts would be SMALL.

4.3.14 Summary

The adverse environmental impacts of decontamination and decommissioning of the proposed NEF site could be SMALL to MODERATE on the order of the construction and operations impacts. The mitigating environmental impacts include release of the facilities and land for unrestricted use, termination of releases to the environment, discontinuation of a large portion of water and electrical power consumption, and reduction in vehicular traffic. Decommissioning impacts would be localized in the immediate proposed NEF developed site. No disposal of waste, including radioactive waste, would occur at the proposed NEF site.

4.4 Cumulative Impacts

The Council on Environmental Quality regulations implementing the NEPA define cumulative effects as "the impact on the environment which results from the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR § 1508.7). Cumulative impacts are presented below for areas in which there are anticipated changes related to other activities that may arise from single or multiple actions and may result in additive or interactive effects (e.g., WCS application for a low-level radioactive wastes disposal license). Areas in which cumulative impacts are not addressed in this section include:

- Cultural and historical resources.
- Visual/scenic resources.
- Ecological resources.
- Noise.
- Waste management.

There would be no cumulative adverse impacts to cultural or historical resources. For visual/scenic resources, the analysis in section 4.2.3 includes cumulative impacts from other nearby operations. There would be no cumulative adverse impacts to ecological resources as the impacts from the proposed NEF would be restricted to the site, and the proposed NEF site takes up a negligible percentage of the habitat surrounding the site, thereby not noticeably changing the cumulative impacts already existing from other local and regional activities. There would be no cumulative noise impacts because noise from activities at the proposed NEF site would not impact any sensitive offsite receptors. Waste management impacts related to cumulative impacts of the proposed NEF are addressed in section 4.2.14.

4.4.1 Land Use

As described in sections 4.2.1 and 4.3.1 of this chapter, the proposed NEF site is located in a sparsely populated area surrounded by several industrial installations. Land further to the north, south, and west of the proposed NEF site has been mostly developed by the oil and gas industry with hundreds of oil pump jacks and associated rigs. Range cattle are also raised on this land. WCS submitted a license application for disposal of low-level radioactive wastes approximately 1.6 kilometers (1 mile) east of the proposed NEF (WCS, 2004). Of the 582 hectares (1,438 acres) of the land owned by WCS, 81 hectares (200 acres) are occupied by the existing disposal and waste storage facilities and the proposed disposal cells would occupy an additional 81 hectares (200 acres) (WCS, 2004). This would be in addition to a sanitary landfill, several land farms, and disposal facilities for oil industry wastes operated by others in the area. The construction and operation of the proposed NEF would not substantially change the land use in the region other than the small displacement of grazing land from the proposed NEF site. Therefore, the impacts would be SMALL.

4.4.2 Geology and Soils

The proposed NEF site is located in a region where there has been contamination of soils and ground-water aquifers from activities related to the oil and gas industry. The contamination has not been quantified on a regional scale but potential contaminants from such activities would be in the form of hydrocarbons. Any contamination resulting from the proposed NEF operations would most likely be radioactive in nature. However, the proposed NEF operations would not result in soil contamination that could not be cleaned up through mitigation measures such as those described in the Spill Prevention Control and Countermeasures Plan. WCS's operations (the storage of radioactive material), on the other hand, are passive in nature and are not expected to result in the release of a similar mix of radioactive contaminants to the soils. The WCS application for the proposed disposal cells would require excavations that extend to a maximum depth of 36.6 meters (120 feet) below the surface (WCS, 2004). Surface soils from the proposed WCS disposal cells would be stockpiled for later use in construction of the cover system. The disposal cells would also have to meet the State of Texas regulations to ensure the materials within the disposal cells would not contaminate the surrounding geology and soils. WCS would also employ BMPs to reduce the potential for both water and wind erosion (WCS, 2004). Therefore, cumulative impacts to soils would be considered SMALL.

4.4.3 Water Resources

There has been regional groundwater contamination from the oil and gas industry activities. Sundance Services, Inc., has a ground-water monitoring well network to monitor for possible future offsite contamination resulting from its own operations. As with potential soil contamination, potential groundwater contaminants from its activities would be in the form of hydrocarbons. Any contamination resulting from the proposed NEF operations would most likely be radioactive in nature. However, implementation of the Spill Prevention Control and Countermeasure Plan would result in the cleaning of soil contamination prior to such releases affecting groundwater.

The impacts of nearby facilities on water resources is accounted for through consideration of the Eunice and Hobbs municipal water-supply systems. The proposed NEF water use would be a small percentage of the systems' capacity. Forecasts predict that future regional water demand, if unrestrained, would deplete current regional supplies and, if required, the proposed NEF would be expected to comply with the Lea County Drought Management Plan.

WCS estimates that the construction of the two proposed disposal cells (i.e., a Federal disposal cell and a Texas compact disposal cell) would require approximately 3,785 cubic meters (1 million gallons) of water to be obtained either from the onsite well or would be brought in from offsite (WCS, 2004). During operation of the proposed disposal cells, WCS projects that there would be no changes in water use.

A privately owned casino/hotel/racetrack is under construction in Hobbs, New Mexico (Valdez, 2004). Non-resort casinos typically use approximately 34 cubic meters per day (10 acre-feet per year) of water (Dornbusch, 1999). Therefore, this casino would be expected to require about 14 percent of the water use of the proposed NEF. This increase in water use would still be well within the capacity of the local municipal water supply systems. The cumulative impacts to local water resources would be SMALL.

4.4.4 Air Quality

Despite the presence of the oil and gas industry, the EPA declared that both Lea County, New Mexico, and Andrews County, Texas, are in attainment for all of the criteria pollutants (EPA, 2004). For example, Table 4-20 presents a comparison of the emissions from WCS and the proposed NEF to the total of all point sources in Lea County, New Mexico, and Andrews County, Texas.

WCS's annual emissions are generally less than those expected from the proposed NEF (except for volatile organic compounds) and significantly less than 1 percent of the total point source contribution for all criteria pollutants. The construction of the proposed disposal cells would add some fugitive dust emissions and the emissions of criteria pollutants but would be well below the NAAQS values (WCS, 2004), as for the proposed NEF. Therefore, WCS's cumulative impacts to the surrounding area would also be SMALL. In addition, no other foreseeable point-source activity can be identified that would cumulatively impact the air quality.

Table 4-20 Comparison of the Total Annual Emissions (Tons Per Year) of Criteria Air Pollutants for the Area of the Proposed NEF[a]

County, State	VOC	NO_X	CO	SO_2	$PM_{2.5}$	PM_{10}
Lea County, New Mexico	6,713	38,160	31,185	16,096	5,188	28,548
Proposed NEF	1.0	4.3	5.5	0.04	N/A	0.37
Andrews County, Texas	2,873	3,259	6,680	1,398	440	1,577
WCS	1.93	0.34	0.05	0.02	0.01	0.11
Gaines County, Texas	2,696	2,791	7,709	735	1,825	8,650

[a] A ton is equal to 0.9078 metric ton.

VOC - volatile organic compounds; NO_X - nitrogen oxides; CO - carbon monoxide; SO_2 - sulphur dioxide; PM_{25} - particulate matter less than 2.5 microns; PM_{10} - particulate matter less than 10 microns; N/A - no data available.

Sources: EPA, 2003; LES, 2005a; TCEQ, 2004. Latest available data is from 1999 for the counties and 2002 for WCS.

4.4.5 Socioeconomics

At the time of this EIS, a privately owned casino was developed in Hobbs, New Mexico. An adjacent racetrack is currently under construction with completion scheduled for the fall of 2005 (Hobbs, 2005). Following completion of the racetrack, an adjacent hotel and restaurant(s) are planned for construction in the next several years, and additional employment impacts are expected at that time. The casino and racetrack, excluding the hotel and restaurant(s), could be expected to employ up to 400 workers during the September to December racing season and 275 to 300 workers during the off season (Valdez, 2004). This would mean about a 1-percent increase in direct and indirect jobs for the three principal counties in the region of influence. The full-time casino jobs and the seasonal racetrack jobs would be low-paying positions for largely unskilled workers as compared to the proposed NEF. The casino project would obtain workers from a different pool of workers than the proposed NEF.

The proposed WCS disposal facility would have a peak construction force of about 40 full-time workers with an expected range of 30 to 50 persons and operations would have approximately 38 workers (WCS, 2004). The source of employees would likely be filled by residents in the region. The slight population increases predicted by WCS from constructing and operating the proposed disposal cells would have SMALL impacts to the housing and community services in the region of influence.

No other large-scale projects are anticipated in the near future that would significantly impact the socioeconomics of Lea County, New Mexico, or Andrews and Gaines Counties, Texas. Therefore, cumulative impacts would be MODERATE. Impacts from the impending casino/hotel/racetrack and WCS disposal (provided the WCS is granted a license amendment) would be added to the cumulative impacts.

4.4.6 Environmental Justice

Environmental justice analysis performed on the potential cumulative impacts concluded there would be no disproportionally high-minority and low-income populations that exist warranting further examination of environmental impacts to those populations (WCS, 2004). It is unlikely that minority and low-income persons would be disproportionately affected by adjacent activities at WCS and Lea County Landfill. Any impacts from traffic during construction of the proposed disposal cells by WCS would be short termed and SMALL.

4.4.7 Transportation

The construction, operation, and decommissioning of the proposed NEF would result in SMALL to MODERATE impact due to increased traffic from commuting construction workers and no highway upgrades are required other than possibly some safety enhancements, such as the addition of turning lanes. With the implementation of all current and planned or proposed future actions within the vicinity of the proposed NEF (e.g., construction and operation of the proposed WCS and operation at Lea County Landfill), traffic volumes would contribute to cumulative impacts. However, no changes are anticipated in the SMALL to MODERATE cumulative effects concerns for transportation.

4.4.8 Public and Occupational Health

Currently, the only reasonably foreseeable radiological actions in the area not related to the proposed NEF is the application by WCS to seek and obtain a low-level radioactive wastes disposal site license through the State of Texas (an NRC Agreement State) (WCS, 2004). The existing WCS license only allows for the storage of radioactive material (BRC, 2003). This radioactive material is packaged and stored such that it would not contribute to the annual dose for members of the public. For the WCS application for a low-level radioactive waste disposal site, the impacts to members of the public were analyzed at the site boundary and for the nearest resident, the same nearest resident as for the proposed NEF (WCS, 2004). The annual doses for normal operations would be 4.9×10^{-4} millisieverts (4.9×10^{-2} millirem) at the site boundary and 1.9×10^{-6} millisieverts (1.9×10^{-4} millirem) for the nearest resident. The largest potential accident impact could be from a truck fire with doses of 0.49 millisieverts (49 millirem) and 7.7×10^{-4} millisieverts (7.7×10^{-2} millirem) for the site boundary and the nearest resident, respectively. When added to the maximally exposed individual airborne dose of 5.3×10^{-5} millisieverts (5.3×10^{-3} millirem) per year projected for the proposed NEF, this cumulative dose would still be considered SMALL.

The cumulative collective radiological impacts to the offsite population, from all sources, would be SMALL by being below the 1 millisieverts (100 millirem) per year dose limit (10 CFR Part 20) to the offsite maximally exposed individual during the time of the construction, operation, and decommissioning of the proposed NEF.

4.5 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable commitment of resources for the proposed NEF would include the commitment of land, water, energy, raw materials, and other natural and manmade resources for construction. The impacts from such commitment of resources would be SMALL (see box on page 4-1 for definition).

About 81 hectares (200 acres) within a 220-hectare (543-acre) site would be used for the construction and operation of the proposed NEF. Following decommissioning, all parts of the plant and site will be unrestricted to any specific type of use (LES, 2005a). Therefore, if the license is granted, the 81 hectares (200 acres) parcel of land would likely remain industrial beyond license termination.

The construction and operation of the proposed NEF would use up to 2.63 million cubic meters (695 million gallons) per year of groundwater resources from the Eunice and/or Hobbs municipal water-supply systems. The proposed NEF is a consumptive water-use facility, meaning all water would be used and none would be returned to its original source. Although the amount of water that would be used from the Ogallala Aquifer by the proposed NEF represents a small percentage of the total capacity of the two municipalities, this water would be lost in three ways. The water would evaporate from the Treated Effluent Evaporative Basin and UBC Storage Pad Stormwater Retention Basin; it would evaporate or infiltrate into the ground from the Site Stormwater Detention Basin and septic leach fields; and infiltrated groundwater would undergo evapotranspiration. It is unlikely that any of the water used by the proposed NEF would replenish the Ogallala Aquifer.

Energy expended would be in the form of fuel for equipment and vehicles, electricity for facility operations, and natural gas for steam generation used for heating. Operation of the proposed NEF would consume approximately 236 cubic meters (62,350 gallons) of gasoline and diesel fuel annually for operation of vehicles and the emergency diesel generators. The electrical energy requirement represents a small increase in electrical energy demand of the area. Improvements in the local area’s electrical power capacity to support the proposed NEF, namely the addition of transmission lines, transmission towers, and two onsite transformers, would contribute to a slight increase in the irreversible and irretrievable commitment of resources due to the dedication of a small portion of land (i.e., access of county right-of-way next to New Mexico Highway 234) and material necessary for such improvements and expansion of services. During normal operation, the average and peak electrical power requirements of the proposed NEF would be approximately 30.3 million volt-amperes and 32 million volt-amperes, respectively (LES, 2005a). Based on the relationship that the generation of one separative work unit (SWU) would require approximately 40 kilowatt-hours of electrical energy (Urenco, 2004), the proposed NEF's centrifuge equipment would use approximately 120 million kilowatt-hours annually during the 30-year license of the facility. The annual consumption of natural gas for the proposed NEF would be approximately 3.1 million cubic meters (110 million cubic feet) based on plant requirements of approximately 354 cubic meters (12,500 cubic feet) per hour (LES, 2005b).

Resources that would be committed irreversibly or irretrievably during construction and operation of the proposed NEF include materials that could not be recovered or recycled and materials that would be consumed or reduced to unrecoverable forms. It is expected that about 60,000 cubic meters (2.1 million cubic feet) of concrete, 80,000 square meters (861,000 square feet) of asphalt, 288,000 square meters (3.1 million square feet) of crushed stone, more than 500 metric tons (551 tons) of steel products and about 55,800 cubic meters (73,000 cubic yards) of clay would be committed to the construction of the proposed NEF. The proposed NEF would generate during operations a small amount of nonrecyclable waste streams, such as hazardous wastes that are subject to RCRA regulations and radiological waste. Generation of these waste streams would represent an irreversible and irretrievable commitment of material resources. However, during decommissioning, certain materials and former operational equipment of the proposed NEF could be recycled after completing decontamination and dismantling.

Chemical additives would be used during operation to control bacteria and corrosion. Approximately 8,000 kilograms (17,637 pounds) of corrosion inhibitors and 1,800 kilograms (3,968 pounds) of bio-growth inhibitors may be used annually. Table 4-21 lists process chemicals and gases that would be irreversibly and irretrievably committed.

Table 4-21 Process Chemicals and Gases Used at the Proposed NEF

Chemical	Form[a]	Quantity
Acetone	L	27 liters
Acetylene	G	6 m^3
Activated Carbon	S	730 kg
Aluminum Oxide	S	1,312 kg
Argon	G	380 m^3
Carbon Fibers	S	classified
Carbon/Potassium Carbonate	S	only states as filter
Citric Acid	L (5-10%), S (crystalline)	800 liters
Cutting Oil	L	2.4 liters
Degreaser Solvent, SS25	L	2.4 liters
Detergent	L	205 liters
Diatomaceous Earth	S	10 kg
Diesel Fuel (Outdoors)	L	37,854 liters
Ethanol	L	85 liters
Filters, Radioactive and Industrial	S	37,044 kg
Helium	G	440 m^3
Hydrogen	G	Standard cylinder

Chemical	Form[a]	Quantity
Ion Exchange Resin	S	1.6 m^3
Metals (Aluminum)	S	classified
Methylene Chloride	L	670 liters
Nitric Acid (65%)	L	26 liters
Nitrogen	L, G	37,858 liters
Oil	L	1 kg
Organic Chemicals	L	50 liters
Oxygen	G	11 m^3
Paint	L	12 liters
Papers, Wipes, Gloves, etc.	S	1 m^3
Penetrating Oil	L	0.44 liter
Peroxide	L	4 liters
Petroleum Ether	L	10 liters
PFPE (Fomblin®) Oil	L	20 liters
PFPE (Tyreno®) Oil	L	120 liters
Phosphoric Acid	L	44 liters
Potassium or Sodium Hydroxide	L	210 liters
Primus Gas	G	0.5 kg
Propane	G	0.68 kg
R23 Trifluoromethane	L, G	42.5 kg
R404A Fluoroethane blend	L, G	375 kg
R507 Penta/tri Fluoroethane	L, G	1,590 kg
Sandblasting Sand	S	50 kg
Shot Blasting Media	S	1 bag
Silicone Oil	L	1,750 liters
Sodium Carbonate	S	10 kg
Sodium Fluoride	S	14,500 kg
Sodium Hydroxide (0.1N)	L	5 liters
Sulfuric Acid	L	10 liters
Toluene	L	2 liters

[a] L - liquid; G - gas; and S - solid.
m^3 - cubic meter.
kg - kilogram.
To convert from kilograms to pounds, multiply by 2.2.
To convert from cubic meters to cubic feet, multiply by 35.3.
To convert from liters to gallons, multiply by 0.26.
Source: LES, 2005a.

4.6 Unavoidable Adverse Environmental Impacts

Implementing the proposed action would result in unavoidable adverse impacts on the environment. These impacts would result from the proposed NEF site preparation, construction, and operation. Generally, these impacts are SMALL.

Site preparation and construction of the proposed NEF would use at least one-third of the 220-hectare (543-acre) proposed NEF site. This construction area would be cleared of vegetation and graded by filling approximately 611,000 cubic meters (797,000 cubic yards) of soil and caliche. In addition, construction activities to relocate the CO_2 pipeline would be performed. The impact from the loss of grazing lands from the proposed NEF site would be minimal due to the abundance of other nearby grazing areas. These activities would also lead to the displacement of some local wildlife populations to nearby habitat. In addition, there would be temporary impacts from the construction of new facilities associated with the proposed NEF site. These impacts would consist of increased fugitive dust, increased potential for soil erosion and stormwater pollution, and increased construction vehicle traffic and emissions.

Water consumption during the site preparation and construction phase would be less than that required during operations. The proposed NEF site water supply would be obtained from the cities of Eunice and Hobbs, which obtain their water from wells positioned in the most productive portion of the Ogallala Aquifer in New Mexico. The total water use for the 30-year life of this facility is projected to exceed 2.63 million cubic meters (695 million gallons) from the Ogallala Aquifer. This is relatively low compared to the total pumping capacity of the Eunice and Hobbs municipalities.

During operations, workers and members of the public would face unavoidable exposure to radiation and chemicals. Workers would be exposed to radiation and chemicals associated with operating the proposed NEF and handling and transporting radioactive material and waste. The public would be exposed to low levels of radioactive contaminants released to the air and through limited exposure to radioactive materials, including waste, that would be transported to the final disposal sites. Small quantities of hydrofluoric acid and uranium would be released to the air with the potential for chemical exposure.

4.7 Relationship Between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Consistent with the Council on Environmental Quality's definition as well as the definition provided in section 5.8 of NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," this EIS defines short-term uses and long-term productivity as follows:

- Short-term uses generally affect the present quality of life for the public (i.e., this is the 30-year license period for the proposed NEF).

- Long-term productivity affects the quality of life for future generations based on environmental sustainability (i.e., this is the period after license termination for the proposed NEF).

The construction and operation of the proposed NEF would necessitate short-term commitments of resources and would permanently commit certain other resources (such as energy and water). The short-term use of resources would result in potential long-term socioeconomic benefits to the local area and the region. The short-term commitments of resources would include the use of materials required to construct new buildings, the commitment of new operations support facilities, transportation, and other disposal resources and materials for the proposed NEF operations.

Workers, the public, and the environment would be exposed to increased amounts of hazardous and radioactive materials over the short term from the operations of the proposed NEF and the associated materials, including process emissions and the handling of waste and DUF_6 cylinders. Construction and operation of the proposed NEF would require a long-term commitment of terrestrial resources, such as land, water, and energy. Short-term impacts would be minimized with the application of proper mitigation measures and resource management. Upon the closure of the proposed NEF, LES would decontaminate and decommission the buildings and equipment and restore them for unrestricted use. This would make the site available for future use.

Continued employment, expenditures, and tax revenues generated during the implementation of the proposed action would directly benefit the local, regional, and State economies.

4.8 No-Action Alternative

As presented in section 2.2.1, the no-action alternative would be to not construct, operate, and decommission the proposed NEF in Lea County, New Mexico. Utility customers would continue to depend on uranium enrichment services needs through existing suppliers (e.g., existing uranium enrichment facilities, foreign sources and from the "Megatons to Megawatts" program). Current U.S. contract commitments for low-enriched uranium total about 12 million SWU annually (EIA, 2004). U.S. Enrichment Corporation (USEC) is currently the only domestic supplier of enrichment services. USEC currently sells enriched uranium to both domestic and foreign users. The existing activities would include the continued operation of the aging Paducah Gaseous Diffusion Plant, the downblending of highly enriched uranium covered under the "Megatons to Megawatts" program that is managed by USEC and scheduled to expire in 2013, and the importation of foreign enrichment product. By combining its domestic enrichment facilities and the downblending of foreign highly enriched uranium, USEC can provide for approximately 56 percent of the U.S. enrichment market needs (USEC, 2004a) while foreign suppliers provide the remaining 44 percent.

On January 12, 2004, USEC announced plans to build and operate a uranium enrichment plant (known as the American Centrifuge Plant) in Piketon, Ohio (USEC, 2004b). This plant would cost up to $1.5 billion, employ up to 500 people, and reach an initial annual production level of 3.5 million SWUs by 2010 (USEC, 2004a). Completion of the American Centrifuge Plant would allow for the replacement of the enrichment services provided by the Paducah Gaseous Diffusion Plant with subsequent closure, decontamination, and decommissioning. The efforts by USEC for the research and development of their own gaseous centrifuge technology, licensing, construction, and operation of the American Centrifuge Plant is an unrelated action to the proposed NEF.

Under the no-action alternative, there is only one remaining domestic enrichment facility, the Paducah Gaseous Diffusion Facility, which could continue to serve as a source of low-enriched uranium into the foreseeable future or until replaced by the American Centrifuge Plant. The "Megaton to Megawatts" program managed by USEC would continue to provide low-enriched uranium until 2013 under the current program. After the cessation of this program in 2013 if not renewed by the United States and Russia, the availability of low-enriched uranium through the downblending of highly enriched uranium is uncertain. Reliance on only one domestic source for enrichment services could result in disruptions to the supply of low-enriched uranium, and consequently to reliable operation of U.S. nuclear energy production, should there be any disruptions to foreign supplies and/or the operations of the domestic supplier (i.e., failure of USEC to construct and operate the American Centrifuge Plant and if the "Megaton to Megawatts" program is not extended beyond 2013).

The need for generating capacity within the United States is expected to increase, so that by 2020 nuclear-generating capacity is expected to increase by more than 5 gigawatts (5,000 megawatts), the equivalent of adding about five large nuclear power reactors. In the short term, any excess demand can be accommodated by depleting existing inventories at USEC, commercial utilities, and the Federal Government. In the long term, this could lead to more reliance on foreign suppliers for enrichment services unless other new domestic suppliers are constructed and operated.

The likelihood that low-enriched uranium would be available from foreign suppliers in the long term is also subject to uncertainty. The current world enrichment demand is about 35 million SWU per year, and world production capacity is about 38 million SWU (Lenders, 2001). There could also be large, long-term uncertainty concerning the impacts from potential future changes in world-wide supplies of low-enriched uranium. Therefore, the fading of the downblending "Megaton to Megawatts" program could lead to excess world-wide demand. Foreign sources of enrichment services would continue to provide commercial nuclear reactors with their fuel supplies.

The impacts experienced today from the existing uranium fuel cycle activities in the United States would continue if the proposed NEF is not constructed, operated or decommissioned. To the extent that the failure to construct and operate the proposed NEF maintains or increases reliance on foreign sources for low-enriched uranium, foreign countries would experience the associated environmental impacts. This assumes foreign uranium enrichment services would be available in the future to supply U.S. market demand for the market share that would have been provided by the proposed NEF.

The following section discusses additional environmental impacts from not constructing, operating, and decommissioning the proposed NEF. Additional domestic enrichment facilities in the future could be constructed with impacts to be determined in their associated NEPA documentation. The above-mentioned existing activities such as enrichment services from existing uranium enrichment facilities, from foreign sources and from the "Megatons to Megawatts" program would have impacts as previously analyzed in their respective NEPA documentation and historical environmental monitoring.

4.8.1 Land Use Impacts

Under the no-action alternative, no local impact would occur because the proposed NEF would not be constructed or operated. The land use of cattle grazing would continue and the property would be available for alternative use. There would also be no land disturbances. Impacts to local land use would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future and would have land use impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to land use would be expected to be SMALL.

4.8.2 Historical and Cultural Resources Impacts

Under the no-action alternative, the land would continue to be used for cattle grazing and historical and cultural resources would remain in place unaffected by the proposed action. Without the proposed treatment plan and its mitigation measures, historical sites identified at the proposed NEF site could be exposed to the possibility of human intrusion and continued weathering. Local impacts to historical and cultural resources would be expected to be SMALL, providing that requirements included in applicable Federal and State historic preservation laws and regulations are followed or could be MODERATE if not followed.

Additional domestic enrichment facilities could be constructed in the future and could have potential impacts to cultural resources if at a new location. The impacts would be expected to be SMALL if built and operated at an existing industrial site. The impacts could be SMALL to MODERATE if additional domestic enrichment facilities were located at a new site, depending on the specific site conditions.

4.8.3 Visual/Scenic Resources Impacts

Under the no-action alternative, the visual and scenic resources would remain the same as described in the affected environment section. Local impacts to visual and scenic resources would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future and would have visual and scenic resources impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to visual and scenic resources would be expected to be SMALL.

4.8.4 Air Quality Impacts

Under the no-action alternative, air quality in the general area would remain at its current levels described in the affected environment section. Impacts to air quality would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future . Depending on the construction methods and design of these facilities, the likely impact on air quality would be similar to the proposed action. Impacts to air quality would be expected to be SMALL.

4.8.5 Geology and Soils Impacts

Under the no-action alternative, the land would continue to be used for cattle grazing. The geology and soils on the proposed site would remain unaffected because no land disturbance would occur. Natural events such as wind and water erosion would remain as the most significant variable associated with the geology and soils of the site. Impacts to geology and soils would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future and would have geology and soils impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial site. Impacts to geology and soils would be expected to be SMALL.

4.8.6 Water Resources Impacts

Under the no-action alternative, water resources would remain the same as described in the affected environment section. Water supply demand would continue at the current rate. The natural surface flow of stormwater on the site would continue, and potential groundwater contamination could occur due to surrounding operations related to the oil industry. Impacts to water resources local to Lea County would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future. Depending on the design, location of these facilities and local water resources, the likely impact on water resources (including water usage) would be similar to the proposed action. Impacts to water resources would be expected to be SMALL.

4.8.7 Ecological Resources Impacts

Under the no-action alternative, the land would continue to be used for cattle grazing and the ecological resources would remain the same as described in the affected environmental section. Local land disturbances would also be avoided. Impacts to ecological resources would be expected to be SMALL

Additional domestic enrichment facilities could be constructed in the future and would have ecological resources impacts that would be similar to those of the proposed action, depending on the site conditions either at a new location or an existing industrial site. Impacts to ecological resources would be expected to be SMALL.

4.8.8 Socioeconomic Impacts

Under the no-action alternative, socioeconomics in the local area would continue as described in the affected environmental section. The socioeconomic impacts would be SMALL.

Additional domestic enrichment facilities in the future could be constructed. Depending on the construction methods, design of these facilities and local demographics, the likely socioeconomic impact would be similar to the proposed action. Socioeconomic impacts would be expected to be SMALL to MODERATE.

4.8.9 Environmental Justice Impacts

Under the no-action alternative, no changes to environmental justice issues other than those that may already exist in the community would occur. No disproportionately high or adverse impacts would be expected. Environmental justice impacts would be expected to be SMALL.

Additional domestic enrichment facilities in the future could be constructed, with site-specific impacts on environmental justice. The impacts could be similar to the proposed action if the location has a similar population distribution or at a site with a similar industrial process. Environmental justice impacts would be expected to be SMALL under most likely circumstances.

4.8.10 Noise Impacts

Under the no-action alternative, there would be no construction or operational activities or processes that would generate noise. Noise levels would remain as is currently observed at the site. Noise impacts would be expected to be SMALL.

Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and surrounding land uses, the likely noise impact would be similar to the proposed action. Noise impacts would be expected to be SMALL.

4.8.11 Transportation Impacts

Under the no-action alternative, traffic volumes and patterns would remain the same as described in the affected environment section. The current volume of radioactive material and chemical shipments would not increase. Transportation impacts would be expected to be SMALL.

Additional domestic enrichment facilities in the future could be constructed and would have transportation impacts that would be similar to those of the proposed action, depending on site conditions either at a new location or an existing industrial facility. Impacts to transportation would be expected to be SMALL to MODERATE.

4.8.12 Public and Occupational Health Impacts

Under the no-action alternative, the public health would remain the same as described in the affected environment section. No radiological exposures are estimated to the general public other than from background radiation levels. Local public and occupational health impacts would be expected to remain SMALL.

Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods and design of these facilities, the likely public and occupational health impacts from normal operations and accidents would be similar to the proposed action. Public and occupational health impacts for additional domestic enrichment facilities would be expected to be SMALL to MODERATE.

4.8.13 Waste Management Impacts

Under the no-action alternative, new wastes including sanitary, hazardous, low-level radioactive wastes, or mixed wastes would not be generated that would require disposition. Local impacts from waste management would be expected to remain SMALL.

Additional domestic enrichment facilities could be constructed in the future. Depending on the construction methods, design of these facilities, and the status of DUF_6 conversion facilities, the likely waste management impacts would be similar to the proposed action. For additional domestic enrichment facilities, impacts from waste management would be expected to be SMALL to MODERATE.

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5 MITIGATION MEASURES

Mitigation measures are those actions or processes (e.g., process controls and management plans) that would be implemented to control and minimize potential impacts from construction and operation activities. These measures are in addition to actions taken to comply with applicable laws and regulations (including permits). This chapter summarizes the mitigation measures that were proposed by Louisiana Energy Services (LES) for the proposed National Enrichment Facility (NEF). The proposed mitigation measures provided in this chapter do not include environmental monitoring activities. Environmental monitoring activities are described in Chapter 6 of this Environmental Impact Statement.

The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the mitigation measures proposed by LES for the proposed NEF and has concluded that no additional mitigation measures other than those proposed by LES are required. The NRC staff has determined that additional mitigation measures are not likely to be sufficiently beneficial to warrant implementation.

5.1 Mitigation Measures Proposed by LES

LES identified mitigation measures in the Environmental Report and in responses to requests for additional information that would reduce the environmental impacts associated with the proposed action (LES, 2005; Krich, 2005). Tables 5-1 and 5-2 list the mitigation measures impact areas. LES did not identify mitigation measures for the impact areas of socioeconomics and environmental justice during construction and operations. This does not preclude additional mitigation measures that may be considered by LES based upon consultations with regulatory agencies other than NRC.

Table 5-1 Summary of Potential Mitigation Measures Proposed by LES for Construction

Impact Area	Activity	Proposed Mitigation Measures
Land Use	Land disturbance	Use best management practices (BMPs) to develop the smallest area of the site as practicable and use water spray on roads to suppress dust. Limit site slopes to a horizontal-vertical ratio of three to one or less. Use sedimentation detention basins. Protect undisturbed areas with silt fencing and straw bales as appropriate. Use site stabilization practices such as placing crushed stone on top of disturbed soil in areas of concentrated runoff.
Geology and Soil	Soil disturbance	Use construction BMPs and comply with a fugitive dust control plan and a Spill Prevention, Control, and Countermeasures Plan. BMPs include: • Minimize construction footprint. • Use water to control dust. • Promptly stabilize or cover bare areas once earthmoving activities are completed. Use earthen berms, dikes, and sediment fences as necessary to

Impact Area	Activity	Proposed Mitigation Measures
Geology and Soil *(continued)*		limit suspended solids in runoff. Stabilize and line drainage culverts and ditches with rock aggregate/riprap to reduce flow velocity and prohibit scouring.
Water Resources	Runoff	Use BMPs for dust control, fill operations, erosion control measures, maintenance of equipment, stormwater runoff, and erosion controls.
		Use staging areas for materials and wastes and retention/detention basins to control runoff.
		Implement a Spill Prevention, Control, and Countermeasures Plan and a site Stormwater Pollution Prevention Plan.
		Berm all aboveground diesel storage tanks.
	Water use	Use low-water-consumptive landscaping techniques and install low-flow toilets, sinks, and showers and other efficient water-using equipment.
		Implement a waste management and recycling program to segregate and minimize industrial and hazardous waste.
Ecological Resources	Disturbance of habitats	Use construction BMPs to minimize the construction footprint and to control erosion, and manage stormwater including those associated with the construction of the water supply pipeline, construction of the natural gas pipeline, relocation of the carbon dioxide pipeline, and construction of the electric transmission lines.
		Use native, low-water-consumptive vegetation in restored and landscaped areas.
		Consult with New Mexico Department of Game and Fish on the design and use of animal-friendly fencing and netting or other suitable material over basins to prevent use by migratory birds.
		Consult with water supply utilities on the New Mexico Department of Game and Fish wildlife protection guidance.
		Minimize the number of open trenches at any given time and keep trenching and backfilling crews close together.
		Trench during the cooler months (when possible).
		Avoid leaving trenches open overnight. Construct escape ramps at least every 90 meters (295 feet) and make the slope of the ramps less than 45 degrees. Inspect trenches that are left open overnight and remove animals prior to backfilling.
		Consult with the electric utility responsible for the construction of the new transmission line to address New Mexico Department of Game and Fish and Edison Electric Institute guidance for the protection of birds.
Ecological		Consider down-shielding of security lights consistent with

Impact Area	Activity	Proposed Mitigation Measures
Resources *(continued)*		security plan requirements. Implement pest management controls for mosquitoes if significant population develops. Implement weed control if a significant intrusion develops.
Historical and Cultural Resources	Disturbance of prehistoric archaeological sites and sites eligible for listing on the National Register of Historic Places	Implement treatment plan developed in coordination with the NRC, the New Mexico State Historic Preservation Office, the State Land Office, Lea County, the Advisory Council on Historic Preservation, and affected Indian tribes for the sites eligible for listing on the National Register of Historic Places.
Air Quality	Fugitive dust and construction equipment emissions	Use BMPs for fugitive dust and for maintenance of vehicles and equipment to minimize air emissions. Implement “best available control measures” (identified in the Natural Events Action Plan being prepared by the New Mexico Environment Department Air Quality Bureau) as appropriate to the proposed NEF. In addition to those mitigative measures identified in Geology and Soil above: • Use covers over load beds of open-bodied trucks. • Promptly remove earthen material on paved roads.
Public and Occupational Health	Nonradiological effects from construction activities	Use BMPs and management programs associated with promoting safe construction practices.
Transportation	Traffic volume	Use construction BMPs to suppress dust by watering down roads as necessary and maintain temporary roads. Convert the temporary access roads into permanent access roads upon completion of the construction. Cover open-bodied trucks when in motion, stabilize or cover bare earthen areas, ensure prompt removal of earthen materials from paved areas, and use containment methods during excavation activities. Use shift work during construction, operation, and decommissioning to reduce traffic on roadways. Encourage car pooling to reduce the number of workers’ cars on the road.
Waste Management	Generation of industrial and	Use waste-staging areas to segregate and store wastes. Use BMPs that minimize the generation of solid waste.

Impact Area	Activity	Proposed Mitigation Measures
	hazardous wastes (air and liquid emissions in “Air Quality” and “Water Resources,” above)	Perform a waste assessment and develop and use a waste recycling plan for nonhazardous materials. Conduct employee training on the recycling program.
Visual and Scenic Resources	Potential visual intrusions in the existing landscape character	Use accepted natural, low-water-consumption landscaping techniques. Consider down-shielding of security lights consistent with security plan requirements. Conduct prompt revegetation or covering of bare areas.
Noise	Exposure of workers and the public to noise	Maintain in proper working condition the noise-suppression systems on construction vehicles. Promote use of hearing protection for workers.

Table 5-2 Summary of Potential Mitigation Measures Proposed by LES for Operations

Impact Area	Activity	Proposed Mitigation Measures
Land Use	Land disturbance	Stabilize bare areas with natural, low-water-maintenance landscaping and pavement.
Geology and Soil	Soil disturbance	Implement a Spill Prevention, Control, and Countermeasures Plan. Use water to control dust. Use permanent retention/detention basins to collect stormwater and process water. Stabilize bare areas with natural, low-water-maintenance landscaping and pavement.
Water Resources	Runoff	Use staging areas for materials and wastes and retention/detention basins to control runoff. Implement a Spill Prevention, Control, and Countermeasure Plan and a site Stormwater Pollution Prevention Plan during operation. Perform visual inspections of the basins on a sufficient basis for high water levels and to verify proper functioning. Implement corrective actions for high water levels as needed to prevent overflowing. Use low-water-consumptive landscaping techniques.
	Water use	
Water Resources *(continued)*		Building and maintenance practices designed to reduce water consumption.

Impact Area	Activity	Proposed Mitigation Measures
		Use closed-loop cooling systems.
Ecological Resources	Disturbance of habitats	Manage unused open areas (i.e., leave undisturbed), including areas of native grasses and shrubs for the benefit of wildlife. Conduct pest management and weed control if the presence of pest or weed intrusion is significant. Use native, low-water-consumptive vegetation in restored and landscaped areas. Use animal-friendly fencing and netting or other suitable material over basins to prevent use by migratory birds.
Historical and Cultural Resources	Disturbance of prehistoric archaeological sites and sites eligible for listing on the National Register of Historic Places	Implement treatment plan developed in coordination among the NRC, the New Mexico State Historic Preservation Office, the State Land Office, Lea County, the Advisory Council on Historic Preservation, and affected Indian tribes for the sites eligible for listing on the National Register of Historic Places.
Air Quality	Fugitive dust and construction equipment emissions	Implement "best available control measures" (identified in the Natural Events Action Plan being prepared by the New Mexico Environment Department Air Quality Bureau) as appropriate to the proposed NEF.
Waste Management	Generation of industrial, hazardous, radiological, and mixed wastes (air emissions are addressed under "Air Quality" on page 5-2, and liquid emissions are addressed under "Water Resources" on page 5-4)	Use a storage array that permits easy visual inspection of all cylinders, with uranium byproduct cylinders (UBCs) stacked no more than two high. Segregate the storage pad areas from the rest of the enrichment facility by barriers (e.g., vehicle guardrails). Prior to placing the UBCs on the UBC Storage Pad or transporting them offsite, inspect the cylinders for external contamination (a "wipe test") using a maximum level of removable surface contamination allowable on the external surface of the cylinder of no greater than 0.4 becquerel per square centimeter (22 disintegrations per minute per square centimeter) (beta, gamma, alpha) on accessible surfaces averaged over 300 square centimeters (46.5 square inches). Take steps to ensure that UBCs are not equipped with defective valves (identified in NRC Bulletin 2003-03, "Potentially Defective 1-Inch Valves for Uranium Hexafluoride Cylinders") (NRC, 2003).
Waste Management *(continued)*		Allow only designated vehicles with less than 280 liters (74 gallons) of fuel in the UBC Storage Pad area. Allow only trained and qualified personnel to operate vehicles on the UBC Storage Pad area.

Impact Area	Activity	Proposed Mitigation Measures
		Inspect cylinders of UF_6 prior to placing a filled cylinder on the UBC Storage Pad and annually inspect UBCs for damage or surface coating defects. Inspections would ensure: • Lifting points are free from distortion and cracking. • Cylinder skirts and stiffener rings are free from distortion and cracking. • Cylinder surfaces are free from bulges, dents, gouges, cracks, or significant corrosion. • Cylinder valves are fitted with the correct protector and cap. • Cylinder valves are straight and not distorted, two to six threads are visible, and the square head of the valve stem is undamaged. • Cylinder plugs are undamaged and not leaking. If inspection of a UBC reveals significant deterioration or other conditions that may affect the safe use of the cylinder, the contents of the affected cylinder shall be transferred to another cylinder and the defective cylinder shall be discarded. The root cause of any significant deterioration would be determined, and if necessary, additional inspections of cylinders shall be made. Monitor all site detention/retention basins. Use waste-staging areas to segregate and store wastes and volume reduce/minimize wastes through a waste management program and associated procedures. Use operating practices that minimize the generation of solid wastes, liquid wastes, liquid effluents, and gaseous effluents and that minimize energy consumption. Perform a waste assessment and develop and use a waste recycling plan for nonhazardous materials. Conduct employee training on the waste recycling program. Implement as-low-as-reasonably-achievable concepts and waste minimization and reuse techniques to minimize radioactive waste generation. Implement a Spill Prevention, Control, and Countermeasures Plan.

Impact Area	Activity	Proposed Mitigation Measures
Visual and Scenic Resources	Potential visual intrusions in the existing landscape character	Use accepted natural, low-water-consumption landscaping techniques. Consider down-shielding of security lights consistent with security plan requirements. Conduct prompt revegetation or covering of bare areas.
Noise	Exposure of workers and the public to noise	Maintain in proper working condition the noise-suppression systems on vehicles and any outdoor equipment. Promote use of hearing protection for workers.

5.2 References

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6 ENVIRONMENTAL MEASUREMENTS AND MONITORING PROGRAMS

This chapter describes the proposed monitoring program used to characterize and evaluate the environment, to provide data on measurable levels of radiation and radioactivity, and to provide data on principal pathways of exposure to the public at the proposed National Enrichment Facility (NEF) site in Lea County, New Mexico. The monitoring program is described in terms of radiological and physiochemical (i.e., chemical and meteorological properties that affect measurements) gaseous and liquid effluents, and ecological impacts from the proposed NEF operations.

Figure 6-1 shows the following proposed sampling and monitoring locations for gaseous and liquid effluents and groundwater (LES, 2005a):

- Sixteen thermoluminescent dosimeters along the site perimeter fence in the north, south, east, and west.

- Eight soil-sampling and vegetation-sampling locations along the site perimeter fence (north, south, east, and west).

- Three water/sediment-sampling locations:
  - The Site Stormwater Detention Basin.
  - The Uranium Byproduct Cylinder (UBC) Storage Pad Stormwater Retention Basin.
  - The Treated Effluent Evaporative Basin.

- Seven continuous airborne-particulate sampling locations:
  - Two samplers on the south side of the fenceline.
  - Sampler on the east side of the fenceline.
  - Sampler to the west at the nearest residential area.
  - Sampler to the north at the sand/aggregate quarry.
  - Sampler adjacent to the Treated Effluent Evaporative Basin.
  - Control sampler 16 kilometers (10 miles) to the southeast.

- Five groundwater monitoring wells:
  - Background groundwater monitoring well located on the northern boundary of the site.
  - Two monitoring wells located on the southern edge of the UBC Storage Pad.
  - Monitoring well located on the south side of the UBC Storage Pad Stormwater Retention Basin.
  - Monitoring well located on the southeastern corner of the Site Stormwater Detention Basin.

Radiological, physiochemical, and ecological monitoring may not occur at all of the locations shown in Figure 6-1, and sampling locations may change based on meteorological conditions and operations. The following sections describe the monitoring programs more fully.

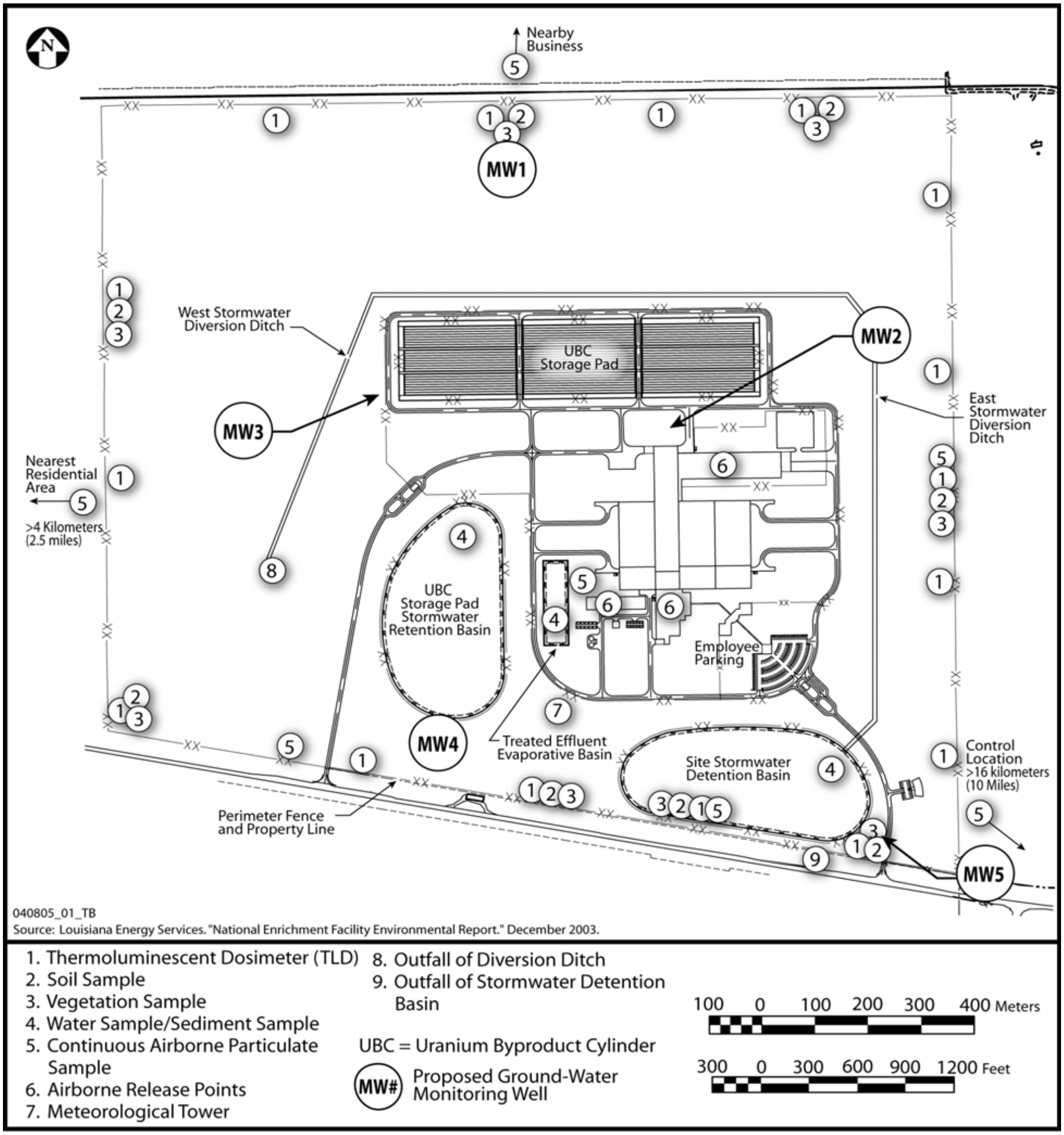

Figure 6-1 Proposed Sampling Stations and Monitoring Locations (LES, 2005a)

6.1 Radiological Monitoring

The proposed NEF would address radiological monitoring through two programs: the Effluent Monitoring Program and the Radiological Environmental Monitoring Program. The Effluent Monitoring Program would address the monitoring, recording, and reporting of data for radiological contaminants being emitted from specific emission points such as an airborne release stack or liquid waste outfall. The Radiological Environmental Monitoring Program would address the monitoring of the general environmental impacts (i.e., soil, sediment, groundwater, ecology, and air) within and outside the proposed NEF site boundary. The following subsections provide information on the two radiological monitoring programs.

6.1.1 Effluent Monitoring Program

The U.S. Nuclear Regulatory Commission (NRC) requires that a radiological monitoring program be established by the proposed NEF to monitor and report the release of radiological air and liquid effluents to the environment. Table 6-1 lists the guidance documents that apply to the radiological monitoring program.

Table 6-1 Guidance Documents that Apply to the Radiological Monitoring Program

Document	Applicable Guidance
Regulatory Guide 4.15[1]	"Quality Assurance for Radiological Monitoring Programs (Normal Operations) - Effluent Streams and the Environment." This guide describes a method acceptable to the NRC for designing a program to ensure the quality of the results of measurements for radioactive materials in the effluents and the environment outside of nuclear facilities during normal operations.
Regulatory Guide 4.16[2]	"Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants." This guide describes a method acceptable to the NRC for submitting semiannual reports that specify the quantity of each principal radionuclide released to unrestricted areas to estimate the maximum potential annual dose to the public resulting from effluent releases.

[1] NRC, 1979.
[2] NRC, 1985.

Public exposure to radiation from routine operations at the proposed NEF could occur due to the following releases (LES, 2005a):

- Controlled releases of liquid and gaseous effluents from stacks and evaporation ponds.
- Uncontrolled liquid and gaseous releases due to accidents.
- Controlled liquid and gaseous releases from the uranium enrichment equipment during decontamination and maintenance of equipment.
- Transportation and temporary storage of uranium hexafluoride (UF_6) feed cylinders, product cylinders, and UBCs.

Of these potential release pathways, discharge of gaseous effluents would be considered the principal release pathway. Chapter 4 of this Environmental Impact Statement (EIS) presents the impacts from the assessment of the potential release pathways.

Compliance with Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) § 20.1301 would be demonstrated using a calculation of the total effective dose equivalent (TEDE) to the individual who would be likely to receive the highest dose in accordance with 10 CFR § 20.1302(b)(1). Regulatory Guide 1.109 (NRC, 1977) describes the methodology to be used for determining the TEDE. The dose conversion factors used in the models would be obtained from Federal Guidance Report numbers 11 (EPA, 1988) and 12 (EPA, 1993).

Administrative action levels are established for effluent samples and monitoring instrumentation as an additional step in the effluent control process. All action levels are sufficiently low so as to permit implementation of corrective actions before regulatory limits are exceeded. Effluent samples that exceed the action level are cause for an investigation into the source of elevated radioactivity. Radiological analyses would be performed more frequently on ventilation air filters if there is a significant increase in gross radioactivity or when a process change or other circumstances cause significant changes in radioactivity concentrations. Additional corrective actions would be implemented based on the level, automatic shutdown programming, and operating procedures to be developed in the detailed alarm design. Under routine operating conditions, radioactive material in effluent discharged from the facility would comply with regulatory release criteria.

Compliance with action levels would be demonstrated through effluent and environmental sampling data. If an accidental release of uranium would occur, then routine operational effluent data and environmental data would be used to assess the extent of the release. Processes would be designed to include, when practical, provisions for automatic shutdown in the event action levels were exceeded. In other cases, manual shutdown could be necessary as specified in the proposed NEF operating procedures.

The NEF Quality Assurance Program would oversee the Effluent Monitoring Program and audits would be conducted on a regular basis. Written procedures would be in place to ensure the collection of representative samples; use of appropriate sampling methods and equipment; establishment of proper locations for sampling points; and proper handling, storage, transport, and analyses of effluent samples. The NEF's written procedures would address the maintenance and calibration of sampling and measuring equipment, including ancillary equipment such as airflow meters at regular intervals. The Effluent Monitoring Program procedures would also address functional testing and routine checks to demonstrate that monitoring and measuring instruments are in working condition. Employees involved in implementing this program would be trained in the program procedures (LES, 2005a).

6.1.1.1 Gaseous Effluent Monitoring

All potentially radioactive effluents from the proposed NEF would be discharged through monitored pathways. As required by 10 CFR Part 70, effluent sampling procedures would be designed in a manner that allows determination of the quantities and concentrations of radionuclides discharged to the environment. The uranium isotopes uranium-238 (^{238}U), uranium-236 (^{236}U), uranium-235 (^{235}U), and uranium-234 (^{234}U) would be expected to be the prominent radionuclides in the gaseous effluent. The annual uranium source term for routine gaseous effluent releases from the proposed NEF would be 8.9 megabecquerels (240 microcuries) per year. This value (8,886 kilobecquerels per year, or 240 microcuries per year) would be conservative because it is approximately 35 times larger than the expected gaseous source term of 253.1 kilobecquerels per year (6.84 microcuries per year)) as identified in Table 4-10 of this EIS.

Representative samples would be collected from each release point of the proposed NEF. Uranium compounds expected in the proposed NEF gaseous effluent could include depleted hexavalent uranium, triuranium octaoxide (U_3O_8), and uranyl fluoride (UO_2F_2). Effluent data would be maintained, reviewed, and assessed by the NEF Radiation Protection Manager to ensure that gaseous effluent discharges comply with regulatory release criteria for uranium. Table 6-2 provides an overview of the Gaseous Effluent Sampling Program (LES, 2005a).

Table 6-2 Gaseous Effluent Sampling Program

Location	Sampling and Collection Frequency	Type of Analysis
Separations Building GEVS Stack TSB GEVS Stack TSB HVAC Stack CAB Stack	Continuous Air Particulate Filter	Gross Beta/Gross Alpha - Weekly Isotopic Analysis[a] - Quarterly
Process Areas[b]	Continuous Air Particulate Filter[b]	Isotopic Analysis[a]
Nonprocess Areas[b]	Continuous Air Particulate Filter[b]	Isotopic Analysis[a]

[a] Isotopic analysis for ^{234}U, ^{235}U, ^{236}U, and ^{238}U.
[b] As required to complement the bioassay program.
CAB - Centrifuge Assembly Building.
GEVS - Gaseous Effluent Vent System.
TSB - Technical Services Building.
HVAC - Heating Ventilation and Air Conditioning.
Source: LES, 2005a.

When sampling particulate matter within ducts with moving airstreams, sampling conditions within the sample probe would be maintained to simulate as closely as possible the conditions in the duct. The applicable criteria for sampling airborne effluents would be conducted in accordance with ANSI/HPS N13.1-1999 (ANSI/HPS, 1999), as required by 40 CFR § 60.107. These criteria include approaches to ensure that representative samples are obtained (LES, 2005b).

Particle size distributions would be determined from process knowledge or measured to estimate and compensate for sample line losses and momentary conditions not reflective of airflow characteristics in the duct. Sampling equipment (pumps, pressure gages, and airflow calibrators) would be calibrated by qualified individuals. All airflow and pressure-drop calibration devices (e.g., rotometers) would be calibrated periodically using primary or secondary airflow calibrators (wet test meters, dry gas meters, or displacement bellows). Secondary airflow calibrators would be calibrated annually by the manufacturer(s). Air-sampling train flow rates would be verified and/or calibrated with tertiary airflow calibrators (rotometers) each time a filter is replaced or a sampling train component is replaced or modified. Sampling equipment and lines would be inspected for defects, obstructions, and cleanliness. Calibration intervals would be developed based on applicable standards (LES, 2005a; LES, 2005b).

Gaseous effluent from the proposed NEF that has the potential for airborne radioactivity would be discharged from the following facilities (LES, 2005a; LES, 2005c):

- *The Separations Building Gaseous Effluent Vent System.* This system would discharge to a stack on the Technical Services Building roof. The Separations Building Gaseous Effluent Vent System would provide for continuous monitoring and periodic sampling of the gaseous effluents in the exhaust stack. The stack-sampling system would provide the required samples. The exhaust stack would be equipped with monitors for alpha radiation. In addition, gamma monitors would be used within the Gaseous Effluent Vent System to monitor the accumulation of ^{235}U. The alpha/gamma monitors and their specifications would be selected in the final design.

- *The Technical Services Building Gaseous Effluent Vent System.* This system would be used to monitor gaseous effluents from the Chemical Laboratory, the Mass Spectroscopy Laboratory, and the Vacuum Pump Rebuild Workshop. The Technical Services Building Gaseous Effluent Vent System would provide filtered exhaust for potentially hazardous contaminants via fume hoods for these facilities. The gaseous effluent would include argon effluent from an inductively coupled plasma-mass spectrometer that would be used to analyze for uranium in liquid samples. The Technical Services Building Gaseous Effluent Vent System would discharge to an exhaust stack on the Technical Services Building roof and would provide for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack. This stack-sampling system would provide the required samples. The exhaust stack would contain monitors for alpha radiation (LES, 2005a). In addition, gamma monitors would be used within the Gaseous Effluent Vent System to monitor the accumulation of ^{235}U.

- *The Centrifuge Test and Postmortem Facilities Exhaust Filtration System.* This system would discharge through a stack on the Centrifuge Assembly Building. The Centrifuge Test and Postmortem Facilities Exhaust Filtration stack-sampling system would provide for continuous monitoring and periodic sampling of the gaseous effluent in the exhaust stack. The exhaust stack would contain monitors for alpha radiation.

- *Portions of the Technical Services Building Heating, Ventilating, and Air-Conditioning System*. For the portions of the Technical Services Building Heating, Ventilating, and Air-Conditioning System that provide the confinement ventilation function for areas of the Technical Services Building with the potential for contamination (i.e., Decontamination Workshop, Cylinder Preparation Room, and the Ventilated Room), this system would maintain the room temperature in various areas of the Technical Services Building, including some potentially contaminated areas. The confinement ventilation function of the Technical Services Building heating, ventilating, and air-conditioning system would maintain a negative pressure in the above rooms and would discharge the gaseous effluent to an exhaust stack on the Technical Services Building roof near the Gaseous Effluent Vent System. The stack-sampling system would provide for continuous monitoring and periodic sampling of gaseous effluents from the rooms served by the Technical Services Building heating, ventilating, and air-conditioning confinement ventilation function.

- *The Environmental Laboratory in the Technical Services Building and the Cylinder Receipt and Dispatch Building.* Gaseous effluent from these two facilities would be expected to be very low and would not be removed and filtered through vent/exhaust systems. Quarterly samples would be taken from these facilities to demonstrate that these grab samples would be representative of actual releases from the proposed NEF, in accordance with Regulatory Guide 4.16.

- *The Mechanical, Electrical, and Instrumentation Workshop in the Technical Services Building*. This workshop is designed to provide space for the normal maintenance of uncontaminated plant equipment and would contain no process confinement systems and no radioactive material in dispersable form. However, during the final design phase, Louisiana Energy Services (LES) would evaluate the workshop using Regulatory Guide 4.16 (NRC, 1985).

During the final design phase for the proposed NEF, facilities would be evaluated in accordance with Regulatory Guide 4.16 (NRC, 1985). Using the results of this evaluation, periodic sampling or continuous sampling provisions, as appropriate, would be implemented in accordance with Regulatory Guide 4.16 (LES, 2005c).

A minimum detectable concentration of 3.7×10^{-11} becquerels per milliliter (1.0×10^{-15} microcuries per milliliter) would be required (NRC, 2002) for all gross alpha analyses performed on gaseous effluent samples. This value would represent less than 2 percent of the limit for any uranium isotope (the regulatory requirement is less than 5 percent of the limit for any uranium isotope as stated in 10 CFR Part 20) (LES, 2005a). Table 6-3 summarizes detection requirements for gaseous effluent sample analyses. Minimum detectable concentration values would be less than administrative action levels.

Table 6-3 Minimum Detectable Concentration Values for Gaseous Effluents

Nuclide	Minimum Detectable Concentration bequerels per milliliter (microcuries per milliliter)
^{234}U	3.7×10^{-13} (1.0×10^{-17})
^{235}U	3.7×10^{-13} (1.0×10^{-17})
^{236}U	3.7×10^{-13} (1.0×10^{-17})
^{238}U	3.7×10^{-11} (1.0×10^{-15})
Gross Alpha	3.7×10^{-11} (1.0×10^{-15})

Source: LES, 2005a.

6.1.1.2 Liquid Effluent Monitoring

LES would perform periodic visual inspections of the proposed NEF basins to identify high water levels and verify proper functioning. The visual inspections would be performed on a frequency sufficient to allow for identification of basin high-water-level conditions and implementation of corrective actions to restore the water level of the applicable basin(s) prior to potential overflowing. Liquid effluents to be generated at the proposed NEF would contain low concentrations of radioactive material consisting mainly of spent decontamination solutions, floor washings, liquid from the laundry, and evaporator flushes. Table 6-4 provides estimates of the expected annual volume and radioactive material content in liquid effluents by source prior to processing.

Potentially contaminated liquid effluent would be routed to the Liquid Effluent Collection and Treatment System for treatment. Most of the radioactive material would be removed from wastewater in the Liquid Effluent Collection and Treatment System through a combination of precipitation, evaporation, and ion exchange. Post-treatment liquid wastewater would be sampled and undergo isotopic analysis prior to discharge to ensure that the released concentrations were below the concentration limits established in Table 3 of Appendix B to 10 CFR Part 20.

After treatment, the effluent would be released to the double-lined Treated Effluent Evaporative Basin, which would have a leak-detection monitoring system comprised of leak-detection piping located between the two liners. The piping would lead to a sump that would be equipped with a level monitor that would alert staff if water levels in the sump indicate a possible leak (LES, 2005a). Chapter 2 of this EIS describes the leak-detection system in more detail. Concentrated radioactive solids generated by the liquid treatment processes at the proposed NEF would be handled and disposed of as low-level radioactive waste.

Table 6-4 Estimated Uranium in Pre-Treated Liquid Waste from Various Sources

Source	Typical Annual Quantities cubic meters (gallons)	Typical Annual Uranic Content kilograms (pounds)*
Laboratory/Floor Washings/ Miscellaneous Condensates	23 (6,112)	16 (35)
Degreaser Water	4 (980)	18.5 (41)
Citric Acid	3 (719)	22 (49)
Laundry Effluent Water	406 (107,213)	0.2 (0.44)
Hand Wash and Shower Water	2,100 (554,820)	N/A
Total	2,535 (669,844)	56.7 (125)

* Uranic quantity before treatment. After treatment, approximately 1 percent, or 0.57 kilogram (1.26 pounds), of uranic material would be expected to be discharged into the Treated Effluent Evaporative Basin.
Source: LES, 2005a.

The amount of uranium in routine liquid effluent discharge to the Treated Effluent Evaporative Basin would be 14.4 megabecquerels (389 microcuries) per year. Release of liquid radiological effluents to unrestricted areas would not occur (LES, 2005a).

Representative liquid samples would be collected from each liquid batch and analyzed prior to any transfer to the Treated Effluent Evaporative Basin. Isotopic analysis would be performed prior to discharge. Table 6-5 shows the minimum detectable concentrations for analysis of liquid effluent. Tank agitators and recirculation lines would be used to help ensure the sample would be representative of the batch. All collection tanks would be sampled before the contents would be sent through any treatment process. Treated water would be collected in monitoring tanks that would be sampled before discharge to the Treated Effluent Evaporative Basin (LES, 2005a).

Table 6-5 Minimum Detectable Concentration Values for Liquid Effluents

Nuclide	Minimum Detectable Concentration bequerels per milliliter (microcuries per milliliter)
^{234}U	1.4×10^{-4} (3.0×10^{-9})
^{235}U	1.4×10^{-4} (3.0×10^{-9})
^{236}U	1.4×10^{-4} (3.0×10^{-9})
^{238}U	1.4×10^{-4} (3.0×10^{-9})

Source: LES, 2005a.

In addition, each of the six septic tanks that would process sanitary wastes would be sampled (prior to pumping to the leach field) and analyzed for isotopic uranium. While no plant-process-related effluents would be introduced into the septic systems, sampling of the septic systems would help mitigate any unexpected release of isotopic uranium to the soils (LES, 2005a).

NRC Information Notice 94-07 describes the method for determining solubility of discharged radioactive materials (NRC, 1994). At the proposed NEF, insoluble uranium would be removed from liquid effluents as part of the treatment process. Releases would be in accordance with the as low as reasonably achievable (ALARA) principle (LES, 2005a).

General site stormwater runoff would be routed to the Site Stormwater Detention Basin. The UBC Storage Pad Stormwater Retention Basin would collect rainwater from the UBC Storage Pad as well as cooling tower and heating boiler blowdown water. The two basins would be expected to collect approximately 174,100 cubic meters (46 million gallons) of stormwater each year, and both would be included in the site's Radiological Environmental Monitoring Program as described below (LES, 2005a).

6.1.2 Radiological Environmental Monitoring Program

The Radiological Environmental Monitoring Program would provide an additional monitoring system to the effluent monitoring program to perform the following activities:

- Establish a process for collecting data for assessing radiological impacts on the environment.
- Estimate the potential impacts to the public.
- Support the demonstration of compliance with applicable radiation protection standards and guidelines.

During the course of proposed NEF operations, revisions to the Radiological Environmental Monitoring Program (including changes to sampling locations) could be necessary and appropriate to ensure reliable sampling and collection of environmental data. The proposed NEF would document the rationale and actions behind such revisions to the program and report the changes to the appropriate regulatory agency as required by the NRC license. Radiological Environmental Monitoring Program sampling would focus on locations within 4.8 kilometers (3 miles) of the proposed NEF. Control sites at distant locations would also be monitored, such as one for particulate air concentrations (LES, 2005a). Sampling locations would be based on NRC guidance found in NUREG-1302, "Offsite Dose Calculation Manual Guidance: Standard Radiological Effluent Controls for Boiling Water Reactors" (NRC, 1990); meteorological information; and current land use.

6.1.2.1 Sampling Program

Representative samples from various environmental media would be collected and analyzed for the presence of radioactivity associated with the proposed NEF operations. Table 6-6 summarizes the types and frequency of sampling and analyses (Table 6-2 shows the sampling protocol for airborne particulates). Environmental media identified for sampling would consist of ambient air, groundwater, soil/sediment, and vegetation. All environmental samples would be analyzed onsite or shipped to a qualified independent laboratory for analyses.

Table 6-7 shows the minimum detectable concentrations for gross alpha and isotopic uranium in various environmental media that would be required.

The Radiological Environmental Monitoring Program would include the collection of data during pre-operational years to establish baseline radiological information that would be used to determine and evaluate impacts from operations at the proposed NEF on the local environment. The Radiological Environmental Monitoring Program would be initiated at least two years prior to the proposed NEF operations to develop a baseline. Radionuclides in environmental media would be identified using technically appropriate, accurate, and sensitive analytical instruments. Data collected during the operational years would be compared to the baseline generated by the pre-operational data. Such comparisons would provide a means of assessing the magnitude of potential radiological impacts on members of the public and the environment and in demonstrating compliance with applicable radiation protection standards (LES, 2005a).

Table 6-6 Radiological Sampling and Analysis Program

Sample Type	Location	Sampling and Collection Frequency	Type of Analysis
Continuous Airborne Particulate	Seven locations along fenceline and in the region of influence.	Continuous operation of air sampler with sample collection as required by dust loading but at least biweekly. Quarterly composite samples by location.	Gross beta/gross alpha analysis each filter change. Quarterly isotopic analysis on composite sample.
Vegetation/Soil Analyses	Eight locations along fenceline.	For each vegetation and soil sample, 1 to 2 kilograms (2.2 to 4.4 pounds). Samples collected semiannually.	Isotopic analysis[a].
Groundwater	Five wells.	Samples (4 liters [1.1 gallons]) collected semiannually.	Isotopic analysis[a].
Thermoluminescent Dosimeters	Sixteen locations along fenceline.	Samples collected quarterly.	Gamma and neutron dose equivalent.
Stormwater	• Site Stormwater Detention Basin • UBC Storage Pad Stormwater Retention Basin • Treated Effluent Evaporative Basin	Water sample 4 liters (1.1 gallons). Sediment samples 1 to 2 kilograms (2.2 to 4.4 pounds). Samples collected quarterly.	Isotopic analysis[a].
Septic Tanks	One from each affected tank.	1 to 2 kg (2.2 to 4.4 lbs) sludge samples collected from each affected tank prior to pumping sludge from the tanks.	Isotopic analysis[a].

[a] Isotopic Analysis for ^{234}U, ^{235}U, ^{236}U, and ^{238}U.
Source: LES, 2005a.

Table 6-7 Required Minimum Detectable Concentrations for Environmental Sample Analyses

Medium	Analysis	Minimum Detectable Concentrations becquerels per milliliter (microcuries per milliliter)
Ambient air	Gross alpha	3.7×10^{-14} (1.0×10^{-18})
Vegetation	Isotopic uranium	3.7×10^{-6} (1.0×10^{-10})
Soil/sediment	Isotopic uranium	1.1×10^{-2} (3.0×10^{-7})
Groundwater	Isotopic uranium	3.7×10^{-8} (1.0×10^{-12})

Source: LES, 2005a.

Atmospheric radioactivity monitoring would be based on plant-design data, demographic and geologic data, meteorological data, and land use data. Because operational releases would be very low and subject to rapid dilution via dispersion, distinguishing plant-related uranium from background uranium already present in the site environment would be difficult. The gaseous effluent would be released from either rooftop discharge points or from the Treated Effluent Evaporative Basin as resuspended airborne particles that would result in ground-level releases. A characteristic of ground-level plumes would be that plume concentrations decrease continually as the distance from the release point increases; therefore, the impact at locations close to the release point would be greater than at more distant locations. The concentrations of radioactive material in gaseous effluents from the proposed NEF would be very low concentrations of uranium because of process and effluent controls. Air samples collected at locations close to the proposed NEF site would provide the best opportunity to detect and identify plant-related radioactivity in the ambient air; therefore, air monitoring would be performed at the plant perimeter fence or the plant property line.

Air-monitoring stations would be situated along the site boundary locations based on prevailing meteorological conditions (i.e., wind direction) and at nearby residential areas and businesses. In addition, an air-monitoring station would be located next to the Treated Effluent Evaporative Basin to measure for particulate radioactivity that would be resuspended into the air from sediment layers when the basin is dry (LES, 2005a). A control sample location would be established approximately 16 kilometers (10 miles) upwind from the proposed NEF. All environmental air samplers would operate on a continuous basis with sample retrieval for a gross alpha and beta analysis occurring on a biweekly basis (or as required by dust loads) (LES, 2005a).

Vegetation and soil samples from onsite and offsite locations would be collected on a quarterly basis beginning at least two years prior to startup to establish a baseline. During the operational years, vegetation and soil sampling would be performed semiannually in eight sectors surrounding the proposed NEF site, including three with the highest predicted atmospheric deposition in the prevailing wind direction. Vegetation samples could include vegetables and grass, depending on availability. Soil samples would be collected in the same vicinity as the vegetation samples (LES, 2005a).

Groundwater samples from onsite monitoring well(s) would be collected semiannually for radiological analysis. The background groundwater monitoring well (MW1), as shown in Figure 6-1, would be located on the northern boundary of the proposed NEF site, between the proposed NEF and Wallach Concrete, Inc. This location would be up-gradient of the proposed NEF and cross-gradient from the

Waste Control Specialists facility. The other four monitoring wells would be located within the proposed NEF site. All of the monitoring well locations would be based on the slope of the red bed surface at the base of the shallow sand and gravel layer, the groundwater gradient in the 67-meter (220-foot) groundwater zone under the proposed NEF site, and in proximity to key site structures.

The monitoring wells would monitor groundwater in the sand and gravel layer at the 67-m (220-ft) zone. This groundwater zone is not considered an aquifer (it does not transmit significant quantities of water under ordinary hydraulic gradients), but it is the closest occurrence of groundwater beneath the proposed NEF site. It is possible that the background monitoring well MW1 could become contaminated from operations associated with Wallach Concrete, Inc., and Sundance Services, Inc. These two facilities process “produced water” in lagoons that could infiltrate the ground to the groundwater. Contaminants of concern from these two facilities would primarily be hydrocarbons. The proposed NEF would not emit hydrocarbons in quantities that would be detectable so any contamination found in the NEF groundwater wells would be readily differentiated from any offsite sources (LES, 2005a).

Sediment samples would be collected semiannually from both of the stormwater runoff detention/ retention basins onsite to look for any buildup of uranic material being deposited. With respect to the Treated Effluent Evaporative Basin, measurements of the expected accumulation of uranic material into the sediment layer would be evaluated along with nearby air-monitoring data to assess any observed resuspension of particles into the air.

Direct radiation in offsite areas from processes inside the proposed NEF building would be expected to be minimal because the low-energy radiation associated with the uranium would be shielded by the process piping, equipment, and cylinders to be used at the proposed NEF site. However, the UBCs stored on the UBC Storage Pad could more directly impact public exposures due to direct and scatter (skyshine) radiation. The conservative evaluation found in Chapter 4 of this EIS showed that an annual dose equivalent of < 0.2 millisievert (20 millirem) would be expected at the highest impacted area at the proposed NEF perimeter fence. Because the offsite dose equivalent rate from stored UBCs would be very low and difficult to distinguish from the variance in normal background radiation beyond the site boundary, compliance would be demonstrated by NEF by relying on a system that combines direct-dose-equivalent measurements and computer modeling to extrapolate the measurements (LES, 2005a).

Environmental thermoluminescent dosimeters placed at the plant perimeter fenceline or other location(s) close to the UBCs would provide quarterly direct-dose-equivalent information. The direct dose equivalent at offsite locations would be estimated through extrapolation of the quarterly thermoluminescent dosimeter data using the Monte Carlo N-Particle computer program or a similar computer program (ORNL, 2000).

10 CFR Part 70.59 requires that LES submit a semi-annual report to the NRC that specifies the quantity of each of the principal radionuclides released to unrestricted areas in liquid and gaseous effluents during the previous six months of operation. In addition, the semi-annual report will specify such other information as the Commission may require to estimate maximum potential annual radiation doses to the public resulting from effluent releases in compliance with 10 CFR § 20.1301. The proposed NEF would perform the estimate by calculating the TEDE of an individual who would be likely to receive the annual highest dose as specified by 10 CFR § 20.1302(b)(1). Computer codes would be used that have undergone validation and verification, and they would follow the methodology for pathway modeling described in the NRC Regulatory Guide 1.109, “Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I” (NRC, 1977). Dose-conversion factors to be used in the computer models would be those presented in Federal Guidance Reports numbers 11 and 12 (LES, 2005a). In addition to the regulatory requirements,

LES plans to monitor trends in radiological effluent releases through monthly dose projections to members of the public. These dose projections will assist in ensuring that the annual dose to members of the public would not exceed the as-low-as-reasonably-achievable constraint of 0.1 millisievert (10 millirem) per year in accordance with 10 CFR § 20.1101(d) (LES, 2005d).

6.1.2.2 Procedures

Monitoring procedures would employ well-known, acceptable analytical methods and instrumentation. The instrument maintenance and calibration program would comply with manufacturers recommendations. The onsite laboratory and any contractor laboratory used to analyze the NEF samples would participate in third-party laboratory intercomparison programs appropriate to the media and analyses being measured. The following are examples of these third-party programs:

- The U.S. Department of Energy (DOE) Mixed Analyte Performance Evaluation Program and DOE Quality Assurance Program.

- Analytics, Inc., Environmental Radiochemistry Cross-Check Program.

The proposed NEF would require that all radiological and nonradiological laboratory vendors are certified by the National Environmental Laboratory Accreditation Program or an equivalent State laboratory accreditation agency for the analytes being tested (LES, 2005a).

The Radiological Environmental Monitoring Program would fall under the oversight of the proposed NEF's Quality Assurance Program. Quality assurance procedures would be implemented to ensure representative sampling, proper use of appropriate sampling methods and equipment, proper locations for sampling points, and proper handling, storage, transport, and analyses of effluent samples. In addition, written procedures would ensure that sampling and measuring equipment, including ancillary equipment such as airflow meters, would be properly maintained and calibrated at regular intervals according to manufacturer recommendations. The implementing procedures would include functional testing and routine checks to demonstrate that monitoring and measuring instruments are in working condition. Audits would be periodically conducted as part of the Quality Assurance Program (LES, 2005a).

The quality control procedures used by the analytical laboratories would conform with the guidance in Regulatory Guide 4.15 (NRC, 1979). These quality control procedures would include the use of established standards such as those provided by the National Institute of Standards and Technology as well as standard analytical procedures such as those established by the National Environmental Laboratory Accreditation Conference (LES, 2005a).

6.1.2.3 Reporting

Reporting procedures would comply with the requirements of 10 CFR § 70.59 and the guidance specified in Regulatory Guide 4.16 (NRC, 1985). Each year, the proposed NEF would submit a summary report of the Environmental Sampling Program to the NRC. The NRC would place this report (and all other relevant information pertaining to environmental sampling) on the NRC's web site to make it available to the public. The report would include the types, numbers, and frequencies of environmental measurements and the identities and activity concentrations of proposed NEF-related nuclides found in environmental samples. The minimum detectable concentrations for the analyses and the error associated with each data point would also be included. Significant positive trends in activities would be noted in the report along with any adjustment to the program, unavailable samples, and deviation from the sampling program. Monitoring reports in which the quantities are estimated on the basis of methods other than direct measurement would include an explanation and justification of how the results were obtained (LES, 2005a).

6.2 Physiochemical Monitoring

The primary objective of physiochemical monitoring would be to provide verification that the operations at the proposed NEF do not result in detrimental chemical impacts on the environment. Effluent controls, which are discussed in Chapters 2 and 4 of this EIS, would be in place to ensure that chemical concentrations in gaseous and liquid effluents are maintained within applicable limits. In addition, physiochemical monitoring would provide data to confirm the effectiveness of effluent controls. The physiochemical monitoring program would comply with the pertinent regulations/permits issued by Federal and State agencies.

LES would establish administrative action levels, as described below, for effluent sampling and monitoring as an additional step in the effluent control process (LES, 2005a). Action levels would be divided into the following three priorities:

1. The sample parameter is three times the normal background level.
2. The sample parameter exceeds any existing administrative limits.
3. The sample parameter exceeds any regulatory limits.

For the first two priorities, LES would initiate steps for the exceedance of an administrative action level to increase monitoring, review operations that could lead to the increased release, restrict personnel access near the release locations, and implement corrective measures that would reduce the releases to below the administrative action levels. The third priority represents the worst case scenario that would be prepared for but would not be expected. Corrective actions for the third priority would be implemented to ensure that the cause for the action level exceedance would be identified and immediately corrected; applicable regulatory agencies would be notified, if required; communications to address lessons learned would be made to appropriate personnel; and applicable procedures would be revised accordingly, if needed. All action plans would be commensurate to the severity of the exceedance. Under routine operating conditions, the impact analyses in Chapter 4 of this EIS show that radioactive material in effluents discharged from the proposed NEF would comply with the regulatory release criteria (LES, 2005a).

Administrative action levels would be implemented prior to the proposed NEF operation to ensure that chemical discharges would remain below the limits specified in the proposed NEF discharge permits. The limits would be specified in the U.S. Environmental Protection Agency (EPA) Region 6 National Pollutant Discharge Elimination System (NPDES) General Discharge Permits as well as the New Mexico Environment Department Water Quality Bureau Groundwater Discharge Permit/Plan (LES, 2005a).

Chapters 2 and 4 of this EIS provide specific information regarding the source and characteristics of all nonradiological plant effluents and wastes that would be collected and disposed of offsite or discharged in various effluent streams.

In conducting physiochemical monitoring, sampling protocols and emission/effluent monitoring would be performed for routine operations with provisions for additional evaluation in response to a potential accidental release (LES, 2005a).

The proposed NEF would use the Environmental Monitoring Laboratory, located in the Technical Services Building, to analyze solid, liquid, and gaseous effluents. This laboratory would be equipped with analytical instruments needed to ensure that the operation of the plant activities complies with

Federal, State, and local environmental regulations and requirements. Compliance would be demonstrated by monitoring and sampling at various plant and process locations, analyzing the samples, and reporting the results of these analyses to the appropriate agencies. The sampling/monitoring locations would be selected by the Health, Safety and Environmental organization staff in accordance with proposed NEF permits and good sampling practices. Constituents to be monitored would be identified in environmental permits obtained for the proposed NEF operations (LES, 2005a).

The Environmental Monitoring Laboratory would be available to perform analyses on air, water, soil, flora, and fauna samples obtained from designated areas around the plant. In addition to its environmental and radiological capabilities, the Environmental Monitoring Laboratory would also be capable of performing bioassay analyses when necessary. Offsite commercial laboratories could also be contracted to perform bioassay analyses. Monitoring procedures would employ well-known acceptable analytical methods and instrumentation. The instrument maintenance and calibration program would comply with manufacturer recommendations. LES would ensure that the onsite laboratory and any contractor laboratory used to analyze proposed NEF samples participate in third-party laboratory intercomparison programs appropriate to the media and analytes being measured (LES, 2005a).

Results of process sample analyses would be used to verify that process parameters would be operating within expected performance ranges. Results of liquid effluent sample analyses would be characterized to determine if treatment would be required prior to discharge to the Treated Effluent Evaporative Basin and if corrective action would be required in proposed NEF process and/or effluent collection and treatment systems (LES, 2005a).

All waste liquids, solids, and gases from enrichment-related processes and decontamination operations would be analyzed and/or monitored for chemical contamination to determine safe disposal methods and/or further treatment requirements (LES, 2005a).

6.2.1 Effluent Monitoring

Chemical constituents discharged to the environment in proposed NEF effluents would be below concentrations that have been established by State and Federal regulatory agencies as protective of the public health and the natural environment. Under routine operating conditions, no significant quantities of contaminants would be released from the proposed NEF. LES would confirm this through monitoring and collection and analysis of environmental data (LES, 2005a). The exhaust stacks for the gaseous effluent vent systems and the exhaust filtration system for the Centrifuge Test and Postmortem Facilities would be equipped with monitors for hydrogen fluoride. Hydrogen fluoride monitors would have a range of 0.04 to 50 milligrams per cubic meter (2×10^{-9} to 3×10^{-6} pounds per cubic foot) and a lower detection limit of 0.04 milligrams per cubic meter (2×10^{-9} pounds per cubic foot).

Chapter 2 of this EIS lists routine liquid effluents from the proposed NEF. The proposed NEF would not directly discharge any industrial effluents to surface waters or grounds offsite, and there would be no plant tie-in to a publicly owned treatment works. Except for discharges from the septic systems, all liquid effluents would be contained on the proposed NEF site via collection tanks and detention/retention basins. Annual chemical sampling of the septic systems would be based on the approval of the Groundwater Discharge Permit by New Mexico Environment Department Water Quality Bureau for total Kjeldahl nitrogen, nitrate, total dissolved solids, and chloride.

Parameters for continuing environmental performance would be developed from the baseline data collected during pre-operational sampling. In addition, operational monitoring surveys would be conducted using sampling sites at frequencies established from baseline sampling data and based on requirements contained in EPA Region 6 NPDES General Discharge Permits as well as the Groundwater Discharge Permit/Plan (LES, 2005a).

The frequency of some types of samples could be modified depending on baseline data for the parameters of concern. The monitoring program would be designed to use the minimum percentage of allowable limits (lower limits of detection) broken down daily, quarterly, and semiannually. As construction and operation of the enrichment plant would proceed, changing conditions (e.g., regulations, site characteristics, and technology) and new knowledge could require that the monitoring program be reviewed and updated. The monitoring program would be enhanced as appropriate to maintain the collection and reliability of environmental data. The specific location of monitoring points would be determined in the detailed design.

During implementation of the monitoring program, some samples could be collected in a different manner than specified herein. Examples of reasons for these deviations could include severe weather events, changes in the length of the growing season, and changes in the amount of vegetation. Under these circumstances, documentation would be prepared to describe how the samples were collected and the rationale for any deviations from normal monitoring program methods. If a sampling location has frequent unavailable samples or deviations from the schedule, then another location could be selected or other appropriate actions taken (LES, 2005a). Each year, the proposed NEF would submit a summary of the Environmental Sampling Program and associated data to the proper regulatory authorities, as required by each regulatory agency. This summary would include the types, numbers, and frequencies of samples collected.

Physiochemical monitoring would be conducted via sampling of stormwater, soil, sediment, vegetation, and groundwater to confirm that trace, incidental chemical discharges would be below regulatory limits. Table 6-8 defines physiochemical sampling by type, location, frequency, and collections.

Because no naturally occurring surface waters would be on the site, a Surface Water Monitoring Program would not be implemented; however, soil sampling would include outfall areas such as the outfall at the Site Stormwater Detention Basin. In the event of any accidental release from the proposed NEF, these sampling protocols would be initiated immediately and on a continuing basis to document the extent and impact of the release until conditions have been abated and mitigated (LES, 2005a).

Table 6-8 Physiochemical Sampling

Sample Type	Sample Location	Frequency	Sampling and Collections[b]
Stormwater	Site Stormwater Detention Basin UBC Storage Pad Stormwater Retention Basin	Quarterly	Analytes as determined by baseline program
Vegetation	4 minimum[a]	Quarterly (growing seasons)	Fluoride uptake
Soil/Sediment	4 minimum[a]	Quarterly	Metals, organics, pesticides, and fluoride uptake
Groundwater	All selected groundwater wells	Semiannually	Metals, organics, and pesticides

[a] Location to be established by Health, Safety and Environmental organization staff.
[b] Analyses would meet EPA Lower Limits of Detection, as applicable, and would be based on the baseline surveys and the type of matrix (sample type).
Source: LES, 2005a.

6.2.2 Stormwater Monitoring

A Stormwater Monitoring Program would be initiated during construction of the proposed NEF. Data collected from the program would be used to evaluate the effectiveness of measures taken to prevent the contamination of stormwater and to retain sediments within property boundaries. A temporary detention basin would be used as a sediment control basin during construction as part of the overall sedimentation erosion control plan.

The water quality of the discharge would be typical runoff from building roofs and paved areas. Except for small amounts of oil and grease typically found in runoff from paved roadways and parking areas, the discharge would not be expected to contain contaminants.

Stormwater monitoring would continue with the same monitoring frequency upon initiation of the proposed NEF operation. During plant operation, samples would be collected from the UBC Storage Pad Stormwater Retention Basin and the Site Stormwater Detention Basin to demonstrate that runoff would not contain any contaminants.

Table 6-9 shows a list of parameters that would be monitored and monitoring frequencies. This monitoring program would be refined to reflect applicable requirements as determined during the NPDES process. Additionally, the Site Stormwater Detention Basin would adhere to the requirements of the Groundwater Discharge Permit/Plan under *New Mexico Administrative Code* 20.6.2.3104 (LES, 2005a).

Normal discharge from the Site Stormwater Detention Basin would be through evaporation and infiltration into the ground. During high precipitation runoff events, some discharge could occur from the outfall next to New Mexico Highway 234. If any discharge from this outfall would occur, the volume of water would be expected to be equal to or less than the preconstruction runoff rates from the site area. Several culverts presently exist under New Mexico Highway 234 that transmit runoff to the south side of the highway. Since flow from this outfall would be intermittent, no monitoring would be conducted because the detention basin would be monitored (LES, 2005a).

Table 6-9 Stormwater Monitoring Program

Monitored Parameter	Monitoring Frequency	Sample Type	Lower Limit of Detection
Oil and Grease	Quarterly, if standing water exists.	Grab	0.5 ppm
Total Suspended Solids	Quarterly, if standing water exists.	Grab	0.5 ppm
Five-Day Biological Oxygen Demand	Quarterly, if standing water exists.	Grab	2 ppm
Chemical Oxygen Demand	Quarterly, if standing water exists.	Grab	1 ppm
Total Phosphorus	Quarterly, if standing water exists.	Grab	0.1 ppm
Total Kjeldahl Nitrogen	Quarterly, if standing water exists.	Grab	0.1 ppm
pH	Quarterly, if standing water exists.	Grab	0.01 unit
Nitrate Plus Nitrite Nitrogen	Quarterly, if standing water exists.	Grab	0.2 ppm
Metals	Quarterly, if standing water exists.	Grab	Varies by metal

ppm - parts per million; ppb - parts per billion.
Source: LES, 2005a.

The diversion ditch would intercept surface runoff from the area upstream of the proposed NEF site around the east and west sides of the proposed NEF structures during extreme precipitation events. There would be no retention or attenuation of flow within the diversion ditch. The east side would divert surface runoff into the Site Stormwater Detention Basin, which would be monitored. The west side would divert surface runoff around the site where it would continue on as overland flow. There would be no need to monitor this overland flow because this water would not flow through the proposed NEF site (LES, 2005a).

6.2.3 Environmental Monitoring

Chemistry data collected as part of the effluent and stormwater monitoring programs would be used for environmental monitoring. The chemistry data would be used to comply with NPDES and air permit obligations. Final constituent analysis requirements, which include the hazardous constituent to be monitored, minimum detectable concentrations, emission limits, and analytical requirements, would be in accordance with the permits that would be obtained prior to construction and operation (LES, 2005a).

Sampling locations would be determined based on meteorological information and current land use. The sampling locations could be subject to change as determined from the results of any observed changes in land use.

Vegetation and soil sampling would be conducted. Vegetation samples would include grasses and, if available, vegetables. Soil would be collected in the same vicinity as the vegetation sample. The samples would be collected from both onsite and offsite locations in various sectors. Sectors would be chosen based on air modeling.

Sediment samples would be collected from discharge points into the different collection basins onsite. Groundwater samples would be obtained semiannually from wells located within the proposed NEF boundary and monitored for metals, organics, and pesticides to ensure groundwater would not become contaminated from the proposed NEF operations and to identify any contaminants that could migrate from non-NEF facilities. Stormwater samples collected in the UBC Storage Pad Stormwater Retention Basin would be sampled to ensure no contaminants are present in the UBC Storage Pad runoff (LES, 2005a).

6.2.4 Meteorological Monitoring

A 40-meter (132-foot) meteorological tower would be installed and operated onsite to monitor and characterize meteorological phenomena (e.g., wind speed, direction, and temperature) during plant operation and to analyze the effect of the local terrain on meteorology conditions. The data obtained from the meteorological tower would assist in evaluating the potential impacts of the proposed NEF operations on workers onsite and the community offsite due to any emissions (LES, 2005a).

The meteorological tower would be located and operated in a manner consistent with the guidance in Regulatory Guide 3.63, "Onsite Meteorological Measurement Program for Uranium Recovery Facilities—Data Acquisition and Reporting" (NRC, 1988). The meteorological tower would be located at a site approximately the same elevation as the finished facility grade and in an area where proposed NEF structures would have little or no influence on the meteorological measurements. An area approximately 10 times the obstruction height around the tower towards the prevailing wind direction would be maintained. This practice would be used to avoid spurious measurements resulting from local building-caused turbulence. The program for instrument maintenance and servicing, combined with redundant data recorders, would ensure at least 90-percent data recovery (LES, 2005a). The data this equipment provides would be recorded in the proposed NEF control room and could be used for dispersion calculations. Equipment would also measure temperature and humidity that would be recorded in the control room.

6.2.5 Local Flora and Fauna

Section 6.3, "Ecological Monitoring," details the monitoring of radiological and physiochemical impacts to local flora and fauna.

6.2.6 Quality Assurance

The proposed NEF would use a set of formalized and controlled procedures for sample collection, laboratory analysis, chain of custody, reporting of results, and corrective actions. Corrective actions would be instituted when an administrative action level is exceeded for any of the measured parameters, as described in section 6.1.1.

The proposed NEF would ensure that the onsite laboratory and any contractor laboratory used to analyze NEF samples participate in third-party laboratory intercomparison programs appropriate to the media and constituents being measured as described in section 6.1.1.

6.2.7 Lower Limits of Detection

Table 6-9 lists the lower limits of detection for the parameters sampled in the Stormwater Monitoring Program. Minimum detectable concentrations for the radiological parameters shown in Tables 6-3 and 6-5 would be based on the results of the baseline surveys and the sample type.

6.3 Ecological Monitoring

Cattle grazing, oil/gas pipeline right-of-ways, and access roads have impacted the existing natural habitats on the proposed NEF site and the surrounding region. These current and historic land uses have resulted in a dominant habitat type, the Plains Sand Scrub. As discussed in Chapter 4 of this EIS, no significant impacts from construction and operations would be anticipated; however, the environment at the site could potentially support endangered, threatened, and candidate species and species of concern described in Chapter 3 of this EIS.

6.3.1 Monitoring Program Elements

The ecological monitoring program would focus on four elements: vegetation, birds, mammals, and reptiles/amphibians. Currently, there is no action or reporting level for each specific element. Appropriate agencies (New Mexico Department of Game and Fish and the U.S. Fish and Wildlife Service) would be consulted as ecological monitoring data are collected. Agency recommendations would be considered when developing reporting levels for each element and mitigation plans, if needed (LES, 2005a).

LES would periodically monitor the proposed NEF site property and basin waters during construction and plant operations to ensure the risk to birds and wildlife is minimized. If needed, measures would be taken to release entrapped wildlife. The monitoring program would assess the effectiveness of the entry barriers and release features to ensure risk to wildlife would be minimized (LES, 2005a).

6.3.2 Observations and Sampling Design

The proposed NEF site observations would include preconstruction, construction, and operational monitoring programs. The preconstruction monitoring program would establish the site baseline data. LES would use procedures to characterize the plant, bird, mammalian, and reptilian/amphibian communities at the proposed NEF during preconstruction monitoring. In addition, operational monitoring surveys would be conducted annually (except semiannually for birds and reptiles/amphibians) using the same sampling sites established during the preconstruction monitoring program.

These surveys would be intended to help identify gross changes in the composition of the vegetative, avian, mammalian, and reptilian/amphibian communities of the site associated with operation of the plant. Interpretation of operational monitoring results, however, would consider those changes that would be expected at the proposed NEF site as a result of natural succession processes. Plant communities at the site would continue to change as the proposed NEF site begins to regenerate and mature. Changes in the bird, small mammal, and reptile/amphibian communities would likely occur concomitantly in response to the changing habitat (LES, 2005a).

6.3.2.1 Vegetation

Collection of ground cover, frequency, woody plant density, and production data would be sampled from 16 permanent sampling locations within the proposed NEF site. Annual sampling would occur in September or October to coincide with the mature flowering stage of the dominant perennial species.

The sampling locations would be selected in areas outside of the proposed footprint of the proposed NEF site but within the site boundary. The selected sampling locations would be marked physically onsite, and the Global Positioning System coordinates would be recorded. Figure 6-1 shows the expected positions of the sampling locations. The establishment of permanent sampling locations would facilitate a long-term monitoring system to evaluate vegetation trends and characteristics.

Transects used for data collection would originate at the sampling location and radiate out 30 meters (100 feet) in a specified compass direction. Ground cover and frequency would be determined using the line-intercept method. Each 0.3-meter (1-foot) segment would be considered a discrete sampling unit. Cover measurements would be read to the nearest 0.03 meter (0.1 foot). Woody plant densities would be determined using the belt transect method. All shrub and tree species rooted within 2 meters (6 feet) of the 30-meter (100-foot) transect would be counted.

Productivity would be determined using a double-sampling technique that estimates the production within three 0.25-square-meter (2.7-square-foot) plots and harvesting one equal-sized plot for each transect. Harvesting would consist of clipping each species in a plot separately, oven drying, and weighing to the nearest 0.01 gram (0.00035 ounce). The weights would be converted to kilograms (pounds) of oven-dry forage per hectare (acre) (LES, 2005a).

6.3.2.2 Birds

Site-specific avian surveys would be conducted in both the wintering and breeding seasons to verify the presence of particular bird species at the proposed NEF site. The winter and spring surveys would be designed to identify the members of the avian community.

The winter survey would identify the distinct habitats at the site and the composition of bird species within each of the habitats described. Transects 100 meters (328 feet) in length would be established within each distinct homogenous habitat, and data would be collected along the transect. Species composition and relative abundance would be determined based on visual observations and call counts.

In addition to verifying species presence, the spring survey would determine the nesting and migratory status of the species observed and (as a measure of the nesting potential of the site) the occurrence and number of territories of singing males and/or exposed, visible posturing males. The area would be surveyed using the standard point-count method (USDA, 1993; USDA, 1995). Standard point counts would require a qualified observer to stand in a fixed position and record all the birds seen and heard over a time period of 5 minutes. Distances and time would each be subdivided. Distances would be divided into less than 50 meters (164 feet) and greater than 50 meters (164 feet) categories (estimated by the observer), and the time would be divided into two categories: 0-3 minute and 3-5 minute segments. All birds seen and heard at each station/point visited would be recorded on standard point-count forms. All surveys would be conducted from 6:15 a.m. to 10:30 a.m. to coincide with the territorial males' peak singing times. The stations/points would be recorded using a Global Positioning System that would enable the observer to make return visits. Surveys would only be conducted when fog, wind, or rain do not interfere with the observer's ability to accurately record data.

Chapter 3 of this EIS describes the avian communities, and all data collected would be recorded and compared to this information. The field data collections would be performed semiannually. The initial monitoring would be effective for at least the first three years of commercial operation. Following this period, program changes could be initiated based on operational experience (LES, 2005a).

6.3.2.3 Mammals

Annual onsite surveys would monitor the mammalian communities. Chapter 3 of this EIS describes the existing mammalian communities. General observations would be compiled concurrently with other wildlife monitoring data and compared to information listed in Table 3-16 of Chapter 3 of this EIS. The initial monitoring would be effective for at least the first three years of commercial operation. Following this period, program changes could be initiated based on operational experience (LES, 2005a).

6.3.2.4 Reptiles and Amphibians

Approximately 13 species of lizards, 13 species of snakes, and 11 species of amphibians could occur on the site and in the area. Chapter 3 of this EIS describes the reptile and amphibian communities.

A combination of pitfall drift-fence trapping and walking transects (at trap sites) could provide data in sufficient quantity to allow statistical measurements of population trends, community composition, body-size distributions, and sex ratios that would reflect environmental conditions and changes at the site over time.

The monitoring program would include at least two other replicated sample sites beyond the primary location on the proposed NEF site. Offsite locations on U.S. Bureau of Land Management or New Mexico State land to the south, west, or north of the proposed NEF site would be given preference for additional sampling sites. Each of these catch sites would have the same pitfall drift-fence arrays and standardized walking transects, and would be operated simultaneously.

Replicate sample sites were selected for reptiles and amphibians. The basis for choosing these two types of animals over other ecological media is that reptiles and amphibians are very sensitive to climatic conditions (e.g., the amount of moisture an area receives in a given year). The climate in New Mexico is very diverse and can exhibit dramatic changes within a few kilometers (miles). For this reason, nearby replicate sampling locations were chosen for a more representative population sample for reptiles and amphibians in the vicinity of the NEF. Onsite sampling for other ecological media (i.e., vegetation, birds, and mammals) is considered sufficient to characterize changes in the composition of these media associated with the operation of the plant.

Each sample site would be designed to maximize the total catch of reptiles and amphibians rather than data on each individual caught. Each animal caught would be identified, sexed, measured for snout-vent length, inspected for morphological anomalies, and released. There would be two sample periods at the same time each year, in May and late June/early July. These months coincide with the breeding activity for lizards, most snakes, and depending on rainfall, amphibians.

Because reptiles and amphibians are sensitive to climatic conditions, and to account for the spotty effects of rainfall, each sampling event would also record rainfall, relative humidity, and temperatures. The rainfall and temperature data would act as a covariant in the analysis. The meteorological data would be obtained from the site meteorological tower.

Additionally, the offsite sample locations would act to balance out climatic effects on populations of small animals. The comparison of proposed NEF site data and offsite location data would allow for monitoring to be a much more informative environmental indicator of conditions at the proposed NEF site.

In addition to the monitoring plan described above, general observations would be gathered and recorded concurrently with other wildlife monitoring. The data would be compared to information contained in Chapter 3 of this EIS. As with the programs for birds and mammals, the initial reptile and amphibian monitoring program would be effective for at least the first three years of commercial operation. Following this period, program changes could be initiated based on operational experience (LES, 2005a).

6.3.3 Statistical Validity of Sampling Program

The proposed sampling program would include descriptive statistics. These descriptive statistics would include the mean, standard deviation, standard error, and confidence interval for the mean. In each case, the sampling size would be clearly indicated. These standard descriptive statistics would be used to show the validity of the sampling program. A significance level of 5 percent would be used for the studies, which results in a 95-percent confidence level (LES, 2005a).

6.3.4 Sampling Equipment and Methods

Due to the type of ecological monitoring planned for the proposed NEF, no specific sampling equipment or chemical analyses would be necessary.

6.3.5 Data Analysis, Documentation, and Reporting Procedures

LES or its contractor would analyze the ecological data collected on the proposed NEF site. The NEF Health, Safety and Environmental Manager or a staff member would be responsible for the data analysis. The manager would be responsible for documentation of the environmental monitoring programs. A summary report would be prepared that would include the types, numbers, and frequencies of samples collected. Data relevant to the ecological monitoring program would be recorded in paper and/or on electronic forms. These data would be kept on file for the life of the proposed NEF (LES, 2005a).

6.3.6 Established Criteria

The ecological monitoring program would be conducted in accordance with generally accepted practices and the requirements of the New Mexico Department of Game and Fish. Data would be collected, recorded, stored, and analyzed. Actions would be taken as necessary to reconcile anomalous results (LES, 2005a).

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7 COST BENEFIT ANALYSIS

This chapter summarizes costs and benefits associated with the proposed action and the no-action alternative. Chapter 4 of this Environmental Impact Statement (EIS) discusses the potential socioeconomic impacts of the construction, operation, and decommissioning of the proposed National Enrichment Facility (NEF) by the Louisiana Energy Services (LES).

The implementation of the proposed action would generate national, regional, and local benefits and costs. The primary national benefit of building the proposed NEF would be a greater assurance of a stable domestic supply of low-enriched uranium. The regional benefits of building the proposed NEF would be increased employment, economic activity, and tax revenues in the region around the site. Some of these regional benefits, such as tax revenues, accrue specifically to Lea County and the City of Eunice. Other benefits may extend to neighboring counties in Texas. Costs associated with the proposed NEF are, for the most part, limited to the area surrounding the site. Examples of these environmental impacts would include increased road traffic and the presence of temporarily stored wastes. However, the impact of these environmental costs on the local community are considered to be SMALL to MODERATE.

7.1 No-Action Alternative

Under the no-action alternative, the proposed NEF would not be constructed or operated in Lea County, New Mexico. The proposed site would remain undisturbed, and ecological, natural, and socioeconomic resources would remain unaffected. All potential local environmental impacts related to water use, land use, groundwater contamination, ecology, air emissions, human health and occupational safety, waste storage and disposal, disposition of depleted uranium hexafluoride (DUF_6), and decommissioning and decontamination would be avoided. Similarly, all socioeconomic impacts related to employment, economic activity, population, housing, community resources, and financing would be avoided.

7.2 Proposed Action

Under the proposed action, LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico. In support of this proposed action, the U.S. Nuclear Regulatory Commission (NRC) would grant a license to LES to possess and use source material, byproduct, and special nuclear material in accordance with the requirements of Title 10, “Energy,” of the *U.S. Code of Federal Regulations* (10 CFR) Parts 30, 40, and 70. The proposed NEF would be constructed over an eight-year period with operations beginning during the third construction year. Production would increase as additional cascades are completed and reach full production approximately seven years after initial ground breaking. Peak enrichment operations would continue from about 2014 to 2027, and then production would gradually wind-down as decommissioning and decontamination begins. The principal socioeconomic impact or benefit from the proposed NEF would be an increase in the jobs in the region of influence. The region of influence is defined as a radius of 120 kilometers (75 miles) from the proposed NEF. Enrichment operations and decommissioning and decontamination would overlap for about five years. As production winds-down, some operations personnel would gradually migrate to decommissioning and decontamination activities.

Based on the current population of the region of influence (i.e., 82,982 people in 2000), the limited number of new people and jobs created by the construction and operation of the proposed NEF in the region of influence would not be expected to lead to a significant change in population or cause a significant change in the demand for housing and public services. The total population increase at peak construction would be estimated to be 280 residents and less during later construction stages and facility operations. With 15 percent of housing units currently unoccupied, no housing demand impact is expected during facility construction and operation. Further, any additional demand for public services would not be significant given the small change in population.

The construction and operation of the proposed NEF would provide additional tax revenues to the State of New Mexico, Lea County, and the city of Eunice. Tax revenues would accrue primarily to the State of New Mexico through an increase in gross receipts taxes and corporate income taxes. Over the 30-year operating life of the proposed NEF, estimated property taxes could range between $10.4 and $14.5 million (LES, 2005a). Table 7-1 shows a summary of the estimated tax revenue to the State and local community during the life of the proposed NEF.

Table 7-1 Summary of Estimated Tax Revenues to State and Local Communities Over 30 Year Facility Life (in 2004 dollars)

Type of Tax [a]		New Mexico	Lea County	Total
Gross Receipts Tax				
	High Estimate	$ 33,400,000	$ 1,800,000	$ 35,200,000
	Low Estimate	$ 22,600,000	$ 1,200,000	$ 23,800,000
NM Corporate Income Tax[b]				
	High Estimate	$ 144,900,000	N/A [c]	$ 144,900,000
	Low Estimate	$ 124,200,000	N/A [c]	$ 124,200,000
NM Property Tax				
	High Estimate	--	$ 14,500,000	$ 14,500,000
	Low Estimate	--	$ 10,400,000	$ 10,400,000

[a] Tax values are based on tax rates as of April 2004.
[b] Based on average earnings over the life of the proposed NEF.
[c] Allocation would be made by the State of New Mexico.
Source: LES, 2005a.

The property taxes paid to Lea County, as identified in Table 7-1, is about 20 percent of what it would normally pay. The NRC expects the total property tax exemption to range between $40 and $56 million over the operational life of the facility. Instead of paying the full amount of property taxes, LES would make the payments towards the industrial revenue bond that Lea County would hold. The industrial revenue bond is a procedural mechanism under New Mexico law that is required for tax abatement purposes.

7.2.1 Costs Associated with Construction Activities

The proposed NEF is estimated to cost approximately $1.24 billion (in 2004 dollars) to construct. This excludes escalation, contingencies, and interest. About one-third of the cost of constructing the proposed NEF would be spent locally on goods, services, and wages. Construction jobs are expected to pay above average wages for the Lea County region (LES, 2005a).

Construction of the proposed NEF would provide up to 800 construction jobs during the peak construction period and an average of 397 jobs per year for the eight years of construction. Construction of the proposed NEF would have indirect economic impacts by creating an average of 582 additional jobs in the community each year (Figure 4-4). The combined direct and indirect jobs expected to be created would provide a moderately beneficial socioeconomic impact for the communities within the region of influence. Due to the transitory nature of the construction crews, the projected influx of workers and their families during construction would have only a SMALL impact on the housing vacancy rate and demand for public services (LES, 2005a).

7.2.2 Costs Associated with the Operation of the Proposed NEF

Operation of the proposed NEF would provide 210 full-time jobs at peak operations with an average of 150 jobs per year over the life of the facility (Figure 4-4). These 210 direct jobs would generate an additional 173 indirect jobs at peak operations in the region of influence. The combination of the direct and indirect jobs would have a MODERATE impact on the economics of the communities within the region of influence. Most of the impact would be a direct result of the $10.9 million in payroll and another $9.9 million in purchases of local goods and services LES expects to spend during peak operations (LES, 2005a). The influx of workers would have only a SMALL impact on the vacancy rates for housing in the region of influence, and purchase of local goods and services would have a similar SMALL impact on the supply and demand for the region of influence. The jobs are expected to pay above-average wages for Lea County, New Mexico.

The size of the socioeconomic impacts are defined as follows in this EIS:

- *<u>Employment/economic activity</u> – Small is <0.1- percent increase in employment; moderate is between 0.1- and 1.0-percent increase in employment; and large is defined as >1-percent increase in employment.*
- *<u>Population/housing impacts</u> – Small is <0.1-percent increase in population growth and/or <20-percent of vacant housing units required; moderate is between 0.1- and 1.0-percent increase in population growth and/or between 20 and 50 percent of vacant housing units required; and large impacts are defined as >1-percent increase in population growth and/or >50 percent of vacant housing units required.*
- *<u>Public services/financing</u> – Small is <1-percent increase in local revenues; moderate is between 1- and 5-percent increase in local revenues large impacts are defined as >5-percent increase in local revenues.*

Source: NRC,1996; DOE, 1999.

7.2.3 Costs Associated with Disposition of the DUF_6

The proposed NEF would generate two components: low-enriched uranium hexafluoride (or product) and DUF_6. The low-enriched uranium would be sold to nuclear fuel fabricators. During operation, the proposed NEF would generate approximately 7,800 metric tons (8,600 tons) of DUF_6 annually during peak operations. This would be stored in an estimated 627 uranium byproduct cylinders (UBCs) each year. These UBCs would be temporarily stored onsite on an outside storage pad. The storage pad could ultimately have a capacity of 15,727 UBCs, which would be sufficient to store the total cumulative production of DUF_6 over the 30-year expected life of the facility (LES, 2005a).

The NRC evaluated several alternatives to the LES proposed action. As part of its evaluation of the proposed action, the NRC evaluated two options for disposal of the DUF_6: (1) conversion by a privately owned facility and (2) conversion by a U.S. Department of Energy (DOE) facility. LES's preferred approach is transporting the material to a private conversion facility. Section 4.2.14.3 of this EIS discusses the DUF_6 disposal options.

DUF_6 *Disposition Options Considered*

Option 1a: Private Conversion Facility (LES Preferred Option). Transporting the UBCs from the proposed NEF to an unidentified private conversion facility outside the region of influence. After conversion to U_3O_8, the wastes would then be transported to a licensed disposal facility for final disposition.

Option 1b: Adjacent Private Conversion Facility. Transporting the UBCs from the proposed NEF to an adjacent private conversion facility. This facility is assumed to be adjacent to the site and would minimize the amount of DUF_6 onsite by allowing for ship-as-you-generate waste management of the converted U_3O_8 and associated conversion byproducts (i.e., CaF_2). The wastes would then be transported to a licensed disposal facility for final disposition.

Option 2: DOE Conversion Facility. Transporting UBCs from the proposed NEF to a DOE conversion facility. For example, the UBCs could be transported to one of the DOE conversion facilities either at Paducah, Kentucky, or Portsmouth, Ohio (DOE, 2004b; DOE, 2004c). The wastes would then be transported to a licensed disposal facility for final disposition.

There are numerous possible pathways for the transport, conversion, and disposal of DUF_6 (LLNL, 1997). In addition, there are some potentially beneficial uses for DUF_6 (Haire and Croff, 2004). For example, DUF_6 has been used in a variety of applications ranging from munitions to counterweights, and attempts are being made to develop new uses that potentially could mitigate some or all of the costs of DUF_6 disposition (Haire and Croff, 2004). However, the current inventory of depleted uranium in the United States far exceeds the current and near-term future demand for the material. For each of the two disposition options, it is assumed that the most tractable disposition pathway and the one supported by the NRC is to convert the DUF_6 to a more stable oxide form (U_3O_8) and dispose of the material in a licensed disposal facility.

LES is required to put in place a financial surety bonding mechanism to assure that adequate funds would be available to dispose of all DUF_6 generated by the proposed NEF (10 CFR § 70.25). In 2004 dollars, the amount of funding LES proposes to set aside for DUF_6 disposition is $5.85 per kilogram of uranium (LES, 2005a; LES, 2005b). This amount is based on LES's estimate of the cost of converting and disposing of all DUF_6 generated during operation of the proposed NEF. The NRC evaluated the adequacy of the proposed funding in the Safety Evaluation Report.

Under the disposition options considered in this EIS, the DUF_6 would be converted to U_3O_8 at a conversion facility located either at a private facility outside the region of influence (Option 1a); at a private conversion facility within the region of influence of the proposed NEF (Option 1b); or at the DOE conversion facilities to be located at Portsmouth, Ohio, and Paducah, Kentucky (Option 2). Conversion of the maximum DUF_6 inventory which could be produced at the proposed NEF could extend the time of operation by approximately 11 years for the Paducah conversion facility or 15 years for the Portsmouth conversion facility. The DOE has estimated that the cost of converting and disposing of LES's projected DUF_6 inventory would be approximately $3.34 per kilogram of DUF_6 or $4.91 per kilogram of uranium in 2004 dollars. This estimate includes construction of the conversion facility; transportation of the DUF_6 from the proposed NEF to the conversion site (approximately 3.600 kilometers [1,900 miles]), storage of the DUF_6 awaiting conversion, conversion of the DUF_6, disposal of the depleted uranium oxide as low-level radioactive waste, and decontamination and decommissioning of the conversion facility (DOE, 2005). Thus, using the DOE's cost estimate of $4.91 per kilogram of uranium, the cumulative cost of DUF_6 disposition would be $653 million at a DOE conversion facility. This estimate does not include a contingency factor.

The conversion facilities at Paducah and Portsmouth would have annual processing capacities of 18,000 and 13,500 metric tons DUF_6, respectively (DOE, 2004a). Assuming a completion date of 2006 for these conversion facilities, the stockpiles held at Paducah could be processed by the year 2031, and the stockpiles destined for the Portsmouth conversion facility could be converted by the year 2025. Production at the proposed NEF is scheduled to cease by the year 2034. Therefore, the Portsmouth facility could begin processing the accumulated DUF_6 in 2026 and have nearly all of the accumulated UBCs processed by 2038, which is the time decommissioning and decontamination activities are scheduled to end.

Converting the accumulated proposed NEF DUF_6 could therefore extend the socioeconomic impacts of one of these facilities. It is estimated that slightly more than 300 direct and indirect jobs would be created by each conversion facility at Portsmouth and Paducah, each with a total annual income of approximately $13.5 million (2004 dollars) (DOE, 2004b; DOE, 2004c). While a conversion facility within the region of influence of the proposed NEF or at another private site would be designed with a slightly smaller processing capacity, it can be assumed that the socioeconomic operational impacts would be smaller than, and therefore bounded by, the DOE facilities.

For a new conversion facility with a lower processing capacity constructed near the proposed NEF or at another location, the construction impacts would be approximately 180 total jobs created for a total annual income of $7.1 million. Construction would take place in a 2-year period (DOE, 2004b and 2004c). Operating the facility would create about 185 jobs (direct and indirect) with a total annual income of $7.7 million.

The disposition costs for temporarily storing the UBCs until decontamination and decommissioning begins would be minimal for the first 21 years of operation of the proposed NEF but would increase as DUF_6 is shipped offsite. These costs, which include construction of the UBC Storage Pads and ongoing monitoring of the UBCs, would be small relative to costs for construction and operations. A private facility would be able to begin the conversion and disposal process immediately upon being constructed, reducing the cost of constructing additional storage pads at the proposed NEF. The DOE conversion facilities could accept DUF_6 as it is generated by the proposed NEF or DOE could wait until completion of conversion of their own materials before accepting DUF_6 from the proposed NEF. In 2004 dollars, the cumulative cost of DUF_6 disposition would be $778 million using the $5.85 per kilogram of uranium estimate (LES, 2005a; LES, 2005b).

Disposition Options 1a and 2 (using a private conversion facility outside the region of influence or using the DOE conversion facilities, respectively) are similar in terms of environmental impact. Specific offsite impacts would depend on the timing of the shipments, the location of the conversion facility, length of storage at the conversion facility prior to processing, and the location and type of final burial of the U_3O_8.

A private conversion facility located within the region of influence would result in the smallest onsite accumulation of DUF_6. All shipments offsite would occur shortly after generation, and the material would be quickly converted to oxide and shipped to a final disposal site. The effect of storage would be to delay conversion and shift cost curves to the future.

7.2.4 Costs Associated with Decommissioning Activities

Approximately 21 years after initial groundbreaking, the proposed NEF would begin the shutdown of operations and LES would initiate the decommissioning and decontamination process. As the enrichment cascades are stopped and the site decontamination starts, some of the operational jobs would be eliminated. LES estimates that 10 percent of the operations workforce would be transferred to decommissioning and decontamination activities while other operations personnel would be gradually laid off. It is also possible that private contractors could be used to decontaminate and decommission the proposed NEF.

Using current decommissioning and decontamination techniques, it is estimated that the total workforce during most of the decommissioning and decontamination effort would average 21 direct jobs per year with an additional 20 indirect jobs for part of the nine years required to complete the decommissioning and decontamination activities. The pay scale on the decommissioning and decontamination jobs would be slightly lower than that paid during operation, but it would still be higher than the general average for the region of influence.

Implementation of decommissioning and decontamination activities would have a SMALL socioeconomic impact on the region of influence. LES estimates the total cost of decommissioning to be about $941.6 million in 2004 dollars. Completion of the decommissioning and decontamination activities would result in a shutdown facility with no employees. The site structures and some supporting equipment would remain and be available for alternative use.

7.3 Summary of Benefits of Proposed NEF

Implementation of the proposed action would have a moderate overall economic impact on the region of influence. Table 7-2 summarizes the expenditures and jobs expected during each phase of the proposed project.

Decommissioning of the proposed NEF would be phased in over a nine-year period. During this time, the number of jobs would slowly decrease, and the types of positions would switch from operations to decontamination and waste shipment.

Under temporary storage of UBCs during the operational life of the proposed NEF, the DUF_6 would remain onsite until the start of decommissioning. It would then be shipped to a conversion facility for processing and disposal. This would require the maximum number of jobs for surveillance and maintenance of the DUF_6 during the operating phase of the proposed NEF.

Table 7-3 shows a summary of the socioeconomic impacts of the proposed action with the various DUF_6 disposal options.

Table 7-2 Summary of Expenditures and Jobs Expected to be Created

Project Phase	Expenditures (in 2004 dollars)	Number of Jobs	
		Direct	Indirect
Construction	Total - $1.24 billion Local - $404 million	397 (average) 800 (peak)	582 (average)
Operations	$20.8 million (annual at peak operations)	150 (average) 210 (peak)	173 (average)
Decommissioning and Decontamination	$941.6 million ($163.9 million excluding DUF_6 disposition)	21	20

Table 7-3 Socioeconomic Benefits of the Proposed Action with DUF_6 Disposition Options

Benefit/Cost	No Action	Proposed Action with Proposed DUF_6 Disposition Option		
		Temporary Storage	Options 1a and 1b	Option 2
Need for Facility				
National Energy Security	No Local Impact	Increased Supply Security	Increased Supply Security	Increased Supply Security
Construction				
Employment/ Economic Activity	No Local Impact	Moderate Local Impact	Moderate Local Impact	Moderate Local Impact
Population/ Housing	No Local Impact	Small Impact	Small Impact	Small Impact
Public Services/ Financing	No Local Impact	Small Impact	Small Impact	Small Impact
Operations				
Employment/ Economic Activity	No Local Impact	Moderate Local Impact	Moderate Local Impact	Moderate Local Impact
Population/ Housing	No Local Impact	Small Impact	Small Impact	Small Impact
Public Services/ Financing	No Local Impact	Small Impact	Small Impact	Small Impact

Benefit/Cost	No Action	Proposed Action with Proposed DUF_6 Disposition Option		
		Temporary Storage	Options 1a and 1b	Option 2
Decontamination & Decommissioning				
Employment/ Economic Activity	No Local Impact	Small Impact	Small Impact	Small Impact
Population/ Housing	No Local Impact	Small Impact	Small Impact	Small Impact
Public Services/ Financing	No Local Impact	Small Impact	Small Impact	Small Impact
Tails Disposition				
Disposition Costs	No Local Impact	Requires Maximum Surveillance and Maintenance of Inventory	Option 1a - Surveillance and Maintenance Depends on Timing of Shipments. Option 1b - Surveillance and Maintenance Depends on Timing of Shipments. No Additional Expenditures Required to Monitor and Maintain Inventory.	Surveillance and Maintenance Depends on Timing of Shipments
Employment/ Economic Activity	No Local Impact	Small Impact	Option 1a – Small Impact Option 1b– Moderate Impact to Employment with Presence of DUF_6 Conversion Facility	Small Impact
Population/ Housing	No Local Impact	Small Impact	Option 1a – Small Impact Option 1b – Small Impact	Small Impact
Public Services/ Financing	No Local Impact	Small Impact	Option 1a –Small Impact Option 1b – Small Impact	Small Impact

Disposition options:
Option 1a – Private DUF_6 conversion facility located outside the region of influence.
Option 1b – Private DUF_6 conversion facility located inside the region of influence.
Option 2 – Transport the UBCs from the proposed NEF site to a DOE conversion facility.

7.4 References

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