STAFF EXHIBIT 36

NUREG-1790, Vol. 1

Environmental Impact Statement for the Proposed National Enrichment Facility in Lea County, New Mexico

Chapters 1 through 10 and
Appendices A through G

Final Report

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Washington, DC 20555-0001

2 ALTERNATIVES

This chapter describes the Louisiana Energy Services (LES) proposed action and reasonable alternatives including the no-action alternative. Related to the proposed action, the U.S. Nuclear Regulatory Commission (NRC) staff also examined alternatives for the disposition of the depleted uranium hexafluoride (DUF_6) material resulting from the enrichment operation over the lifetime of the proposed National Enrichment Facility (NEF). Under the no-action alternative, LES would not construct, operate, or decommission the proposed NEF. This alternative is included to comply with National Environmental Policy Act (NEPA) requirements. The no-action alternative provides a basis for comparing and evaluating the potential impacts of constructing, operating, and decommissioning the proposed NEF.

This chapter also addresses the site-selection process and reviews alternative enrichment technologies (other than the proposed centrifuge technology) and alternative sources for enriched product.

2.1 Proposed Action

The LES proposed action is the construction, operation, and decommissioning of the proposed NEF in southeastern New Mexico. Figure 2-1 shows the location of the proposed NEF.

The proposed action can be divided into three major activities: (1) site preparation and construction, (2) operation, and (3) decontamination and decommissioning.

The NRC license, if granted, would be for a 30-year period from the date of issuance.

Table 2-1 presents the current schedule for the proposed NEF project.

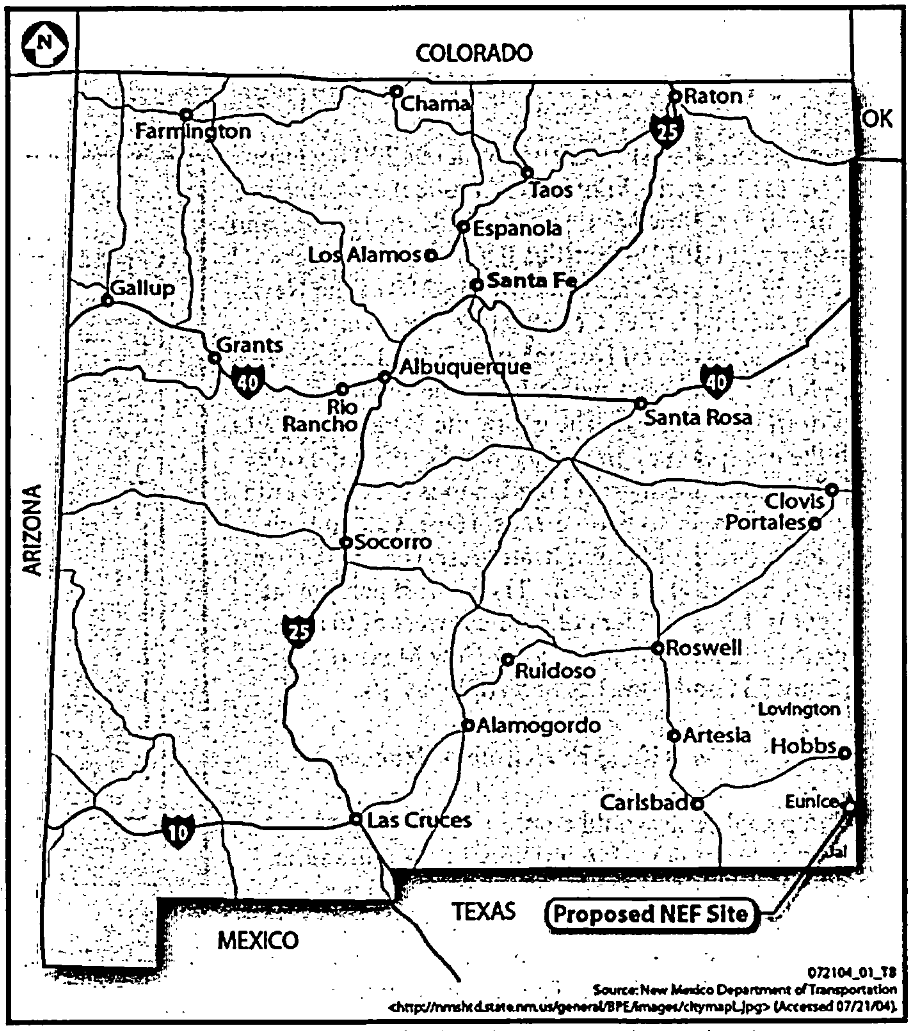

Figure 2-1 Location of Proposed NEF Site (NMDOT, 2004a)

Table 2-1 Proposed National Enrichment Facility Operation Schedule

Task	Start Date
Submit License Application to NRC	December 2003
Begin Construction of Facility	August 2006
Begin Operation of First Cascade	October 2008
Achieve Full Production Output	October 2013
Operate Facility at Full Capacity	October 2013 to October 2027
Submit Decommissioning Plan to NRC	April 2025
Complete Construction of Decontamination and Decommissioning Facility	April 2027
Cease All Operations of Cascades	April 2033
Complete Decommissioning of Facility	April 2036

Source: LES, 2005a.

2.1.1 Location and Description of Proposed Site

The proposed NEF site consists of about 220 hectares (543 acres) located 8 kilometers (5 miles) east of the city of Eunice, New Mexico. The U.S. Bureau of Land Management (BLM) identifies the proposed site as Section 32 of range 38E in Township 21S of the New Mexico Meridian. Lea County currently owns the property; however, on December 8, 2004, LES began a lease for 30 years after which LES would purchase the land from Lea County. The entire site is undeveloped, with the exception of an underground carbon dioxide (CO_2) pipeline and a gravel road, and is used for cattle grazing. There is no permanent surface water on the site, and appreciable groundwater reserves are deeper than 340 meters (1,115 feet). The nearest permanent resident is 4.3 kilometers (2.6 miles) west of the proposed site near the junction of New Mexico Highway 234 and New Mexico Highway 18.

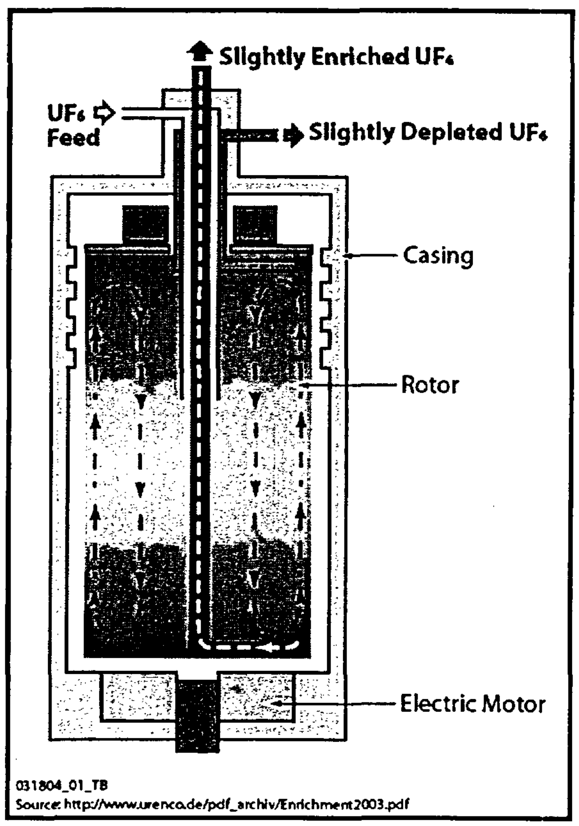

Figure 2-2 Schematic of a Gas Centrifuge (Urenco, 2003)

2.1.2 Gas Centrifuge Enrichment Process

The proposed NEF would employ a proven gas centrifuge technology for enriching natural uranium. Figure 2-2 shows the basic construction of a gas centrifuge. The technology uses a rotating cylinder (rotor) spinning at a high circumferential rate of speed inside a protective casing. The casing maintains a vacuum around the rotor and provides physical containment of the rotor in the event of a catastrophic rotor failure.

The uranium hexafluoride (UF_6) gas is fed through a fixed pipe into the middle of the rotor, where it is accelerated and spins at almost the same speed as the rotor. The centrifugal force produced by the spinning rotor causes the heavier uranium-238 hexafluoride ($^{238}UF_6$) molecules to concentrate close to the rotor wall and the lighter uranium-235 hexafluoride ($^{235}UF_6$) molecules collect closer to the axis of the rotor. This separation effect, which initially occurs only in a radial direction, increases when the rotation is supplemented by a convection current produced by a temperature difference along the rotor axis (thermoconvection). A centrifuge with this kind of gas circulation (i.e., from top to bottom near to the rotor axis and from bottom to top by the rotor wall) is called a counter-current centrifuge.

The inner and outer streams become more enriched/depleted in ^{235}U in their respective directions of movement. The biggest difference in concentration in a counter-current centrifuge does not occur between the axis and the wall of the rotor, but rather between the two ends of the centrifuge rotor. In the flow pattern shown in Figure 2-2, the enriched UF_6 is removed from the lower end of the rotor and the DUF_6 at the upper end through take-off pipes that run from the axis close to the wall of the rotor.

The enrichment level achieved by a single centrifuge is not sufficient to obtain the desired concentration of 3 to 5 percent by weight of ^{235}U in a single step; therefore, a number of centrifuges are connected in series to increase the concentration of the ^{235}U isotope. Additionally, a single centrifuge cannot process a sufficient volume for commercial production, which makes it necessary to connect multiple centrifuges in parallel to increase the volume flow rate. The arrangement of centrifuges connected in series to achieve higher enrichment and parallel for increased volume is called a "cascade." A full cascade contains hundreds of centrifuges connected in series and parallel. Figure 2-3 is a diagram of a segment of a uranium enrichment cascade showing the flow path of the UF_6 feed, enriched UF_6 product, and DUF_6 gas. In the proposed NEF, eight cascades would be grouped in a Cascade Hall, and each separation building would house two cascade halls. There would be three separations buildings in the full-capacity plant.

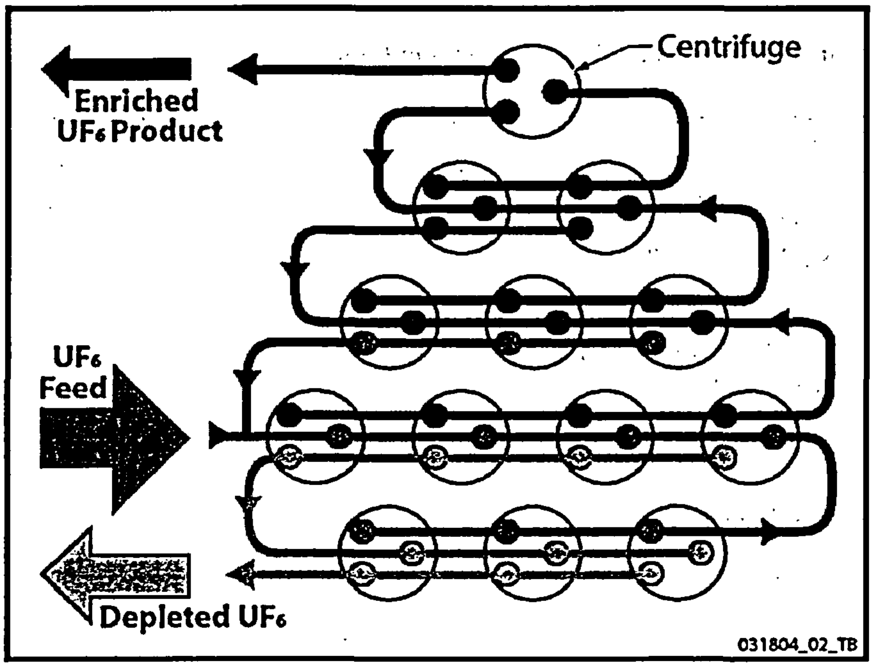

Figure 2-3 Diagram of Enrichment Cascade for Proposed NEF (Urenco, 2003)

What is enriched uranium?

Uranium is a naturally occurring radioactive element. In its natural state, uranium contains approximately 0.72 percent by weight of the uranium-235 isotope (^{235}U), which is the fissile isotope of uranium. There is a very small (0.0055 percent) quantity of the uranium-234 (^{234}U) isotope, and most of the remaining mass (99.27 percent) is the uranium-238 (^{238}U) isotope. All three isotopes are chemically identical and only differ slightly in their physical properties. The most important difference between the isotopes is their mass. This small mass difference allows the isotopes to be separated and makes it possible to increase (i.e., "enrich") the percentage of ^{235}U in the uranium to levels suitable for nuclear power plants or, at very high enrichment, nuclear weapons.

Most civilian nuclear power reactors use low-enriched uranium fuel containing 3 to 5 percent by weight of ^{235}U. Uranium for most nuclear weapons is enriched to greater than 90 percent.

Uranium would arrive at the proposed NEF as natural UF_6 in solid form in a Type 48X or 48Y transport cylinder from existing conversion facilities in Port Hope, Ontario, Canada or Metropolis, Illinois. To start the enrichment process, the cylinder of UF_6 is heated, which causes the material to sublime (change directly from a solid to a gas). The UF_6 gas is fed into the enrichment cascade where it is processed to increase the concentration of the ^{235}U isotope. The UF_6 gas with an increased concentration of ^{235}U is known as "enriched" or "product." Gas with a reduced concentration of ^{235}U is referred to as "depleted" UF_6 (DUF_6) or "tails."

Source: WNA, 2003.

2.1.3 Description of Proposed National Enrichment Facility

Figure 2-4 shows the general layout of the proposed NEF. Structures within the proposed NEF include the following:

- Uranium Byproduct Cylinder (UBC) Storage Pad.
- Centrifuge Assembly Building.
- Cascade Halls.
- Cylinder Receipt and Dispatch Building.
- Blending and Liquid Sampling Area.
- Technical Services Building.
- Administration Building.
- Visitor Center.
- Security Building.
- Central Utilities Building.

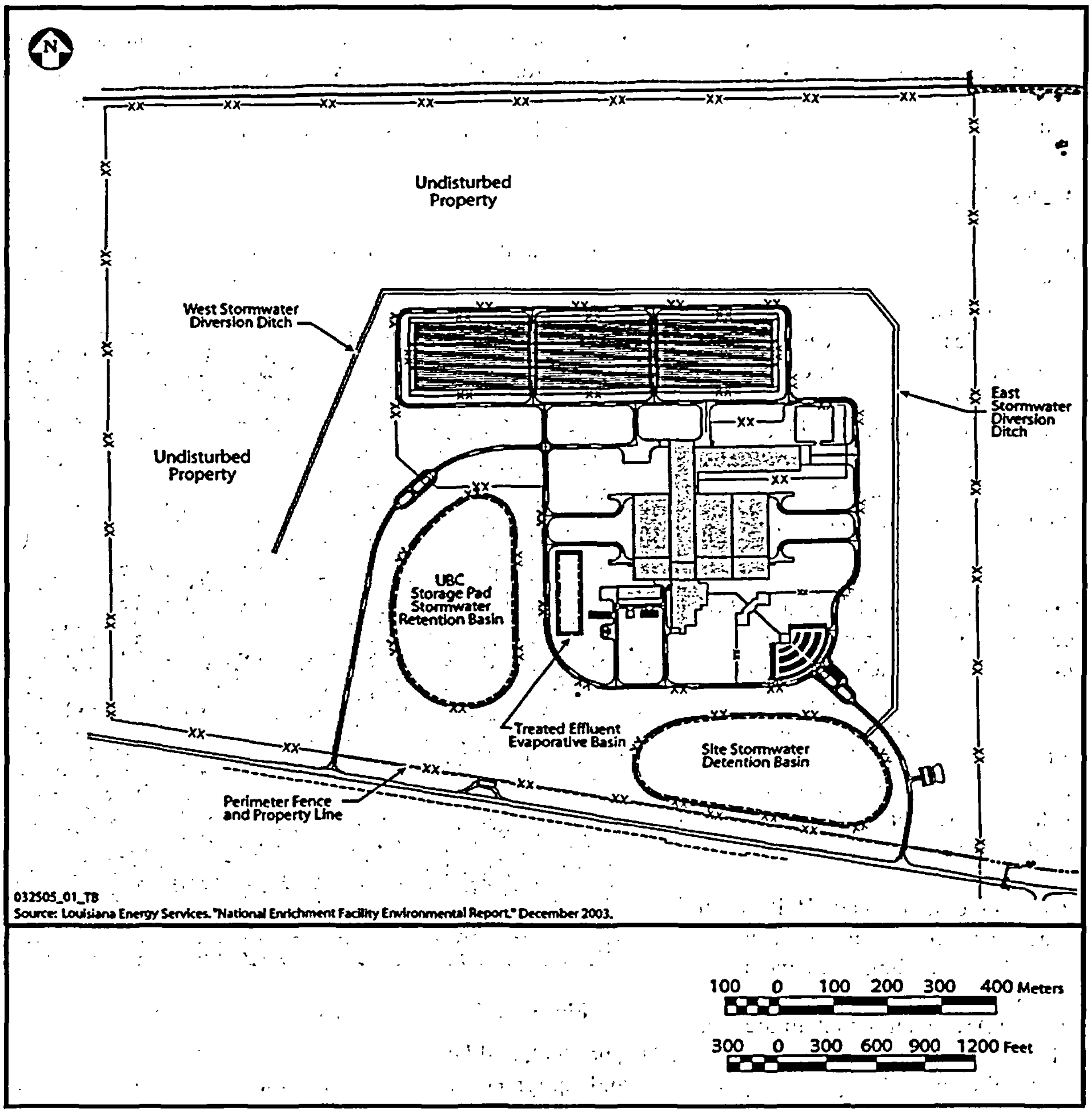

Figure 2-4 Proposed NEF Site Layout (LES, 2005a)

Uranium Byproduct Cylinders (UBC) Storage Pad

The UBC Storage Pad would be constructed on the north side of the controlled area to store transportation cylinders and UBCs. The UBCs are Type 48Y cylinders. The large concrete pad would initially be sized to store the first 5 years' worth of cylinders (about 1,600 cylinders) stacked two high in concrete saddles that would elevate them approximately 20 centimeters (8 inches) above ground level. The pad would be expanded as additional storage is required. The maximum size of the UBC Storage Pad would be 9 hectares (23 acres), and it would be able to store 15,727 cylinders (LES, 2005a).

Centrifuge Assembly Building

The Centrifuge Assembly Building would be used for the assembly, inspection, and mechanical testing of the centrifuges prior to installation in the Cascade Halls. This building would also contain the Centrifuge Test and Postmortem Facilities that would be used to test the functional performance and operational problems of production centrifuges and ensure compliance with design parameters.

Cascade Halls

The six proposed Cascade Halls would be contained in three Separations Buildings near the center of the proposed NEF. Figure 2-5 is a photograph of centrifuges inside a cascade hall at Urenco. Each of the six proposed Cascade Halls would house eight cascades, and each cascade would consist of hundreds of centrifuges connected in series and parallel to produce enriched UF_6. Each Cascade Hall would be capable of producing a maximum of 545,000 separative work units (SWU) per year.

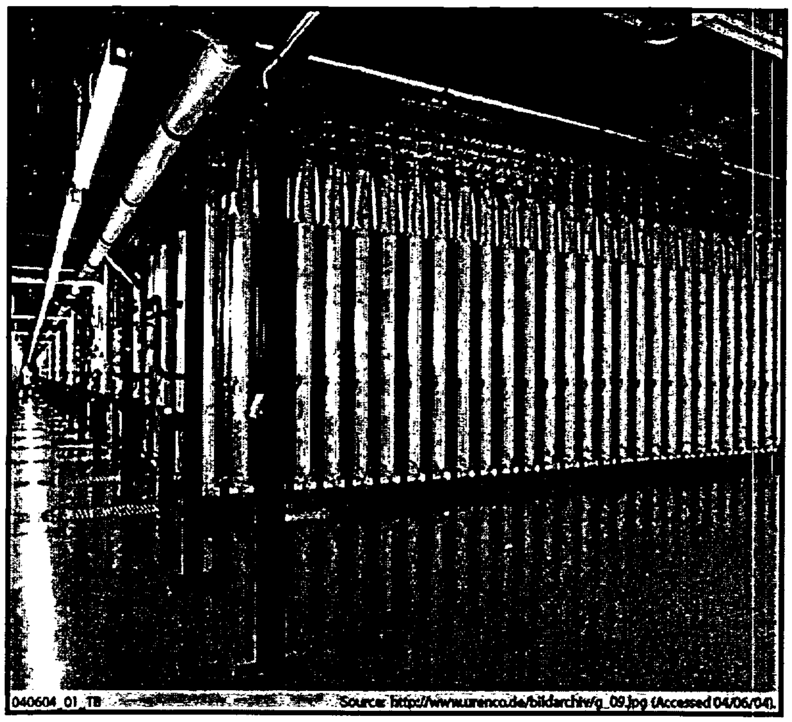

Figure 2-5 Inside a Cascade Hall (Urenco, 2003)

The centrifuges would be mounted on precast concrete-floor-mounted stands (flomels). Each Cascade Hall would be enclosed by a structural steel frame supporting insulated sandwich panels (metal skins with a core of insulation) to maintain a constant temperature within the cascade enclosure.

In addition to the Cascade Halls, each Separations Building module would house a UF_6 Handling Area and a Process Services Area. The UF_6 Handling Area would contain the UF_6 feed input system as well as the enriched UF_6 product, and DUF_6 takeoff systems. The Process Services Area would contain the gas transport piping and equipment, which would connect the cascades with each other and with the product and depleted materials takeoff systems. The Process Services Area would also contain key electrical and cooling water systems.

Cylinder Receipt and Dispatch Building

All UF_6 cylinders (feed, product, and UBCs) would enter and leave the proposed NEF through the Cylinder Receipt and Dispatch Building.

Blending and Liquid Sampling Area

The primary function of the Blending and Liquid Sampling Area would be filling and sampling the Type 30B product cylinders with UF_6 enriched to the customer specifications and verifying the purity of the enriched product.

Technical Services Building

The Technical Services Building would contain support areas for the facility and acts as the secure point of entry to the Separations Building Modules and the Cylinder Receipt and Dispatch Building. This building would contain the following functional areas:

- The *Control Room* would be the main monitoring point for the entire plant and provide all of the facilities for the control of the plant.

- The *Security Alarm Center* would be the primary security monitoring station for the facility. All electronic security systems would be controlled and monitored from this center.

- The *Cylinder Preparation Room* would provide a set-aside area for testing and inspecting Type 30B, 48X, and 48Y cylinders for use in the proposed NEF. It would be maintained under negative pressure and would require entry and exit through an airlock.

- The *Radiation Monitoring Control Room* would separate the non-contaminated areas from the potentially contaminated areas of the proposed plant. It would include personnel radiation monitoring equipment, hand-washing facilities and safety showers.

- The *Decontamination Workshop* would provide a facility for the removal of radioactive contamination from contaminated materials and equipment.

- The *Solid Waste Collection Room* would be used for processing wet and dry low-level solid waste.

- The *Liquid Effluent Collection and Treatment Room* would be used to collect, monitor, and treat potentially contaminated liquid effluents produced onsite.

- The *Gaseous Effluent Vent System Room* would be used to remove uranium and other radioactive particles and hydrogen fluoride from the potentially contaminated process gas streams.

- The *Laboratory Area* would provide space for laboratories where the purity and enrichment percentage of the enriched UF_6 would be measured and the impact of the proposed NEF on the environment would be monitored.

Administration Building

The Administration Building would contain office areas and a security station. All personnel access to the proposed NEF would occur through the Administration Building.

Visitor Center

The Visitor Center would be located outside the security fence close to New Mexico State Highway 234.

Security Building

The main Security Building would be located to monitor all traffic entering and leaving the proposed NEF.

Central Utilities Building

The Central Utilities Building would house two diesel generators, which would provide standby and emergency power for the proposed facility as well as the electrical switchgear and heating, ventilation, and air-conditioning systems for the proposed facility.

2.1.4 Site Preparation and Construction

Site preparation for the construction of the proposed NEF would require the clearing of approximately 81 hectares (200 acres) of undisturbed pasture land within the 220-hectares (543-acre) site. The permanent plant structures, support buildings, and the UBC Storage Pad would occupy about 73 hectares (180 acres) of the 81 hectares (200 acres) if the UBC Storage Pad is expanded to its fullest capacity. Contractor parking and a lay-down area would occupy the remaining 8 hectares (20 acres). The contractor parking and lay-down area and areas around the building exteriors would be graded and restored after completion of the proposed construction (LES, 2005a).

Most of the disturbed area would be graded and would form the owner-controlled area. The disturbed area would comprise about one-third of the total site area. The undisturbed onsite areas (139 hectares [343 acres]) would be left in a natural state with no designated use for the life of the proposed NEF. Figure 2-6 shows the areas that would be cleared for construction activities.

Site Preparation

If licensed, groundbreaking at the proposed NEF site would begin in 2006, with construction continuing for 8 years until 2013. The proposed site terrain currently ranges in elevation from 1,033 to 1,045 meters (3,390 to 3,430 feet) above mean sea level. Because the proposed NEF requires an area of flat terrain, about 36 hectares (90 acres) would be graded to bring the site to a proposed final grade of 1,041 meters (3,415 feet) above mean sea level. All material excavated onsite would be used for onsite fill.

Site preparation would include the cutting and filling of approximately 611,000 cubic meters (797,000 cubic yards) of soil and caliche with the deepest cut being 4 meters (13 feet) and the deepest fill being 3.3 meters (11 feet) (LES, 2005a). In this phase, conventional earthmoving and grading equipment would be used. The removal of very dense soil or caliche could require the use of heavy equipment with ripping tools. Control of soil-removal work for foundations would follow to reduce over excavation and minimize construction costs. In addition, loose soil and/or damaged caliche would be removed prior to installation of foundations for seismically designed structures.

Subsurface geologic materials at the proposed NEF site generally consist of red clay beds, a part of the Chinle Formation of the Triassic-aged Dockum Group. Bedrock is covered with up to 17 meters (55 feet) of silty sand, sand, sand and gravel, and an alluvium that is part of the Antlers and/or Gatuña Formations.

Foundation conditions at the site are generally good, and no potential for mineral development has been found at the site.

A high-pressure CO_2 pipeline would be relocated during the site preparation for safety considerations. The relocation would be performed in accordance with applicable regulations to minimize any direct or indirect impacts on the environment.

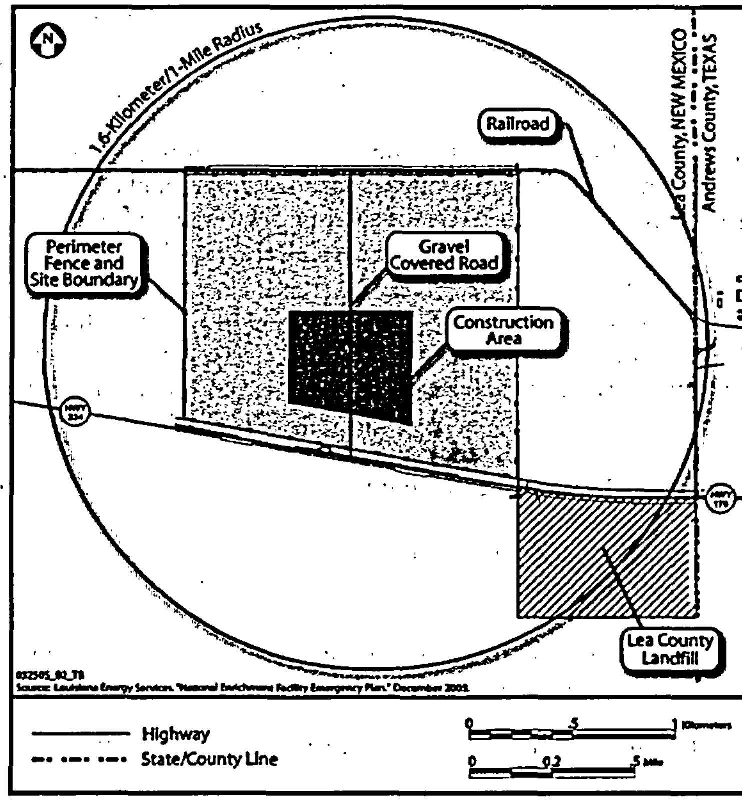

Figure 2-6 Construction Area for the Proposed NEF Site

Soil Stabilization

An engineered system would control surface stormwater runoff for the proposed NEF. Construction and erosion control management practices would mitigate erosional impacts due to site clearing and grading. Part of construction work would involve stabilizing disturbed soils. Earth berms, dikes, and sediment fences would be used as necessary during all phases of construction to limit runoff. Much of the excavated areas would be covered by structures or paved, limiting the creation of new dust sources. Additionally, two stormwater detention basins would be constructed prior to land clearing to be used as sedimentation collection basins during construction, and they would be converted to stormwater detention or retention basins once the site is re-vegetated and stabilized.

One of the construction stormwater detention basins would be converted to the Site Stormwater Detention Basin at the south side of the proposed site. The Site Stormwater Detention Basin would collect runoff from various developed parts of the site including roads, parking areas, and building roofs. It would be unlined and would have an outlet structure to control discharges above the design level. The normal discharge would be through evaporation to the air or infiltration into the ground. The basin's design would enable it to contain runoff for a rainfall of 15.2 centimeter (6.0 inch) in 24 hours, which is equal to the 100-year return frequency storm. In addition, the basin would have 60 centimeters (2 feet) of freeboard beyond design capacity.

The site is currently unimproved ground. Rainfall percolates into the soil or runs off into the roadside drainage ditch. After construction is completed part of the site would be covered with buildings and paved areas that would prevent rainfall from percolating into the soil. Runoff from the buildings and paved areas would be diverted to the Site Stormwater Detention Basin. The Basin would be equipped with an outfall that would be designed to limit the discharge flow rate to the same or less than the site's current runoff rate.

The Site Stormwater Detention Basin would have approximately 123,350 cubic meters (100 acre-feet) of storage capacity. The drainage area served would include about 39 hectares (96 acres), the majority of which would be the developed portion of the proposed NEF site. The water quality of the discharge would be typical of runoff from building roofs and paved areas from any industrial facility. 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.

The second stormwater detention basin built during construction would be converted to the UBC Storage Pad Stormwater Retention Basin for the operation phase. The UBC Storage Pad Stormwater Retention Basin would collect and contain water discharges from three sources: (1) stormwater runoff from the UBC Storage Pad, (2) cooling tower blowdown discharges, and (3) heating boiler blowdown discharges. This basin would be designed with a membrane lining to minimize ground infiltration of the water. Evaporation would be the primary method to eliminate the water from the UBC Storage Pad Stormwater Retention Basin. The basin would be designed to contain a volume equal to 30.4 centimeters (12 inches) of rainfall, which is double the 24-hour, 100-year return frequency storm plus an allowance for cooling tower and heating boiler blowdown water. The UBC Storage Pad Stormwater Retention Basin would be designed to contain a volume of approximately 77,700 cubic meters (63 acre-feet), which serves 9 hectares (23 acres), the maximum area of the proposed UBC Storage Pad.

Additional mitigation measures would be taken to minimize soil erosion and impacts during the construction phase. Mitigation measures proposed by LES during construction include:

- Watering the onsite construction roads periodically to control fugitive dust emissions, taking into account water conservation.
- Using adequate containment methods during excavation and other similar operations.
- Covering open-bodied trucks transporting materials likely to disperse when in motion.
- Promptly removing earthen materials dispensed on paved roads.
- Stabilizing or covering bare areas once earth-moving activities are completed.

After construction is complete, natural, low-water maintenance landscaping and pavement would be used to stabilize the site.

Spill Prevention

All construction activities would comply with the National Pollutant Discharge Elimination System (NPDES) general construction permit obtained from U.S. Environmental Protection Agency Region 6 with an oversight review by the New Mexico Environment Department Water Quality Bureau. A Spill Prevention, Control, and Countermeasure Plan would also be implemented during construction to minimize environmental impacts from potential spills and to ensure prompt and appropriate remediation. Potential spills during construction would likely occur around vehicle maintenance and fueling locations, storage tanks, and painting operations. The Spill Prevention, Control, and Countermeasure Plan would identify sources, locations, and quantities of potential spills and response measures. The plan would also identify individuals and their responsibilities for implementation of the plan and provide for prompt notifications of State and local authorities, as required. Implementing best management practices for waste management would minimize solid waste and hazardous material generation during construction. These practices would include the placement of waste receptacles and trash dumpsters at convenient locations and the designation of vehicle and equipment maintenance areas for the collection of oil, grease, and hydraulic fluids. If external washing of construction vehicles would be necessary, no detergents would be used, and the runoff would be diverted to an onsite basin. Adequately maintained sanitary facilities would be available for construction crews.

Air Emissions

Construction activity would generate some degree of dust during the various stages of construction activity. The amount of dust emissions would vary according to the types of activity. The first 5 months of construction would likely be the period of highest emissions because approximately one-third of the 220-hectare (543-acre) proposed NEF site would be involved along with the greatest number of construction vehicles operating on an unprepared surface. However, it would be expected that no more than 18 hectares (45 acres) would be involved in this type of work at any one time.

Table 2-2 lists the estimated peak emission rates during construction of the proposed NEF. Emission rates for fugitive dust were estimated for a 10-hour workday assuming peak construction activity levels were maintained throughout the year. The calculated total work-day average emissions result for fugitive emission particulate would be 8.6 kilograms per hour (19.1 pounds per hour). Fugitive dust would most likely be caused by vehicular traffic on unpaved surfaces, earth moving, excavating and bulldozing, and to a lesser extent wind erosion.

Table 2-2 Estimated Peak Emission Rates During Construction (Based on 10 hours per day, 5 days per week, and 50 weeks per year)

Pollutant	Average Emissions, kilograms per hour (pounds per hour)
Vehicle Emissions	
Hydrocarbons	2.1 (4.6)
Carbon Monoxide	13.3 (29.4)
Nitrogen Oxides	7.53 (59.8)
Sulfur Oxides	2.7 (6.0)
Particulate	1.9 (4.3)
Fugitive Emissions	
Particulate	8.6 (19.1)

Source: LES, 2005b.

Sanitary Waste

In lieu of connecting to the local sewer system, six onsite underground septic systems would be installed for the treatment of sanitary wastes. Each septic system would consist of a septic tank with one or more leachfields. Together, the six septic systems would be sized to process 40,125 liters per day (10,600 gallons per day), which is sufficient flow capacity for approximately 420 people. Assuming an average water use of 95 liters per day (25 gallons per day) per person, the planned staff of 210 full-time employees would use approximately 20,000 liters per day (5,283 gallons per day) which, if evenly distributed, means the planned septic systems would operate at about 50 percent of design capacity (LES, 2005a).

Construction Work Force

Table 2-3 presents the estimated average annual number of construction employees who would work on the proposed NEF site during construction and their annual pay. The construction force is anticipated to peak at about 800 workers from 2008 to 2009. During early construction stages of the project, the work force would be expected to consist primarily of structural crafts workers, most of whom would be recruited from the local area. As construction progresses, there would be a transition to predominantly mechanical and electrical crafts. The bulk of this labor force would come from the surrounding 120-kilometer (75-mile) region, which is known as the region of influence.

Table 2-3 Estimated Number of Construction Workers by Annual Pay

Year	Number of Workers by Salary Range				Total Number of Workers
	$0 - 16,000	$17,000 - 33,000	$34,000 - 49,000	$50,000 - 82,000	Average Number per Year
2006	100	100	50	5	255
2007	50	75	350	45	520
2008	50	100	500	50	700
2009	50	100	600	50	800
2010	50	25	300	50	425
2011	10	25	100	60	195
2012	10	15	75	40	140
2013	10	15	75	40	140

Source: LES, 2005b.

Construction Materials

Construction of the proposed NEF would require many different commodities. Table 2-4 lists materials that would be used during the construction phase, and most of these materials would be obtained locally.

Table 2-4 Selected Commodities and Resources to be Used During Construction of Proposed NEF

Description	Quantity
Water	7,570 cubic meters (2 million gallons)[a] annually
Asphalt Paving	72,940 cubic meters (95,400 cubic yards)
Chain Link Fencing	15.1 kilometers (9.3 miles)
Concrete	59,196 cubic meters (77,425 cubic yards)
Concrete Paving	1,614 cubic meters (2,111 cubic yards)
Copper & Aluminum Wiring	362 kilometers (225 miles)
Crushed Stone	287,544 square meters (343,900 square yards)
Electrical Conduit	121 kilometers (75 miles)
Piping (Carbon & Stainless Steel)	56 kilometers (34.6 miles)
Roofing Materials	52,074 square meters (560,500 square feet)
Stainless & Carbon Steel Ductwork	515 metric tons (568 tons)
Clay	55,813 cubic meters (73,000 cubic yards)

[a] Escalated from the formerly proposed Claiborne Enrichment Facility. The value from the Claiborne Enrichment Facility was doubled since the proposed NEF would have double the production capacity, and the total was then increased by 65 percent to account for the semi-arid climate of the proposed site (NRC, 1994).
Source: LES, 2005a.

2.1.5 Local Road Network

New Mexico Highway 234 is a two-lane highway located on the southern border of the proposed NEF site with 3.6-meter (12-foot) wide driving lanes, 2.4-meter (8-foot) wide shoulders, and a 61-meter (200-foot) right-of-way easement on either side. The highway provides direct access to the site. A gravel-covered road currently runs north from the highway through the center of the site to the sand and gravel quarry to the north. Two access roads would be built from the highway to support construction. The materials delivery construction access road would run north from the highway along the west side of the proposed NEF. The personnel construction access road would run north from the highway along the east side of the proposed NEF. Both roadways would eventually be paved and converted to permanent access roads upon completion of construction.

Over-the-road trucks of various sizes and weights would deliver construction material to the proposed NEF. Delivery vehicles would range from heavy-duty 18-wheeled tractor trailers to commercial box and light-duty pick-up trucks. Delivery vehicles from the north and south would travel New Mexico Highway 18 or New Mexico Highway 207 to New Mexico Highway 234. The intersection of New Mexico Highway 18 and New Mexico Highway 234 is approximately 6.4 kilometers (4 miles) west of the site. While the intersection of New Mexico Highway 207 and New Mexico Highway 234 is further west, construction material would also travel from the east by way of Texas Highway 176, which becomes New Mexico Highway 234 at the New Mexico/Texas State line. Construction material from the west would come by way of New Mexico Highway 8, which becomes New Mexico Highway 234 near the city of Eunice west of the site. Due to the presence of a quarry directly north of the site, bulk aggregate trucks might also use the onsite gravel road that currently leads to the quarry.

Planned maintenance to New Mexico Highway 234 include the resurfacing, restoration, and rehabilitation of existing lanes to improve roadway quality, enhance safety, and further economic development. However, no time frame has been established for the maintenance activities (NMDOT, 2004b).

2.1.6 Proposed Facility Utilities and Other Services

The proposed NEF would require the installation of water, natural gas, and electrical utility lines.

<u>Water Supply</u>

The proposed NEF water supply would be obtained from the municipalities of Eunice and Hobbs, New Mexico. This would be performed by running new potable water pipelines from the municipal water supply systems for Eunice and Hobbs to the proposed NEF site. The pipeline from Eunice would be about 8 kilometers (5 miles) long, and the pipeline from Hobbs would be about 32 kilometers (20 miles) long. Both pipelines would run inside the Lea County right-of-way easements along New Mexico Highways 18 and 234.

Current capacities for the Eunice and Hobbs municipal water supply systems are 16,350 cubic meters per day (4.32 million gallons per day) and 75,700 cubic meters per day (20 million gallons per day), respectively. Current Eunice and Hobbs usages are about 5,600 cubic meters per day (1.48 million gallons per day) and 23,450 cubic meters per day (6.2 million gallons per day), respectively. The average and peak water requirements for operation of the proposed NEF would be approximately 240 cubic meters per day (63,423 gallons per day) and 2,040 cubic meters per day (539,000 gallons per day), respectively (Abousleman, 2004; Woomer, 2004).

Natural Gas

The natural gas line feeding the site will connect to an existing, nearby line along available county right-of-way easements.

Electrical Power

The proposed NEF would require approximately 30 megawatts of electricity. This power would be supplied by two new synchronized 115-kilovolt overhead transmission lines on a large loop system. These lines would tie into a trunk line about 13 kilometers (8 miles) west of the proposed site. Currently, there are several power poles along the highway in front of the adjacent vacant parcel east of the proposed site, and a 61-meter (200-foot) right-of-way easement along both sides of New Mexico Highway 234 would allow installation of utility lines within the highway easement. Xcel Energy, the local electrical service company, would install two onsite transformers in conjunction with the new electrical lines serving the site. Associated power-support structures would be installed along New Mexico Highway 234. An application for highway easement modification would be submitted to the State. The average power requirement and the peak power requirement of the facility are approximately 30.3 million volt-amps and 32 million volt-amps, respectively (LES, 2005b).

2.1.7 Proposed Facility Operation

At full production, the proposed NEF would receive 8,600 metric tons (9,480 tons) per year of UF_6 containing a concentration of 0.72 percent by weight of the ^{235}U isotope. The proposed NEF would enrich natural UF_6 feed material to between 3 and 5 percent by weight of the ^{235}U isotope. The enriched DUF_6 would be transferred to a Type 30B cylinder where the gas would be cooled to a solid within the cylinder. DUF_6 gas would be transferred to a Type 48Y cylinder where the gas would be cooled to a solid within the cylinder. LES would store the cylinder on the UBC Storage Pad until final dispositioning.

Receiving UF_6 Feed Material

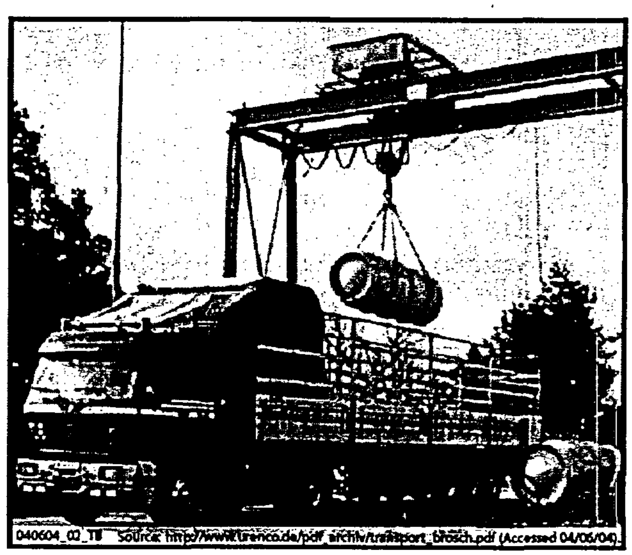

Figure 2-7 Cylinder of UF_6 Being Unloaded (Urenco, 2004a)

Figure 2-7 shows the unloading of a Type 48Y cylinder. The proposed 8,600 metric tons (9,480 tons) of natural UF_6 feed material would be processed by the cascades to generate up to 800 metric tons (882 tons) of enriched UF_6 product and 7,800 metric tons (8,600 tons) of DUF_6 material each year. The feed material would be shipped to the proposed NEF in standard Type 48X or 48Y cylinders. Both of these cylinders are U.S. Department of Transportation approved containers for transporting Type A material (DOE, 1999a). The radioactive materials transported in these containers are subject to Title 10, "Energy," of the *U.S. Code of Federal Regulations* (10 CFR) Part 71 and 49 CFR Parts 171-173 shipping regulations. These regulations include requirements for an internal pressure test without leakage, free drop test without loss or dispersal of UF_6, and thermal test requirements without rupture of the containment system. In addition, shipments would be required to have fissile controls. A fully loaded Type 48Y cylinder weighs 14.9 metric tons (16.4 tons) and is shipped one per truck (WNTI, 2004). Therefore, the site would receive an average of three shipments of natural UF_6 feed material every day (assuming only weekday shipments). After receipt and inspection, the cylinder could be stored until needed or connected to the gas centrifuge cascade at one of several feed stations. Once installed in the feed station, the transport cylinders would be heated to sublime the solid UF_6 into a gas that would be fed to the gas centrifuge enrichment cascade.

After the cylinder has been emptied, it would be inspected and processed for reuse. The proposed NEF currently has no plans for internal cleaning or decontamination of the cylinders (LES, 2005c). The Type 48X cylinders are smaller than the Type 48Y cylinders and would not be used for onsite storage of the DUF_6 material. They would be returned to the supplier for reuse or disposed of at a licensed facility. The Type 48Y cylinders would be used to store DUF_6 material on the UBC Storage Pad or returned to the supplier. A Type 48Y cylinder filled with DUF_6 would be designated as a UBC.

Producing Enriched UF_6 Product

The proposed NEF would be constructed in stages to allow enrichment operations to begin while additional cascade halls are still under construction. The first set of enrichment cascades would begin operating as soon as practical. This ramped production schedule would allow the proposed facility to begin operation only 2 years after initial groundbreaking. Production of enriched UF_6 product would increase from approximately 77 metric tons (85 tons) in 2008 to a maximum of 800 metric tons (882 tons) by 2013 (LES, 2005a).

Shipping Enriched Product

Enriched UF_6 product would be shipped in a Type 30B cylinder, which is 76 centimeters (30 inches) in diameter and 206 centimeters (81 inches) long and holds a maximum of 2.3 metric tons (2.5 tons) of 5-percent enriched $^{235}UF_6$. Figure 2-8 shows Type 30B enriched product cylinders and overpacks being loaded for transport. At full production, the proposed NEF would produce 800 metric tons (882 tons) of enriched product which, at 2.3 metric tons (2.5 tons) per cylinder and three cylinders per truck, would require approximately two trucks per week to be shipped to the fuel fabricators in Richland, Washington; Wilmington, North Carolina; or Columbia, South Carolina.

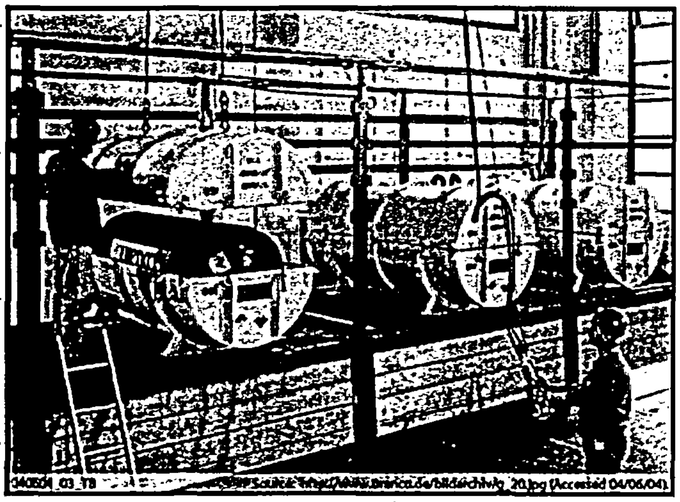

Figure 2-8 Shipment of Enriched Product (Urenco, 2004a)

Storing DUF_6 Material

During operation of the proposed NEF, the production of DUF_6 material would increase from 825 metric tons (909 tons) to 7,800 metric tons (8,600 tons) per year. This material would fill between 66 and 627 cylinders per year. Table 2-5 shows the potential maximum and anticipated quantity of Type 48Y cylinders that would be filled with DUF_6 material each year during the anticipated life of the proposed NEF.

The "Maximum" production column shown in Table 2-5 provides a upper limit bounding guide for the operation of the proposed NEF. It does not consider a sequential shutdown or progressive decommissioning of the proposed NEF. The proposed NEF would undergo sequential decommissioning which would reduce the production capability of the proposed facility as the cascades are shut down in sequence and the proposed NEF undergoes sequential decommissioning. The "Anticipated" production column incorporates this sequential shutdown into the estimated production of DUF_6 material during the operational life of the proposed NEF.

Table 2-5 Maximum and Anticipated Yearly Production of Cylinders of DUF_6 over 30-Year License

Year	Maximum		Anticipated	
	Yearly UBCs Filled	Cumulative UBCs Filled	Yearly UBCs Filled	Cumulative UBCs Filled
2008	66	66	66	66
2009	196	262	196	262
2010	313	575	313	575
2011	431	1,006	431	1,006
2012	548	1,554	548	1,554
2013	623	2,177	623	2,177
2014 to 2027	627	2,804 to 10,955	627	2,804 to 10,955
2028	627	11,582	561	11,516
2029	627	12,209	444	11,960
2030	627	12,836	326	12,286
2031	627	13,463	209	12,495
2032	627	14,090	92	12,587
2033	561	14,651	5	12,592
2034	444	15,095	0	12,592
2035	326	15,421	0	12,592
2036	209	15,630	0	12,592
2037	92	15,722	0	12,592
2038	5	15,727	0	12,592
2039	0	15,727	0	12,592

Source: LES, 2004.

The DUF_6 material would be stored in Type 48Y cylinders on the UBC Storage Pad until a final disposition option is identified. The UBC Storage Pad would be able to hold up to 15,727 cylinders, which is the maximum projected production of the DUF_6 material cylinders.

Figure 2-9 shows the material flow of feed, enriched, and DUF_6 material and cylinders during full operation of the proposed NEF.

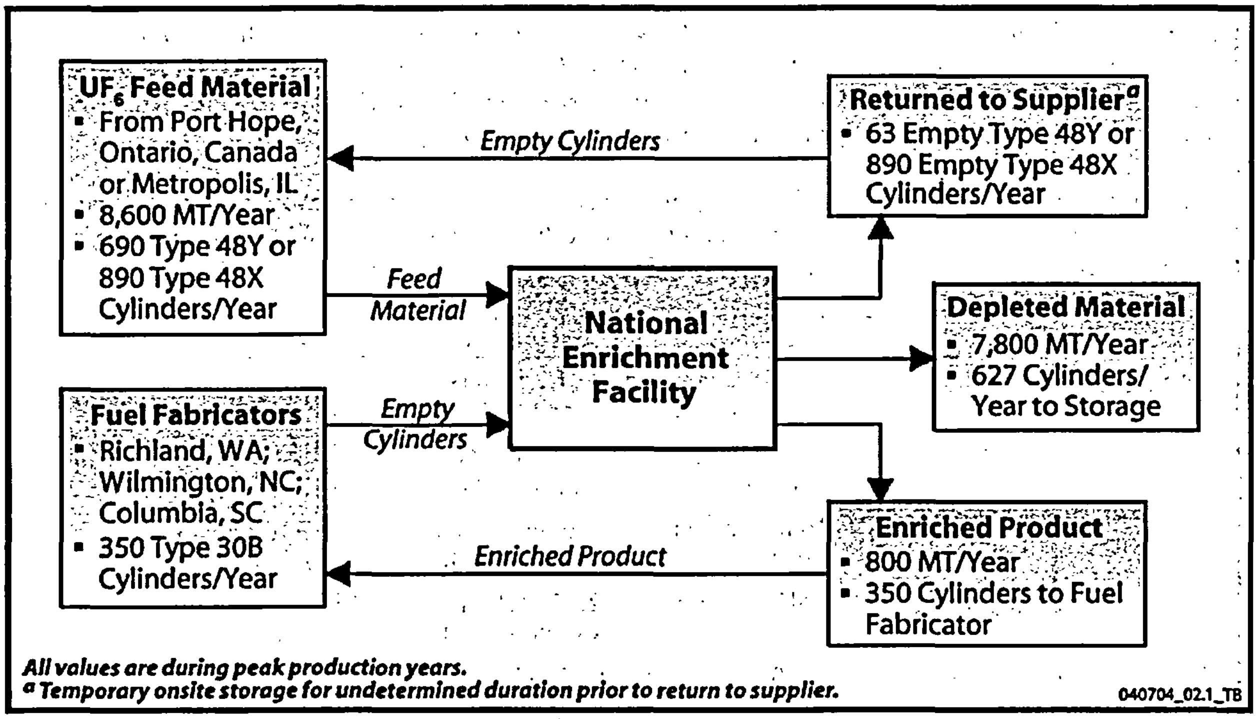

Figure 2-9 Flow from Feed, Enriched, and DUF_6 Material

Operations Work Force

An estimated 210 full-time workers would be required during full operation of the proposed NEF, providing an average of 150 jobs per year over the life of the facility. The average total annual wages and benefits paid to these workers would be $10.5 million per year. The annual number of production workers would increase as construction activities tapered off and, correspondingly, the production work force would reduce as decommissioning activities begin. Table 2-6 shows direct employment and average salaries during operations.

Table 2-6 Direct Employment and Average Salaries During Operations

Position	Number of Jobs	Percentage	Average Salary	Total Payroll
Management	21	10%	$95,000	$1,995,000
Professional	42	20%	$62,000	$2,604,000
Skilled	126	60%	$42,000	$5,292,000
Administrative	21	10%	$30,000	$630,000
Total	210	100%	$50,100	$10,521,000

Source: LES, 2005a.

Containers Used for Transportation and Storage of UF_6

Type 48X or Type 48Y cylinders would be used to transport feed material (natural UF_6) to the proposed NEF site. Only 48Y cylinders would be used for temporary storage of DUF_6 on the UBC Storage Pad. The difference between the Type 48X and 48Y cylinders is their capacity. Both containers are constructed of American Society for Testing and Materials (ASTM) type A-516 steel, and both can be used to transport UF_6 enriched up to 4.5 percent ^{235}U.

Type 30B containers would be used to transport enriched UF_6 to fuel fabrication facilities. Type 30B containers have additional design requirements as specified in 10 CFR § 71.51 to permit the safe transportation of higher enriched UF_6 than the Type 48X or 48Y containers.

	Type 48X	Type 48Y	Type 30B
Diameter	1.2 meters (48 inches)	1.2 meters (48 inches)	0.76 meter (30 inches)
Length	3.0 meters (119 inches)	3.8 meters (150 inches)	2.06 meters (81 inches)
Wall Thickness	16 millimeters (0.625 inch)	16 millimeters (0.625 inch)	12.7 millimeters (0.5 inch)
Empty Weight	2,041 kilograms (4,500 pounds)	2,359 kilograms (5,200 pounds)	635 kilograms (1,400 pounds)
UF_6 Capacity	9,540 kilograms (21,000 pounds)	12,500 kilograms (27,560 pounds)	2,277 kilograms (5,020 pounds)

Sources: DOE, 1999a; LES, 2005a; USEC, 1995.

<u>Production Process Systems</u>

The primary product of the proposed NEF would be enriched UF_6 product. Production of enriched UF_6 would require the safe operation of multiple plant support systems to ensure the safe operation of the facility. The principal process systems required for the safe and efficient production of enriched UF_6 product would include the following:

- Decontamination System.
- Fomblin® Oil Recovery System.
- Liquid Effluent Collection and Treatment System.
- Stormwater Detention/Retention Basins.
- Solid Waste Collection System.
- Gaseous Effluent Vent Systems.
- Centrifuge Test and Postmortem Exhaust Filtration System.

Decontamination System

The Decontamination System would be designed to remove radioactive contamination from centrifuges, pipes, instruments, and other potentially contaminated equipment. The system would contain equipment and processes to disassemble, clean and degrease, decontaminate, and inspect plant equipment. Scrap and waste material from the decontamination process would be sent to the solid or liquid waste processing system for segregation and treatment prior to offsite disposal at a licensed facility. Exhaust air from the decontamination system area would pass through the gaseous effluent vent systems before discharge to the atmosphere.

Fomblin® Oil Recovery System

Vacuum pumps would maintain the vacuum between the rotor and casing of the centrifuge. The pumps would use a perfluorinated polyether oil, such as Fomblin® oil, which is a highly fluorinated, nonflammable, chemically inert, thermally stable oil for vacuum pump lubrication and seal maintenance. The Fomblin® oil would provide long service life and would not react with UF_6 gas. Disposal and replacement of the oil is very expensive, which makes recovery and reuse the preferred practice. The Fomblin® Oil Recovery System would reclaim spent oil from the UF_6 processing system, and filter and recondition it for reuse by the proposed NEF. The recovery would employ anhydrous sodium carbonate (soda ash) in a laboratory-scale precipitation process to remove the primary impurities and activated carbon to remove trace amounts of hydrocarbons.

Liquid Effluent Systems

The Liquid Effluent Collection and Treatment System would collect potentially contaminated liquid effluents generated in a variety of plant operations and processes. These liquid effluents would be collected in holding tanks and then transferred to bulk storage tanks prior to disposal. Significant and slightly contaminated liquids would be processed for uranium recovery while noncontaminated liquids would be rerouted to the Treated Effluent Evaporative Basin. Figure 2-10 shows the annual effluent input streams, which include hydrolyzed UF_6, degreaser water, citric acid, laundry water, floor-wash water, hand-wash/shower water, and miscellaneous effluent.

The Treated Effluent Evaporative Basin would receive liquid discharged from the Liquid Effluent Collection and Treatment System. This liquid could contain low concentrations of uranium compounds and uranium decay products. This uranium-bearing material would settle to the bottom of the Treated Effluent Evaporative Basin and collect in the sludge on the bottom of the basin during the operation of the proposed NEF. The sludge would be disposed of as low-level radioactive waste during the decommissioning of the facility.

The Treated Effluent Evaporative Basin would be a double-lined basin built in accordance with New Mexico Environment Department Guidelines for Liner Material and Site Preparation for Synthetically-Lined Lagoons. The basin foundation would be about 60-centimeter (2-foot) thick clay layer, compacted in place and covered with a high-strength geosynthetic liner. A leak-collection piping system and drainage mat would be installed on top of the liner. A sump system would collect any liquid from the collection piping and pump it back into the Treated Effluent Evaporative Basin. A second geosynthetic liner would cover the collection piping, mat, and sump system. The top liner would be covered with a 30-centimeter (1-foot) thick layer of compacted clay.

Animal-friendly fencing would surround the Treated Effluent Evaporative Basin to prevent access by animals and unauthorized personnel. The surface of the basin would be covered with surface netting or other suitable material to exclude waterfowl.

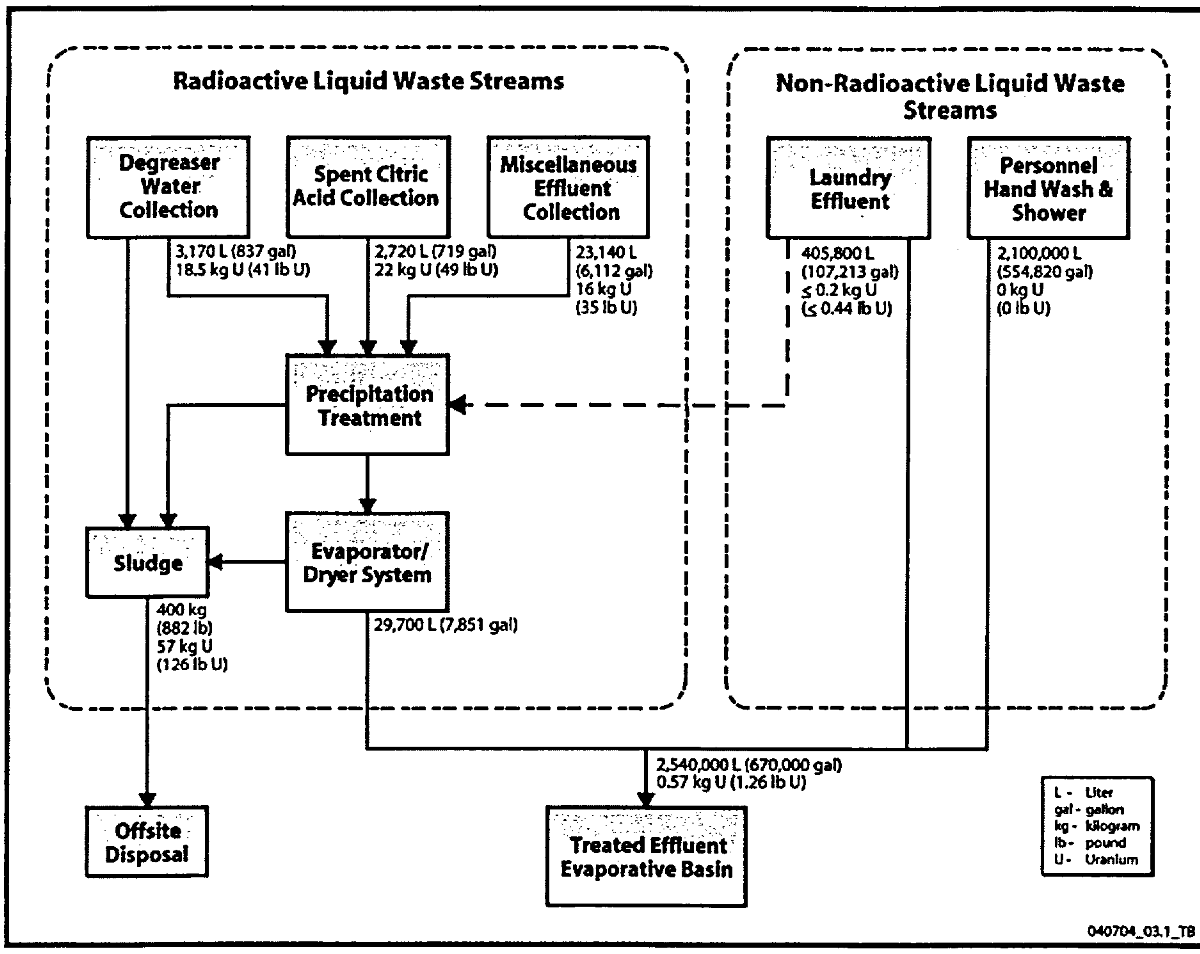

Figure 2-10 Liquid Effluent Collection and Treatment

Stormwater Detention/Retention Basins and Septic Systems

All normal stormwater and runoff waters would be routed from the buildings, parking lot, and roadways to a Site Stormwater Detention Basin and allowed to infiltrate the soil or evaporate. Runoff and stormwaters from the UBC Storage Pad would be routed to the lined UBC Storage Pad Stormwater Retention Basin for evaporation. This would allow the water from the UBC Storage Pad to be monitored and minimize the potential for contaminants entering the soil.

Six separate septic systems throughout the proposed NEF would collect and process all sanitary waste from the facility in accordance with applicable regulations.

Neither the Treated Effluent Evaporative Basin nor the two stormwater basins would meet the definition of "surface water" in the State of New Mexico Standards for Interstate and Intrastate Surface Waters. According to these standards, "Waste treatment systems, including treatment ponds or lagoons designed to meet requirements of the Clean Water Act (other than cooling ponds as defined in 40 CFR § 423.11(m) which also meet the criteria of this definition), are not surface waters of the State, unless they were originally created in surface waters of the State or resulted in the impoundment of surface waters of the State" (NMWQCC, 2002). However, under the *New Mexico Water Quality Act*, the State regulates water-discharge sources. LES has submitted a Groundwater Discharge Permit/Plan application to the w as presented in Table 1-3. The application is undergoing New Mexico Environment Department Water Quality Bureau review.

Solid Waste Collection System

In addition to the DUF_6, operation of the proposed NEF would generate other radioactive and nonradioactive solid wastes. Solid waste would be segregated and processed based on its classification as wet solid or dry solid wastes and segregated into radioactive, hazardous, or mixed-waste categories. Wet solid waste would include wet trash (waste paper, packing material, rags, wipes, etc.), oil-recovery sludge, oil filters, miscellaneous oils (such as cutting machine oils), solvent recovery sludge, and uranic waste precipitate. Dry solid waste would include trash (combustible and non-metallic items), activated carbon, activated alumina, activated sodium fluoride, high efficiency particulate air (HEPA) filters, scrap metal, laboratory waste, and dryer concentrate.

Radioactive solid waste would be sent to a licensed low-level radioactive waste disposal facility. Material that would be classified as mixed waste or *Resource Conservation and Recovery Act* (RCRA) material would be disposed of in accordance with the State of New Mexico regulations (EPA, 2003). Nonradioactive wastes—including office and warehouse trash such as wood, paper, and packing materials; scrap metal and cutting oil containers; and building ventilation filters—would be sent to a commercial landfill for disposal.

Figure 2-11 shows the disposal pathways and anticipated volumes for the miscellaneous solid waste that would be generated by the proposed NEF.

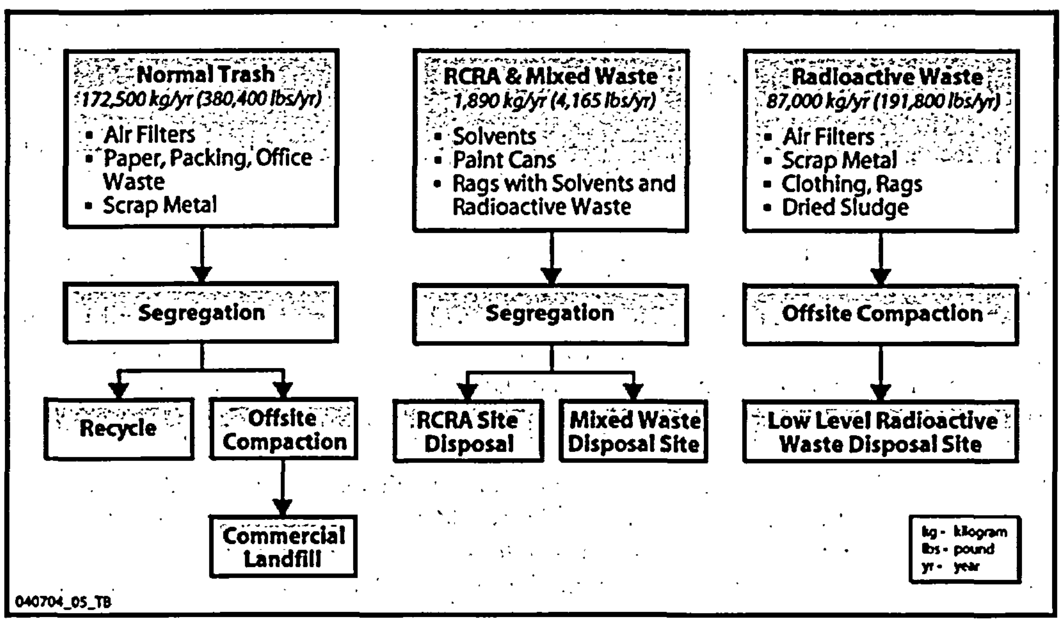

Figure 2-11 Disposal Pathways and Anticipated Volumes for Solid Waste

Gaseous Effluent Vent Systems

Gaseous effluent vent systems would be designed to collect the potentially contaminated gaseous streams in the plant and treat them before discharge to the atmosphere. The system would route these streams through a filter system prior to exhausting out a vent stack which would contain a continuous monitor to measure radioactivity levels. There are two gaseous effluent vent systems for the plant: (1) the Technical Services Building gaseous effluent vent system and (2) the Separations Building gaseous effluent vent system.

The Technical Services Building heating, ventilation, and air conditioning system performs a confinement ventilation function for potentially contaminated areas in the Technical Services Building. Potentially contaminated areas in the Technical Services Building would include ventilation air from the Ventilation Room, Decontamination Workshop, Laundry, Fomblin® Oil Recovery System, Decontamination System, Chemical Laboratory, and Vacuum Pump Rebuild Workshop. The total airflow would be handled by a central gaseous effluent distribution system that would maintain the areas under negative pressure. The treatment system would include a single train of three air filters (a pre-filter, a HEPA filter, and an activated carbon filter impregnated with potassium carbonate); centrifugal fan; automatically operated inlet-outlet isolation dampers; monitoring system; and differential pressure transducers.

The Separations Building gaseous effluent vent system sub-atmospheric duct system transports potentially contaminated gases to a set of redundant filters (a pre-filter, a HEPA filter, and an activated carbon filter impregnated with potassium carbonate) and fans. The cleaned gases would be discharged via rooftop stacks to the atmosphere. The fan would maintain an almost constant sub-atmospheric pressure in front of the filter section by means of a differential pressure controller.

The Technical Services Building gaseous effluent vent system would be the same as the Separations Building gaseous effluent vent system except that it would have one set of filters and a single fan. The gaseous effluent vent system and Technical Services Building heating, ventilation, and air conditioning exhaust points would be on the roof of the Technical Services Building.

Urenco's experience in Europe shows uranium discharges from gaseous effluent vent systems are less than 10 grams (0.35 ounces) per year (LES, 2005a; LES, 2005b).

Nonradioactive gaseous effluents would include argon, helium, nitrogen, hydrogen fluoride, and methylene chloride (LES, 2005a). Approximately 440 cubic meters (15,540 cubic feet) of helium, 190 cubic meters (6,709 cubic feet) of argon, 53 cubic meters (1,872 cubic feet) of nitrogen, and 1.0 kilogram (2.2 pounds) of hydrogen fluoride gaseous effluent would be released each year. The hydrogen fluoride gaseous effluent would be from the chemical reaction of UF_6 with water vapor. In addition, 610 liters (161 gallons) of methylene chloride and 40 liters (11 gallons) of ethanol would be vented each year.

Two natural gas-fired boilers (one in operation and one spare) would be used to provide hot water for the plant heating system. At 100-percent power, each boiler would emit approximately 0.8 metric tons (0.88 tons) per year of volatile organic compounds; 0.5 metric tons (0.55 tons) per year of carbon monoxide; and 5.0 metric tons (5.5 tons) per year of nitrogen dioxide (LES, 2005a). The boilers would not require an air quality permit from the State of New Mexico (LES, 2005a). Specifically, by letter dated May 27, 2004, the New Mexico Environment Department Air Quality Bureau acknowledged receipt of the Notice of Intent application and notified LES that the application will serve as the Notice of Intent in accordance with 20.2.73 NMAC. The New Mexico Environment Department Air Quality Bureau also notified LES of its determination that an air quality permit under 20.2.72 NMAC is not required and that New Source

Performance Standards and National Emission Standards for Hazardous Air Pollutants (NESHAP) do not apply to the proposed NEF (LES, 2005d).

In addition, there would be two diesel generators onsite for use as emergency electrical power sources. Because the diesel generators would have the potential to emit more than 90,700 kilograms (100 tons) per year of a regulated air pollutant, they would only run a limited number of hours per year in order not to be subject to NESHAP. The New Mexico Environment Department Air Quality Bureau stated, along with the specifics mentioned in the previous paragraph, that operation of the two emergency diesel generators and surface-coating activities are exempt from permitting requirements provided all requirements are met, as specified in 20.2.72.202 B (3) and 20.2.72.202 B (6) NMAC (LES, 2005d).

Centrifuge Test and Postmortem Facilities Exhaust Filtration System

The Centrifuge Test and Postmortem Facilities Exhaust Filtration System would exhaust potentially hazardous contaminants from the Centrifuge Test and Postmortem Facilities. The system would also ensure the Centrifuge Postmortem Facility is maintained at a negative pressure with respect to adjacent areas.

The ductwork would be connected to a single-filter station and exhaust through either of two 100-percent fans. The filter station and either of the two fans would be able to handle 100 percent of the effluent exhaust. One of the fans would normally be on standby status. Activities that require the Centrifuge Test and Postmortem Facilities Exhaust Filtration System to be operational would be manually stopped if the system fails or shuts down. After filtration, the clean gases would be discharged through the monitored exhaust stack on the Centrifuge Assembly Building. The Centrifuge Assembly Building exhaust stack would be monitored for hydrogen fluoride and alpha radiation.

2.1.8 Proposed Facility Decontamination and Decommissioning

The proposed NEF would be licensed for 30 years. Before license termination, the proposed NEF would be decontaminated and decommissioned to levels suitable for unrestricted use. All proprietary equipment and radiologically contaminated components would be removed, decontaminated, and shipped to a licensed disposal facility. The buildings, structures, and selected support systems would be cleaned and released for unrestricted use. Before the start of the decontamination and decommissioning activities, LES would prepare a Decommissioning Plan in accordance with the requirements of 10 CFR § 70.38 and submit it to the NRC for approval.

Decontamination and dismantling of the equipment would be conducted in the three Separations Building modules sequentially (in three phases) over a nine-year time frame. Decommissioning of the remaining plant systems and buildings would begin after operations in the final Separations Building module were terminated. The sequential construction of the three Cascade Halls would allow each hall to be isolated during the decommissioning activities. This isolation would help prevent re-contamination of an area once it has been fully decontaminated.

At the end of the useful life of each Separations Building module, the enrichment-process equipment would be shut down and UF_6 removed to the fullest extent possible by normal process operation. This would be followed by evacuation and purging with nitrogen. The shutdown and purging portion of the decommissioning process would take approximately three months for each cascade.

Prompt decontamination or removal of all materials from the site that would prevent release of the facility for unrestricted use would be performed. This approach would avoid long-term storage and monitoring of radiological and hazardous wastes onsite. All of the enrichment equipment would be removed, and only the building shells and site infrastructure would remain. All remaining facilities would be decontaminated to levels that would allow for unrestricted use. DUF_6, if not already sold or otherwise disposed of prior to decommissioning, would be disposed of in accordance with regulatory requirements. Other miscellaneous radioactive and hazardous wastes would be packaged and shipped to a licensed facility for disposal.

Following decommissioning, the entire site would be available for unrestricted use. Decommissioning would generally include the following activities:

- Installation of decontamination facilities.
- Purging of process systems.
- Dismantling and removal of equipment.
- Decontamination and destruction of confidential and secret, restricted-data material.
- Sales of salvaged materials.
- Disposal of wastes.
- Completion of a final radiation survey and spot decontamination.

Decommissioning would require residual radioactivity to be reduced below regulatory limits so the facilities could be released for unrestricted use. The intent of decommissioning would be to release the site for unrestricted use.

As shown in Table 2-1, the decontamination and decommissioning effort would start in 2027 and end by 2036. Specific details of the planned decommissioning of the proposed NEF would be formally proposed in the Decommissioning Plan submitted to the NRC in 2025. Optimization of the decontamination and decommissioning process would occur near the end of the proposed facility's life to take advantage of advances in technology that are likely to occur in between now and the start of the decontamination and decommissioning activities. The timeframe to accomplish both dismantling and decontamination is estimated to be approximately 3 years for each Separations Building module.

Decontamination of Facilities

Decontamination would deal primarily with radiological contamination from ^{238}U, ^{235}U, ^{234}U, and their daughter products. The primary contaminant throughout the plant would be in the form of small amounts of uranium oxide and uranium fluoride compounds.

At the end of the plant's life, some of the equipment, most of the buildings, and all of the outdoor areas should already be acceptable for release for unrestricted use. All basins would be sampled, tested, and disposed of, if required, at the appropriate disposal facility in accordance with pertinent regulations (LES, 2005d). Excavations and berms would be leveled to restore the land to a natural contour (LES, 2005a). If accidentally contaminated during normal operation, they would be cleaned and decontaminated when the contamination was discovered. This would limit the scope of decontamination necessary at the time of decommissioning.

Contaminated plant components would be cut up or dismantled, and then processed through the decontamination facilities. Contamination of site structures would be limited to areas in the Separations Building modules and Technical Services Building, and would be maintained at low levels throughout plant operation by regular surveys and cleaning. The use of special sealing and protective coatings on porous and other surfaces that might become radioactively contaminated during operation would simplify the decontamination process and the use of standard good-housekeeping practices during operation of the proposed facility would ensure that final decontamination of these areas would require minimal removal of surface concrete or other structural material.

Decontamination of Centrifuges

The centrifuges would be processed through a specialized decontamination facility. The following operations would be performed:

- Removal of external fittings.
- Removal of bottom flange, motor and bearings, and collection of contaminated oil.
- Removal of top flange, and withdrawal and disassembly of internals.
- Degreasing of items as required.
- Decontamination of all recoverable items for smelting.
- Destruction of other classified portions by shredding, crushing, smelting, etc.

Dismantling the Facility

Dismantling would require cutting and disconnecting all components requiring removal. The activities would be simple but very labor-intensive and generally require the use of protective clothing. The work process would be optimized through consideration of the following measures:

- Minimizing the spread of contamination and the need for protective clothing.

- Balancing the number of cutting and removal operations with the resultant decontamination and disposal requirements.

- Optimizing the rate of dismantling with the rate of decontamination facility throughput.

- Providing storage and laydown space as required for effective workflow, criticality, safety, security, etc.

To avoid laydown space and contamination problems, dismantling would proceed generally no faster than the downstream decontamination process.

Items to be removed from the facilities would be categorized as potentially re-usable equipment, recoverable scrap, and wastes. However, operating equipment would not be assumed to have reuse value. Wastes would also have no salvage value.

A significant amount of scrap aluminum, steel, copper, and other metals would be recovered during the disassembly of the enrichment equipment. For security and convenience, the uncontaminated materials would likely be shredded or smelted to standard ingots and, if possible, sold at market price. The contaminated materials would be disposed of as low-level radioactive waste.

Disposal

All wastes produced during decommissioning would be collected, handled, and disposed of in a manner similar to that described for those wastes produced during normal operation. Wastes would consist of normal industrial trash, nonhazardous chemicals and fluids, small amounts of hazardous materials, and radioactive wastes. Radioactive wastes would consist primarily of crushed centrifuge rotors, trash, and citric cake. Citric cake consists of uranium and metallic compounds precipitated from citric acid decontamination solutions. Approximately 5,153 cubic meters (6,740 cubic yards) of radioactive waste would be generated over the 9-year decommissioning period. This waste would be subject to further volume-reduction processes prior to disposal. Table 2-7 provides estimates for the amounts and types of radioactive wastes expected to be disposed.

Radioactive wastes would ultimately be disposed of in licensed low-level radioactive waste disposal facilities. Hazardous wastes would be disposed of in licensed hazardous waste disposal facilities. Nonhazardous and nonradioactive wastes would be disposed of in a manner consistent with good industrial practice and in accordance with applicable regulations. A complete estimate of the wastes and effluent to be produced during decommissioning would be provided in the Decommissioning Plan that LES would submit prior to the start of the decommissioning.

Table 2-7 Radioactive Waste Disposal Volume from Dismantling Activities

Low-Level Radioactive Waste Type	Disposal Volume cubic meters (cubic yards)	Maximum Number of Drums[a]
Separation Modules:		
Solidified Liquid Wastes	432 (565)	2,159
Centrifuge Components, Piping, and Other Parts	1,036 (1,355)	5,180
Aluminum	3,602 (4,711)	Not Supplied
Other Buildings:		
Miscellaneous Low-Level Waste	83 (2,930)	400
Total	**5,153 (6,740)**	**7,739**

[a] 55-gallon (208-liter) drums.
Source: LES, 2005b.

Final Radiation Survey

A final radiation survey would verify complete decontamination of the proposed NEF prior to allowing the site to be released for unrestricted use. The evaluation of the final radiation survey would be based in part on an initial radiation survey performed prior to initial operation. The initial site radiation survey would determine the natural background radiation levels in the area of the proposed NEF, thereby providing a benchmark for identifying any increase in radioactivity levels in the area. The final survey would measure radioactivity over the entire site and compare it to the original benchmark survey. The intensity of the survey would vary depending on the location (i.e., the buildings, the immediate area around the buildings, and the remainder of the site). A final radiation survey report would document the survey procedures and results, and would include, among other things, a map of the survey of the proposed site, measurement results, and a comparison of the proposed NEF site's radiation levels to the surrounding area. The results would be analyzed to show that they were below allowable residual radioactivity limits; otherwise, further decontamination would be performed.

2.1.9 DUF_6 Disposition Options

At full production, the proposed NEF would generate 7,800 metric tons per year (8,600 tons per year) of DUF_6. Initially, the DUF_6 would be stored in Type 48Y cylinders (UBC) on the UBC Storage Pad (LES, 2005a). Each Type 48Y cylinder would hold approximately 12.5 metric tons (13.8 tons), which means that the site, at full production, would generate approximately 627 cylinders of DUF_6 every year. During the operation of the facility, the plant could generate and store up to 15,727 cylinders of DUF_6. LES would own the DUF_6 and maintain the UBC's while they are in storage. Maintenance activities would include periodic inspections for corrosion, valve leakage, or distortion of the cylinder shape, and touch-up painting as required. Problem cylinders would be removed from storage and the material transferred to another storage cylinder. The proposed storage area would be kept neat and free of debris, and all stormwater or other runoff would be routed to the UBC Storage Pad Stormwater Retention Basin for monitoring and evaporation.

> *Waste Classification of Depleted Uranium*
>
> *Depleted uranium is different from most low-level radioactive waste in that it consists mostly of long-lived isotopes of uranium, with small quantities of thorium-234 and protactinium-234. Additionally, in accordance with 10 CFR Parts 40 and 61, depleted uranium is a source material and, if treated as a waste, it would fall under the definition of a low-level radioactive waste per 10 CFR § 61.55(a). The Commission reaffirmed this waste classification in the CLI-05-05 Memorandum and Order dated January 18, 2005. This means that it could be disposed of in a licensed low-level radioactive waste facility if it is in a suitably stable form and meets the performance requirements of 10 CFR Part 61. Therefore, under 10 CFR § 61.55(a), depleted uranium is a low-level radioactive waste.*
>
> *Sources: NRC, 1991; NRC, 2005.*

<u>Classification of DUF_6</u>

The U.S. Department of Energy (DOE) has evaluated a number of alternative and potential beneficial uses for DUF_6 (DOE, 1999b; Brown et al, 1997). However, the current DUF_6 consumption rate is low compared to the existing DUF_6 inventory (DOE, 1999b), and the potential for a significant commercial market for the DUF_6 to be generated by the proposed NEF is considered to be low. The NRC has assumed that the excess DOE and commercial inventory of DUF_6 would be disposed of as waste (NRC, 1995).

In Memorandum and Order CLI-05-05, the Commission concluded that depleted uranium is appropriately categorized as a low-level radioactive waste (NRC, 2005). Therefore, for the purpose of this EIS, the DUF_6 generated by the proposed NEF will be treated as a Class A low-level waste.

All DUF_6 would be removed from the proposed NEF for disposition outside the State of New Mexico before decommissioning is completed (LES, 2005a). This EIS evaluates in detail two DUF_6 disposition options. These options are described in the following subsections, and Chapter 4 discusses their potential environmental impacts. Section 2.2 discusses additional DUF_6 disposition options but, for the reasons discussed in that section, these options are not evaluated in detail.

The Defense Nuclear Facilities Safety Board has reported that long-term storage of DUF_6 in the UF_6 form represents a potential chemical hazard if not properly managed (DNFSB, 1995). For this reason, alternatives for the strategic management of depleted uranium include the conversion of DUF_6 stock to a more stable uranium oxide (e.g., triuranium octaoxide [U_3O_8]) form for long-term management (OECD, 2001). DOE also evaluated multiple disposition options for DUF_6 and agreed that conversion to U_3O_8 was preferable for long-term storage and disposal of the depleted uranium due to its chemical stability (DOE, 2000a). Therefore, all the options evaluated in the EIS include conversion of the DUF_6 to U_3O_8.

Two options are proposed for disposition of DUF_6. The first option would be to ship the material to a private conversion facility prior to disposal (Option 1). An alternative available under the provisions of the United States Enrichment Corporation (USEC) Privatization Act of 1996 would be to ship the material to a DOE conversion facility, either at Portsmouth, Ohio, or at Paducah, Kentucky, for temporary storage and eventual processing by the DOE conversion facility prior to disposal by DOE (Option 2). DOE has issued two final EISs to construct and operate conversion facilities at Paducah, Kentucky, and Portsmouth, Ohio (DOE, 2004a; DOE, 2004b). Additionally, DOE has issued two Records of Decision and construction of the conversion facilities began in July 2004 (DOE, 2004c; DOE, 2004d). Figure 2-12 shows the disposal flow paths for DUF_6 evaluated in this EIS.

In this EIS, it is assumed that the proposed private conversion facility would be using the same technology adapted for use by DOE in its conversion facilities. This technology would apply a continuous dry-conversion process based on the commercial process used by Framatome Advanced Nuclear Power, Inc., fuel fabrication facility in Richland, Washington (DOE, 2004a; DOE, 2004b; LES, 2005a).

What is Class A Low-level Radioactive Waste?

Low-level radioactive waste is defined by what it is not; that is, material classified as low-level radioactive waste does not meet the criteria of high-level radioactive waste, transuranic waste, or mill tailings. Low-level radioactive waste represents about 90 percent of all radioactive wastes, by volume. It includes ordinary items such as cloth, bottles, plastic, wipes, etc. that become contaminated with some radioactive material. These wastes can be generated anywhere radioisotopes are produced or used -- in nuclear power stations, local hospitals, university research laboratories, etc.

For regulatory purposes, there are three classes of low-level radioactive wastes. The NRC classifies low-level radioactive waste as Class A, Class B, or Class C based on the concentration of certain long-lived radionuclides as shown in Tables 1 and 2 of 10 CFR § 61.55 and the physical form and stability requirements set forth in 10 CFR § 61.56. Waste that contains the smallest concentration of the identified radionuclides and meets the stability requirement is considered Class A waste and could be considered for near-surface disposal. Classes B and C wastes contain greater concentrations of radionuclides with longer half-lives, and have stricter disposal requirements than Class A.

Sources: 10 CFR § 61.55 and 61.56.

Conversion of UF_6 to U_3O_8 generates hydrogen fluoride gas. This gas is dissolved in water to form aqueous hydrofluoric acid which is easier to store and handle than the hydrogen fluoride gas. The aqueous hydrofluoric acid could be sold to a commercial hydrofluoric acid supplier for reuse if the radioactive content is below free release limits, or it could be converted to calcium fluoride (CaF_2) for sale or disposal. Because conversion of the large quantities of DUF_6 at the DOE Portsmouth and Paducah Gaseous Diffusion Plant sites would be occurring at the same time the proposed NEF would be in operation, it is not certain that the market for aqueous hydrofluoric acid[1] and calcium fluoride would allow for the economic reuse of the material generated by the proposed NEF (DOE, 2000a; DOE, 2000b). Therefore, only immediate neutralization of the hydrofluoric acid by conversion to calcium fluoride with disposal at a licensed low-level radioactive waste disposal facility is considered in this analysis. Descriptions of the options are set forth below.

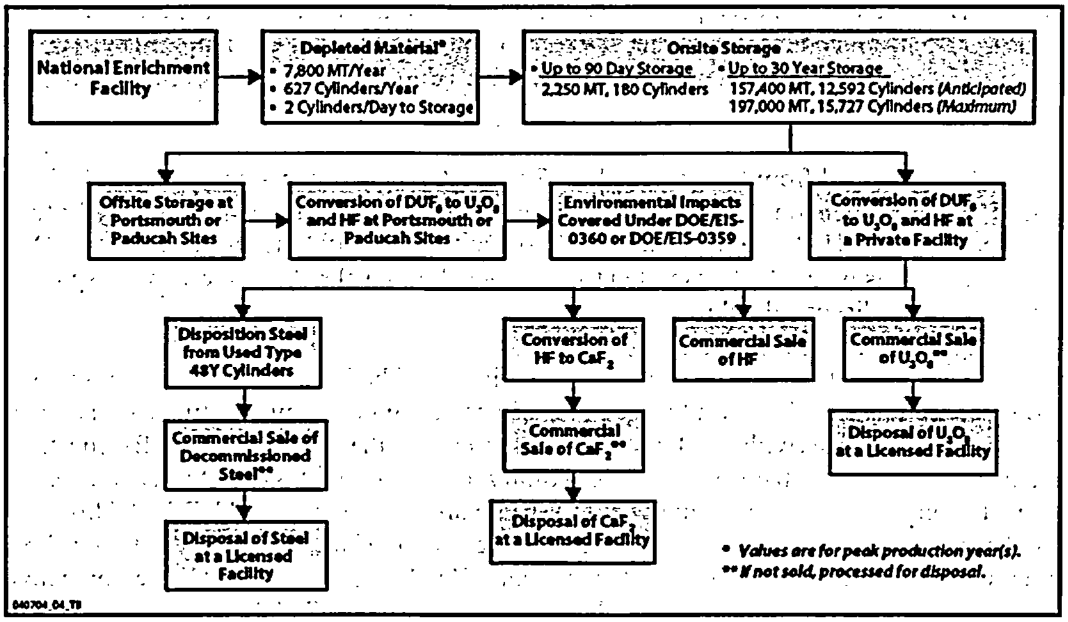

Figure 2-12 Disposal Flow Paths for DUF_6

Option 1: Private Sector Conversion and Disposal

This disposition option is private sector conversion of the depleted uranium hexafluoride into uranium oxide and hydrofluoric acid. The conversion could occur within the region of influence of the proposed NEF or at some other site within the United States. On February 3, 2005, LES and AREVA announced the signing of a memorandum of understanding that could lead to the construction of a privately owned uranium hexafluoride conversion plant to support the operation of the proposed NEF. The memorandum of understanding is only the first step in licensing, building, and operating the conversion facility. No final location has been identified for this private conversion facility. This EIS considers that the private conversion facility could be located beyond the region of influence of the proposed NEF site (this is known as Option 1a).

One potential location for a private conversion facility would be near the ConverDyn UF_6 generation facility in Metropolis, Illinois (LES, 2005a; LES, 2005b). The existing ConverDyn plant converts natural U_3O_8 (yellowcake) from mining and milling operations into UF_6 for feed to enrichment facilities such as the proposed NEF (ConverDyn, 2004). Construction of a private DUF_6 to U_3O_8 conversion facility near the ConverDyn plant in Metropolis, Illinois, could allow for the possible reuse of the hydrogen fluoride produced during the DUF_6 to U_3O_8 conversion process to generate more UF_6 feed material while the depleted U_3O_8 would be shipped for final dispositioning.

---

[1]For the purposes of this EIS, when discussing the conversion of DUF_6 to U_3O_8, the wording of hydrofluoric acid refers to aqueous hydrofluoric acid. Releases of hydrofluoric acid refers to the vapor that forms from the reaction of UF_6 to the moisture in the atmosphere.

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 natural U_3O_8 (yellowcake) 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. DOE has completed an EIS for the Paducah conversion facility which defines the impacts of the proposed DOE conversion facility (DOE, 2004a).

The DUF_6 would be shipped from the proposed NEF site to the new conversion facility. The hydrofluoric acid produced by the conversion process could be re-used by ConverDyn in its existing hydrofluorination process to convert natural U_3O_8 (yellowcake) to UF_6 (ConverDyn, 2004). Once converted, U_3O_8 and the associated waste streams would be transported to a licensed low-level radioactive waste disposal facility for final disposition, as discussed below.

This EIS also considers that the private conversion facility could be located near the proposed NEF, (this is known as Option 1b). This would involve a private sector company constructing and operating a new conversion facility close (within 6.4 kilometers [4 miles]) to the proposed NEF. By constructing and operating a private conversion facility in close proximity to the proposed NEF, the environmental impacts from the private conversion facility would affect the same area as the proposed NEF. Additionally, shipping and conversion of the depleted uranium could be accomplished within days of the filling of the Type 48Y cylinders, which would minimize the amount of DUF_6 stored onsite. The nearby conversion facility would be proportionally sized to meet the annual generation of 7,800 metric tons (8,600 tons) of DUF_6 per year. It is further assumed that the hydrofluoric acid generated at the adjacent conversion facility would not be marketable for reuse due to the large amount that would be available from the DOE conversion plants. The hydrofluoric acid would be converted to calcium fluoride for disposal at a licensed low-level radioactive waste disposal site.

<u>Option 2: DOE Conversion and Disposal</u>

DOE is constructing two conversion plants to convert the DUF_6 now in storage at Portsmouth, Ohio; Paducah, Kentucky; and Oak Ridge, Tennessee, to U_3O_8 and hydrofluoric acid. LES proposes to transport the DUF_6 generated by the proposed NEF to either of these new facilities and paying DOE to convert and dispose of the material. This plan is based on Section 3113 of the 1996 *USEC Privatization Act* that states the DOE "shall accept for disposal low-level radioactive waste, including depleted uranium if it were ultimately determined to be low-level radioactive waste, generated by [...] any person licensed by the Nuclear Regulatory Commission to operate a uranium enrichment facility under Sections 53, 63, and 193 of the *Atomic Energy Act of 1954* (42 U.S.C. 2073, 2093, and 2243)." On January 18, 2005, the

Commission issued its ruling that depleted uranium is considered a form of low-level radioactive waste (NRC, 2005). The Commission also stated that "pursuant to Section 3113 of the USEC Privatization Act, disposal of the LES depleted uranium tails at a DOE facility represents a "plausible strategy" for the disposition of depleted uranium tails" (NRC, 2005).

> ***DUF_6 Conversion Process***
>
> *DUF_6 conversion is a continuous process in which DUF_6 is vaporized and converted to U_3O_8 by reaction with steam and hydrogen in a fluidized-bed conversion unit. The hydrogen is generated using anhydrous ammonia, although an option of using natural gas is being investigated. Nitrogen is also used as an inert purging gas and is released to the atmosphere through the building stack as part of the clean off-gas stream. The depleted U_3O_8 powder is collected and packaged for disposition. The process equipment would be arranged in parallel lines. Each line would consist of two autoclaves, two conversion units, a hydrofluoric acid recovery system, and process off-gas scrubbers. The Paducah facility would have four parallel conversion lines. Equipment would also be installed to collect the hydrofluoric acid co-product and process it into any combination of several marketable products. A backup hydrofluoric acid neutralization system would be provided to convert up to 100 percent of the hydrofluoric acid to calcium fluoride for storage and/or sale in the future, if necessary.*
>
> *Sources: DOE, 2004a; DOE 2004b.*

Disposal Options

Converted DUF_6 in the form of U_3O_8 can be considered a Class A low-level radioactive waste (NRC, 1991). Following conversion, the only currently available viable disposal option would be disposal of the depleted U_3O_8, based on its waste classification and site-specific evaluation, in a near-surface emplacement at a licensed low-level radioactive waste disposal facility within the borders of the United States. LES proposed disposal of the U_3O_8 in an abandoned mine as its preferred option but 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.

DOE recognizes that there could be commercial applications for the U_3O_8, and the possibility exists that other disposal options could become available in the future (after the satisfactory completion of appropriate NEPA or environmental review and licensing processes). If the U_3O_8 could be applied in a commercial application (e.g., as radiation shielding), then it would reduce the disposition impacts in proportion to the amount of U_3O_8 diverted to commercial applications. At this time, no viable commercial application for the material generated by the proposed NEF has been identified.

There are currently three active, licensed commercial low-level radioactive waste disposal facilities, all of which are located in Agreement States (licensing of the use and disposal of radioactive material is regulated by the State in accordance with agreements established with the NRC [NRC, 2003]). Additionally, DOE operates its own low-level radioactive waste disposal facility within the Nevada Test Site that is restricted to DOE-generated waste. Another company, Waste Control Specialists (WCS) is a commercial RCRA waste disposal facility located less than 3.2 kilometers (2 miles) east of the proposed NEF. WCS recently submitted an application to the State of Texas to license the company to dispose of low-level radioactive waste (WCS, 2004). The following summarizes the disposal sites and the regions of the United States that can ship low-level radioactive waste to each site (NRC, 2003):

- Barnwell, located in Barnwell, South Carolina. Currently, Barnwell accepts waste from most U.S. generators, as permitted by Atlantic Compact law. Beginning in 2008, Barnwell would only accept waste from the Atlantic Compact States (Connecticut, New Jersey, and South Carolina). Barnwell is licensed by the State of South Carolina to receive Class A, B, and C wastes.

- Hanford, located in Hanford, Washington. Hanford accepts waste from the Northwest and Rocky Mountain compacts. Hanford is licensed by the State of Washington to receive Class A, B, and C wastes, but not mixed waste (*i.e.*, radioactive and hazardous waste). As New Mexico is a member of the Rocky Mountain Compact, the proposed NEF would be able to ship low-level radioactive waste to Hanford for disposal provided that the waste meets the Waste Acceptance Criteria for the facility.

- Envirocare, located in Clive, Utah. Envirocare accepts waste from all regions of the United States. Envirocare is licensed by the State of Utah to accept for disposal Class A waste only. Therefore, Envirocare is a disposal option for radioactive wastes generated at the proposed NEF.

- Nevada Test Site, located in southern Nye County, Nevada. The Nevada Test Site is a DOE disposal site for low-level radioactive waste from the various DOE sites and facilities across the United States. The Nevada Test Site was selected as the secondary disposal site for converted DUF_6 material generated at the Paducah, Kentucky, and Portsmouth, Ohio, DUF_6 conversion facilities (DOE, 2004a; DOE, 2004b). Because the Nevada Test Site is a DOE disposal site, it could receive low-level radioactive wastes generated by the proposed NEF only if ownership of these wastes is first transferred to the DOE.

- Waste Control Specialists (WCS) disposal facility, located in Andrews County, Texas. The WCS disposal facility is less than 3.2 kilometers (2 miles) east of the proposed NEF site. This facility is currently permitted to dispose of RCRA hazardous waste and licensed to temporarily store, but not dispose of, radioactive material under its current State of Texas Bureau of Radiation Control license L04971 (BRC, 2003). WCS recently submitted an application to the State of Texas to allow them to dispose of Class A, B, and C low-level radioactive waste (WCS, 2004). The application is for two separate facilities, a low-level radioactive waste disposal facility for the Texas Compact and a low-level radioactive waste and mixed low-level radioactive and hazardous waste Federal Waste Disposal Facility. Both the Compact Facility and Federal Waste Disposal Facility would be located within the boundaries of the WCS site in Andrews County, Texas.

  In 1980, Congress passed the "Low-Level Radioactive Waste Policy Act" which requires States to provide for disposal of low-level radioactive waste generated within their own borders. The States of Texas and Vermont have joined together to form the Texas Compact for disposal of low-level radioactive waste generated by these member States. If its August 2, 2004 application is approved, WCS would become the low-level radioactive waste disposal site for the Texas Compact. As previously stated, a disposal site within the Texas Compact can only accept waste generated by the compact member States, unless the Compact specifically approves the disposal of out-of-compact waste. Approval of the other Compact (in this case, the Rocky Mountain Compact, in which the proposed NEF would be located) also would be required.

  The WCS application includes a request for a separate Federal Waste Disposal Facility to dispose of both low-level radioactive waste and mixed low-level radioactive and hazardous wastes from federal facilities such as the DOE. If the license application is approved, the WCS facility would be able to dispose of Class A, B, and C low-level radioactive and mixed wastes (WCS, 2004).

  Before the depleted uranium generated by the proposed NEF could be disposed at the proposed WCS Compact Facility, a series of legal procedures and approval processes would have to be successfully addressed. These procedures and processes include:

1. Approval by the State of Texas of WCS's application, including authorization by the State for the WCS Compact Facility to accept for disposal depleted uranium oxides of the type and quantities expected to be generated as a result of the proposed NEF's operations;
2. Approval by the Rocky Mountain Compact (in which the proposed NEF would be located) for the export of the depleted uranium oxides from the Compact; and
3. Approval by the Texas Compact for the import and disposal of the depleted uranium oxides generated as a result of the proposed NEF's operations.

The disposition of the depleted U_3O_8 generated from the DOE conversion facilities at Paducah and Portsmouth would be either at the Envirocare site (DOE's proposed disposition site) or at the Nevada Test Site (DOE's optional disposal site) (DOE, 2004a; DOE, 2004b). Due to the need for separate regulatory actions prior to disposal at WCS, it is assumed that the depleted U_3O_8 generated from the adjacent or offsite private conversion process would be disposed at another disposal site licensed to accept this material. For example, under its Radioactive Materials License issued by the State of Utah, Envirocare is authorized to accept for disposal the quantities of depleted uranium oxides expected to be generated by the conversion of the proposed NEF's DUF_6 (Envirocare, 2004).

2.2 Alternatives to the Proposed Action

This section examines the alternatives considered for the proposed action described in section 2.1. The range of alternatives was determined by considering the underlying need and purpose for the proposed action. From this analysis, a set of reasonable alternatives was developed and the impacts of the proposed action were compared with the impacts that would result if a given alternative was implemented. These alternatives include:

- A no-action alternative under which the proposed NEF would not be constructed.
- An evaluation of alternative sites for the proposed NEF.
- A discussion of alternative conversion and disposition methods for DUF_6.
- A review of alternative technologies available for uranium enrichment.
- An evaluation of potential alternative sources of low-enriched uranium.

2.2.1 No-Action Alternative

The no-action alternative would be to not construct, operate, or decommission the proposed NEF in Lea County, New Mexico. The NRC would not approve the license application for the proposed NEF. Under the no-action alternative, the fuel-fabrication facilities in the United States would continue to obtain low-enriched uranium from the currently available sources. Currently, the only domestic source of low-enriched uranium available to fuel fabricators is from production of the Paducah Gaseous Diffusion Plant, the only operating uranium enrichment facility in the United States, and the downblending of highly enriched uranium under the "Megatons to Megawatts" program (USEC, 2003a). Foreign enrichment sources are currently supplying more than 85 percent of the U.S. nuclear power plants demand (EIA, 2004).

Currently, the "Megatons to Megawatts" program will expire by 2013, potentially eliminating downblending as a source of low-enriched uranium. Opened in 1952, the Paducah Gaseous Diffusion Plant utilizes gaseous diffusion technology (as described in section 2.2.2.3), which is more energy intensive and requires higher energy consumption than a comparable gaseous centrifuge facility. These issues and factors such as new and more efficient enrichment technology (e.g., gas centrifuge) could lead to the eventual closure of the Paducah Gaseous Diffusion Plant. On the other hand, USEC could continue operation of the Paducah Gaseous Diffusion Plant to supply the needed low-enriched uranium.

Additional domestic enrichment facilities utilizing these more efficient technologies could be constructed in the future. In this regard, USEC has announced its intention to construct and operate a gaseous centrifuge uranium enrichment facility (i.e., proposed American Centrifuge Plant to be located near the Portsmouth Gaseous Diffusion Plant) which could supplement domestic and international demands (USEC, 2004). The proposed American Centrifuge plant would have an initial annual production level of 3.5 million SWU by 2010. If the proposed American Centrifuge Plant begins operations, this would represent a more efficient and less costly means of producing low-enriched uranium as compared to a gaseous diffusion plant.

At the same time, nuclear-generating capacity within the United States is expected to increase, causing an increase in demand for low-enriched uranium (see section 1.3.2). Given the expected increase in demand and the possible elimination of low-enriched uranium from downblending, along with the uncertainty that any additional domestic supplies will be available, the no-action alternative could generate uncertainty regarding the availability of adequate, reliable domestic supplies of low-enriched uranium in the future.

2.2.2 Alternatives Considered but Eliminated

As required by NRC regulations, the NRC staff has considered other alternatives to the construction, operation, and decommissioning of the proposed NEF. These alternatives were considered but eliminated from further analysis due to economical, environmental, national security, or maturity reasons. This section discusses these alternatives and the reasons the NRC staff eliminated them from further consideration. These alternatives can be categorized as (1) an evaluation of alternative sites for the proposed NEF, (2) a discussion of alternative conversion and disposition methods for DUF_6, (3) a review of alternative technologies available for uranium enrichment, and (4) a review of potential alternative sources of low-enriched uranium.

2.2.2.1 Alternative Sites

The alternative sites considered in this EIS are the result of the LES site-selection process. This section discusses the site-selection process and identifies the candidates sites for the proposed NEF and the criteria used in the selection process. LES undertook a site-selection process to identify viable locations for the proposed NEF (LES, 2005a). This evaluation process yielded six finalist sites which are reviewed below. Figure 2-13 shows the six finalist sites for the proposed NEF.

Because many environmental impacts can be avoided or significantly reduced through proper site selection, the NRC staff evaluated the LES site-selection process to determine if a site considered by LES was obviously superior to the proposed NEF (NRC, 2002)

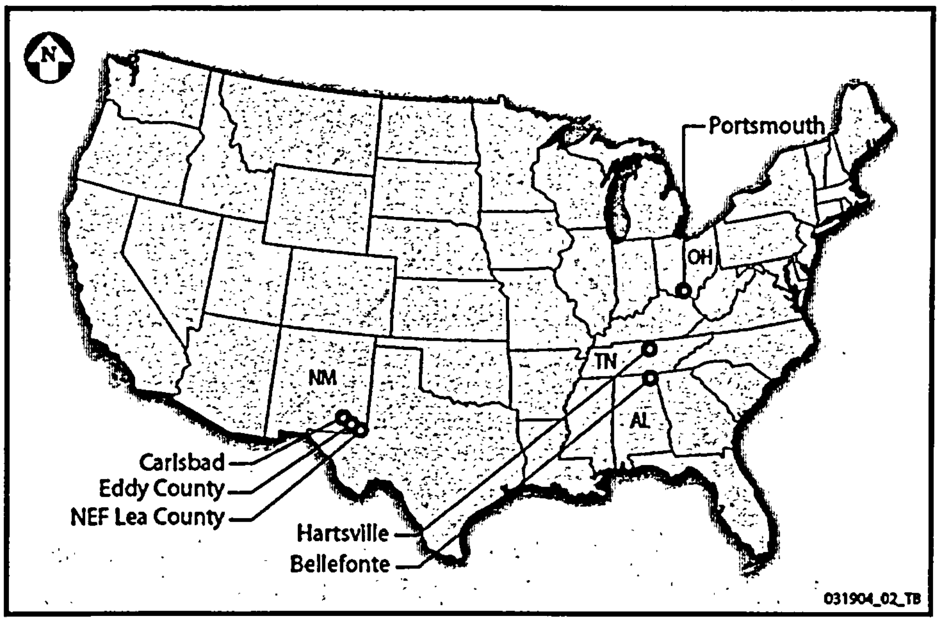

Figure 2-13 Six Final Potential NEF Sites

LES Site-Selection Process

LES evaluated 44 sites throughout the United States. The site-selection process used to locate a suitable site for construction and operation of the proposed NEF was based on various technical, safety, economic, and environmental factors. A multi-attribute-utility-analysis methodology was used for site selection that incorporated all of these factors to assess the relative benefits of a site with multiple, often competing, objectives or criteria. Figure 2-14 is a schematic of the LES site-selection process.

Forty-four potential sites were reviewed for possible analysis in the initial screening phase of the process. Twenty-nine sites were eliminated due to a lack of available environmental information or because they were located next to an operating commercial nuclear power plant. Sites in proximity to operating nuclear power plants would require enhanced security measures (LES, 2005a). The initial screening included the following criteria:

- Availability of adequate site information.
- Location of proposed site for ease of access and security.
- Acceptability of regional climate.

The outcome of the initial screening yielded 15 sites that met the first screening criteria. A second screening program was used to evaluate each of these 15 sites. This second screening program consisted of a "Go/No Go" analysis approach that compared the 15 semifinalist sites using the following criteria:

- Seismology/geology.
- Site characterization surveys.
- Size of plot.
- Land not contaminated.
- Moderate climate.

- Redundant electrical power.

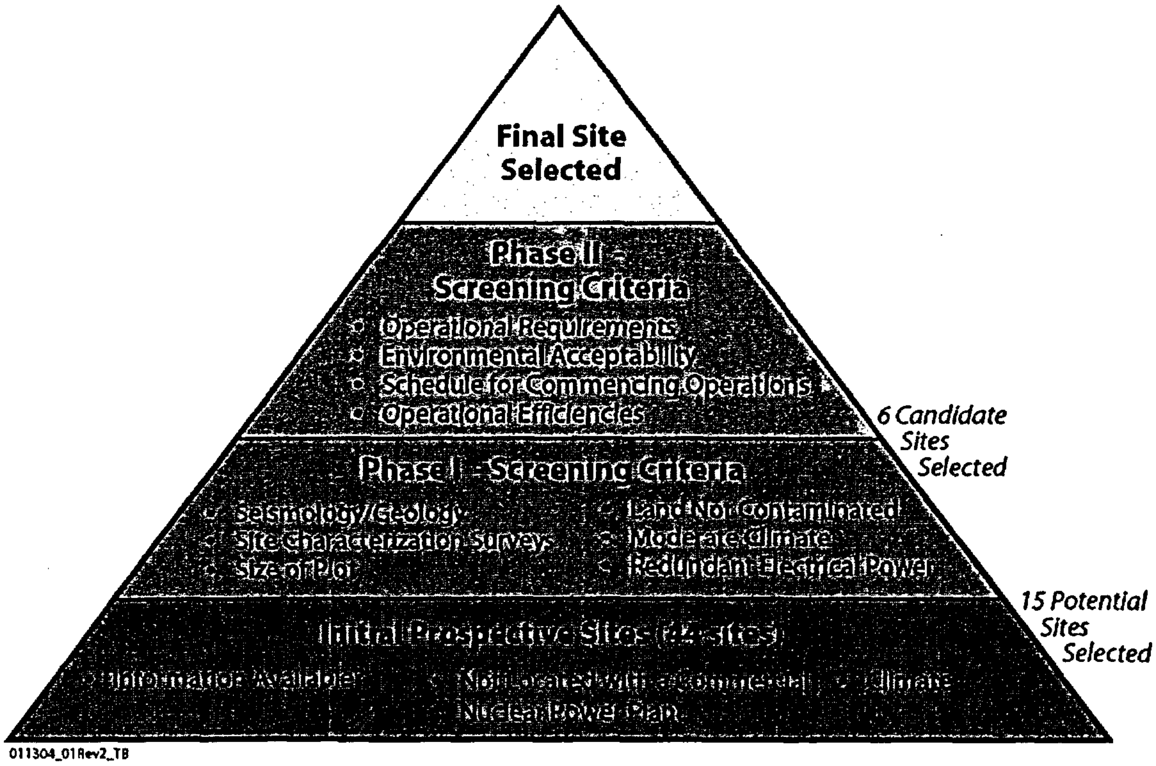

Figure 2-14 LES Site Selection Process (LES, 2005a)

The sites that met all these first-phase screening criteria were further evaluated in the second-phase screening. The second-phase approach in the LES site-selection process involved more detailed analysis using weighted criteria as well as more specific subcriteria for the first-phase criteria. The second-phase screening criteria were placed into the following four site-evaluation categories or objectives:

1. Operational Requirements weighting factor = 

2. Environmental Acceptability weighting factor = 

3. Schedule for Commencing Operations weighting factor = 

4. Operational Efficiencies weighting factor = 

Table 2-8 presents the 15 potential sites formally evaluated against the first-phase screening criteria and the results of the evaluation for each site.

Table 2-8 Summary of First-Phase Evaluation

Potential Site	Reasons for Elimination	Results of Screening
Ambrosia Lake, New Mexico	Earthquake risk.	✖
Barnwell, South Carolina	Earthquake risk.	✖
Bellefonte, Alabama	Met all phase I screening criteria.	✔
Carlsbad, New Mexico	Met all phase I screening criteria.	✔
Clinch River Industrial Site, Tennessee	Earthquake risk. Site not large enough.	✖
Columbia, South Carolina	Earthquake risk. Site impacted by a 500-year flood plain.	✖
Eddy County, New Mexico	Met all phase I screening criteria.	✔
Erwin, Tennessee	Site not large enough.	✖
Hartsville, Tennessee	Met all phase I screening criteria.	✔
Lea County, New Mexico	Met all phase I screening criteria.	✔
Metropolis, Illinois	Earthquake risk. Site not large enough.	✖
Paducah, Kentucky	Earthquake risk.	✖
Portsmouth, Ohio	Met all phase I screening criteria.	✔
Richland, Washington	Earthquake risk.	✖
Wilmington, North Carolina	Site not large enough.	✖

✔ Denotes candidate site status.
Source: LES, 2005a.

Six of the sites met all of the first-phase criteria and were considered in the second-phase screening. These six candidate sites, shown in Figure 2-13, were Bellefonte, Alabama; Carlsbad, New Mexico; Eddy County, New Mexico; Hartsville, Tennessee; Lea County, New Mexico; and Portsmouth, Ohio.

Each of the final six locations underwent a detailed evaluation to identify the best location for the proposed NEF. The results of this evaluation are summarized below.

A sensitivity analysis was conducted after the initial analysis to ensure that the site selection was not sensitive to small changes in the relative weights of objectives or criteria. The sensitivity analysis also helped demonstrate how sites compare to each other. In the sensitivity analysis, the weighting factor for each criterion was adjusted to the minimum and maximum extreme of the weighting scale while the raw score was kept the same. The final score of the site was then reviewed to determine how much it changed (LES, 2005a).

Description of Alternative Sites

Eddy County, New Mexico, Site

The Eddy County site scored highest in the multi-attribute-utility-analysis ranking but, due to potential problems with transferring ownership of the site from the BLM to LES, the site is not the preferred location for the proposed NEF. Federal regulations (43 CFR § 2711.1.3) require that any BLM land currently leased or permitted cannot be sold until the lease or permit holder is given 2 years' prior notification (Sorensen, 2004). Because the Eddy County site is currently leased for cattle grazing, it cannot be transferred to LES for at least 2 years. This two-year period can be waived by the leaseholder or it may run concurrently with preparation of the EIS. However, this could delay the start of construction of the facility and lowered the multi-attribute-utility-analysis ranking of the site (LES, 2005a).

Lea County, New Mexico, Site

Lea County ranked second in the multi-attribute-utility-analysis assessment. It is the preferred LES site for the proposed NEF. Two adjacent sites in Lea County were considered, and the evaluation is applicable to both. The preferred Lea County site consists of 220 hectares (543 acres) in Section 32 of range 38E in Township 21S of the New Mexico Meridian. The alternative Lea County site is 182 hectares (452 acres) in Section 33 of range 38E in Township 21S, which is east of and adjacent to Section 32. The area is in an air-quality attainment zone, and no air-permitting constraints are identified. Because the Lea County site is the preferred site for construction of the proposed NEF, Chapter 3 presents a complete description of the site (LES, 2005a).

Bellefonte, Alabama, Site

The Bellefonte site scored third in the multi-attribute-utility-analysis assessment and is considered an acceptable location for installation of the proposed NEF. However, part of the site is within the historic boundaries of a Cherokee Indian Reservation which may necessitate a historical preservation assessment. Additionally, high-voltage transmission lines cross the site and would have to be relocated before beginning construction. The historical preservation assessment and costly relocation of transmission lines lowered Bellefonte's ranking (LES, 2005a).

Hartsville, Tennessee, Site

The Hartsville site ranked fourth in the multi-attribute-utility-analysis assessment. The major drawback was the business climate in the State of Tennessee and the requirement to rezone the site. The site scored well in environment, labor, and transportation issues. On September 9, 2002, LES identified the Hartsville, Tennessee, site as a location for a uranium enrichment plant. However, because LES was unable to obtain local approval to rezone the site (LES, 2005a), the overall site score was reduced.

Portsmouth, Ohio, Site

The Portsmouth site ranked fifth of the six sites in the multi-attribute-utility-analysis assessment. Contamination on an existing firing range would have to be remediated, and existing waterways and ponds would have to be filled or relocated to make the site useable. Due to the proposed construction of the American Centrifuge Plant by USEC in the same immediate area, the finalization of an agreement between DOE, USEC, and LES would be difficult and would delay construction of the facility, thus lowering the overall score.

Carlsbad, New Mexico, Site

The Carlsbad site ranked sixth in the evaluation. The area around the proposed Carlsbad site contains both active and abandoned facilities including potash mining and oil-field welding services. This creates the possibility that the site soil is contaminated with oils, solvents, and industrial waste products. This potential contamination requires further investigations and surveys prior to selecting the Carlsbad site for the facility. No detailed geological surveys have been completed for the site. However, the general area is geologically and seismically stable and acceptable for construction of the proposed NEF. While no wetlands exist on the site, a dry arroyo, Lone Tree Draw, runs through the site which could require obtaining additional environmental approvals.

An Xcel Energy transmission line passes near the northwest corner of the proposed site. LES would have to pay for a new substation on the main line and new secondary feeder lines from alternate transmission lines to provide a redundant power supply for the site. The potential for soil contamination would make site decommissioning and decontamination more difficult, and the potential for environmental justice issues lowered Carlsbad's overall score.

<u>Conclusion</u>

Based on the above assessment, the NRC staff has determined that the LES site selection process has a rational, objective structure and appears reasonable. None of the candidate sites were obviously superior to the LES preferred site in Lea County, New Mexico; therefore no other site was selected for further analysis.

2.2.2.2 Alternative Sources of Low-Enriched Uranium

The NRC staff examined two alternatives to fulfill the domestic enrichment needs. These alternatives, as shown below, were eliminated from further consideration.

<u>Re-Activate Portsmouth Gaseous Diffusion Facility</u>

USEC closed the Portsmouth Gaseous Diffusion Plant in May 2001 to reduce operating costs (DOE, 2003). USEC cited long-term financial benefits, more attractive power price arrangements, operational flexibility for power adjustments and a history of reliable operations as reasons for choosing to continue operations at the Paducah Gaseous Diffusion Plant. In its June 2000 press release, USEC explained that they "...clearly could not continue to operate two production facilities." Key business factors in USEC's decision to reduce operations to a single production plant included long-term and short-term power costs, operational performance and reliability, design and material condition of the plants, risks associated with meeting customer orders on time, and other factors relating to assay levels, financial results, and new technology issues (USEC, 2000).

The NRC staff does not believe that there has been any significant change in the factors that were considered by USEC in its decision to cease uranium enrichment at Portsmouth. Furthermore, the gaseous diffusion technology (as described in section 2.2.2.3) is more energy intensive than gas centrifuge. The higher energy consumption results in larger indirect impacts, especially those impacts which are attributable to significantly higher electricity usage (e.g., air emissions from coal-fired electricity generation plants) (DOE, 1995). Finally, DOE's FY2006 congressional budget request reflects DOE's intention to cease cold standby activities for the Portsmouth facility, transition to final shutdown, and begin preliminary decontamination and decommissioning activities at the facility (DOE, 2005). Therefore, this proposed alternative was eliminated from further consideration.

Purchase Low-Enriched Uranium From Foreign Sources

There are several potential sources of enrichment services worldwide. However, U.S. reliance on foreign sources of enrichment services, as an alternative to the proposed action, would not meet the U.S. national energy policy objective of a "...viable, competitive, domestic uranium enrichment industry for the foreseeable future" (DOE, 2000b). For this reason, the NRC staff does not consider this alternative action to meet the purpose and need for the proposed action, and this alternative was eliminated from further studies.

2.2.2.3 Alternative Technologies for Enrichment

A number of different processes have been invented for enriching uranium but only two have been proven suitable for commercial and economic use. Only the gaseous diffusion process and the gas centrifuge technology have reached the maturity needed for industrial use. Other technologies—namely the Electromagnetic Isotope Separation Process, Liquid Thermal Diffusion, and a laser enrichment process—have proven too costly to operate or remain at the research and laboratory developmental scale and have yet to prove themselves to be economically viable.

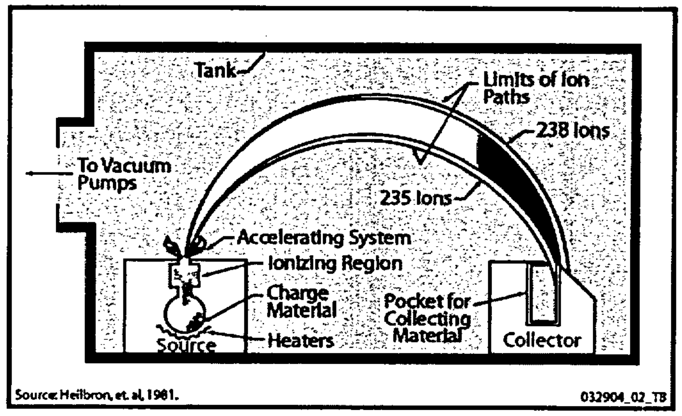

Figure 2-15 Sketch of Electromagnetic Isotopic Separation Process (Heilbron et al., 1981)

Electromagnetic Isotope Separation Process

Figure 2-15 shows a sketch of the electromagnetic isotopic separation process. In the Electromagnetic Isotope Separation Process, or calutron, a monoenergetic beam of ions of normal uranium travels between the poles of a magnet. The magnetic field causes the beam to split into several streams according to the mass of the isotope. Each isotope has a different radius of curvature and follows a slightly different path. Collection cups at the ends of the semicircular trajectories catch the homogenous streams. Because the energy requirements for the calutrons proved very high—in excess of 3,000 kilowatt hour per SWU—and the production was very slow (Heilbron et al., 1981), this process was removed from further consideration.

Liquid Thermal Diffusion

Liquid thermal diffusion process was investigated in the 1940's. Figure 2-16 is a diagram of the liquid thermal diffusion process. It is based on the concept that a temperature gradient across a thin layer of liquid or gas causes thermal diffusion that separates isotopes of differing masses. When a thin, vertical column is cooled on one side and heated on the other, thermal

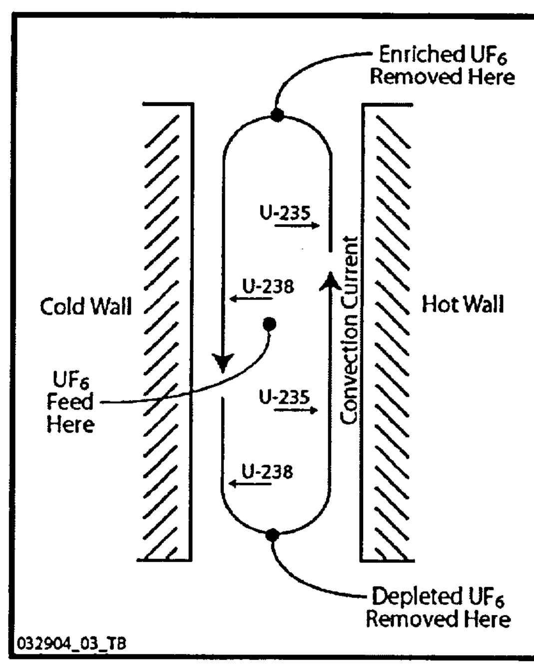

Figure 2-16 Liquid Thermal Diffusion Process

convection currents are generated and the material flows upward along the heated side and downward along the cooled side. Under these conditions, the lighter $^{235}UF_6$ molecules diffuse toward the warmer surface, and heavier $^{238}UF_6$ molecules concentrate near the cooler side. The combination of this thermal diffusion and the thermal convection currents causes the lighter ^{235}U molecules to concentrate on top of the thin column while the heavier ^{238}U goes to the bottom. Taller columns produce better separation. Eventually, a facility was designed and constructed at Oak Ridge, Tennessee, but it was closed after about a year of operation due to cost and maintenance (Settle, 2004). Based on high operating costs and high maintenance requirements, the liquid thermal diffusion process has been eliminated from further consideration.

Gaseous Diffusion Process

The gaseous diffusion process is based on molecular effusion, a process that occurs whenever a gas is separated from a vacuum by a porous barrier. The gas passes through the holes because there are more "collisions" with holes on the high-pressure side than on the low-pressure side (i.e., the gas flows from the high-pressure side to the low-pressure side). The rate of effusion of a gas through a porous barrier is inversely proportional to the square root of its mass. Thus, lighter molecules pass through the barrier faster than heavier ones. Figure 2-17 is a diagram of a single gas diffusion stage.

The gaseous diffusion process consists of thousands of individual stages connected in series to multiply the separation factor. The gaseous diffusion plant in Paducah, Kentucky, contains 1,760 enrichment stages and is designed to produce UF_6 enriched up to 5.5 percent ^{235}U. The design capacity of the Paducah Gaseous Diffusion Plant is approximately 8 million SWU per year, but it has never operated at greater than 5.5 million SWU. Paducah consumes approximately 2,200 kilowatt hours SWU, which is less than the electromagnetic isotopic separation process or liquid thermal diffusion process but still higher than the 40 kilowatt hours per kilogram of SWU possible in modern gas centrifuge plants (DOE, 2000b; Urenco, 2004b). The gaseous diffusion process is 50-year-old technology that is energy intensive and therefore has been eliminated from further consideration.

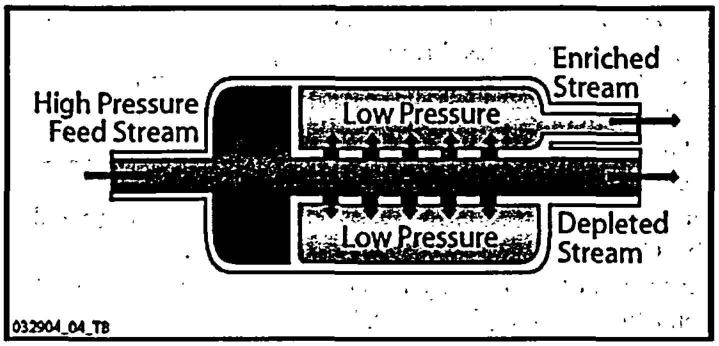

Figure 2-17 Gaseous Diffusion Stage (Urenco, 2003)

Laser Separation Technology

Laser separation technology encompasses two known developmental technologies that have yet to reach the maturity stage for industrial use. These are the Atomic Vapor Laser Isotope Separation and the Separation of Isotopes by Laser Excitation processes.

The Atomic Vapor Laser Isotope Separation process is based on different isotopes of the same element, while chemically identical, having different electronic energies and therefore absorbing different colors of laser light. The isotopes of most elements can be separated by a laser-based process if they can be efficiently vaporized into individual atoms. In Atomic Vapor Laser Isotope Separation enrichment, uranium metal is vaporized and the vapor stream is illuminated with a laser light of a specific wavelength that is absorbed only by ^{235}U. The laser selectively adds enough energy to ionize or remove an electron from ^{235}U atoms while leaving the other isotopes unaffected. The ionized ^{235}U atoms are then collected on negatively charged surfaces inside the separator unit. The collected material (enriched product) is condensed as liquid on the charged surfaces and then drains to a caster where it solidifies as metal nuggets. Figure 2-18 is a diagram of the Atomic Vapor Laser Isotope Separation process (LLNL, 2004). In June 1999, citing budget constraints, USEC stopped further development of the Atomic Vapor Laser Isotope Separation program (USEC, 1999).

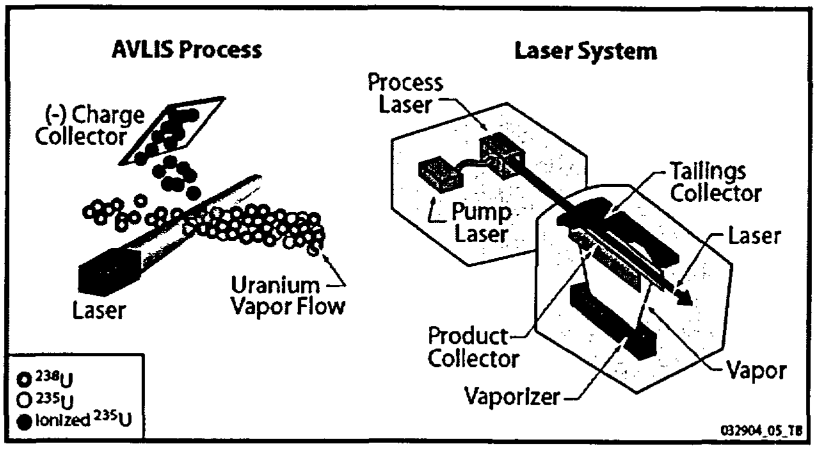

Figure 2-18 AVLIS Process (LLNL, 2004)

The Separation of Isotopes by Laser Excitation technology, developed by the Australian Silex Systems Ltd., uses a similar process to the Atomic Vapor Isotope Separation process. The Separation of Isotopes by Laser Excitation process uses UF_6 vapor that passes through a tuned laser and an electromagnetic field to separate the $^{235}UF_6$ from the $^{238}UF_6$. The process is still under development and will not be ready for field trials for several years. USEC ended its support of the Separation of Isotopes by Laser Excitation program on April 30, 2003, in favor of the proposed American Centrifuge Plant (USEC, 2003b).

Because neither the Atomic Vapor Laser Isotope Separation process nor the Separation of Isotopes by Laser Excitation process is ready for commercial production of low-enriched uranium, these processes have been eliminated from further consideration.

<u>Conclusion</u>

The NRC considered the feasibility of utilizing alternative methods for producing low-enriched uranium. Gas diffusion and liquid thermal diffusion technology would be far more costly than the centrifuge technology proposed. The other technologies reviewed—electromagnetic isotope separation process and laser separation technology—have not been sufficiently developed for commercial application. Accordingly, these technologies were not considered reasonable alternatives.

2.2.2.4 Alternatives for DUF_6 Disposition

In addition to the DUF_6 disposition options discussed in section 2.1.9, other alternatives for dispositioning the DUF_6 include (1) storage of the DUF_6 onsite in anticipation of future use as a resource and (2) continuous conversion of the DUF_6 to U_3O_8 and storage of the oxide as a potential resource. In addition, DOE has evaluated the potential impacts of various disposition options in its "Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride" (DOE, 1999b). These include (1) storage as DUF_6 for up to 40 years, (2) long-term storage as depleted U_3O_8, (3) use of depleted U_3O_8, and (4) use of uranium metal.

LES proposed three additional alternatives for DUF_6 disposition that include Russian re-enrichment, French conversion or re-enrichment, and Kazakhstan conversion. Due to the costs for disposition in Russia, France, or Kazakhstan, the NRC staff does not consider these alternatives to be viable; therefore, they are not discussed further in this EIS. Figure 2-12 shows the disposition flow paths considered by the NRC staff in this EIS.

The following subsections discuss the other DUF_6 disposition alternatives in two broad categories—use of DUF_6 and conversion at existing fuel fabrication facilities—and the reasons these alternatives are not evaluated in detail in this EIS.

Beneficial Uses of Depleted Uranium

Some historical beneficial uses for depleted uranium:

- *Further enrichment – DOE originally undertook the long-term storage of DUF_6 because it can be used in the future as feed for further enrichment. The low cost of uranium ore and postponed deployment of advanced enrichment technology have indefinitely delayed this application.*
- *Nuclear reactor fuel – depleted uranium oxide can be mixed with plutonium oxide from nuclear weapons to make mixed oxide fuel (typically about 6 percent plutonium oxide and 94 percent depleted uranium oxide) for commercial power reactors.*
- *Down-blending high-enriched uranium – Nuclear disarmament allows the down-blending of some weapons-grade highly enriched uranium with depleted uranium to make commercial reactor fuel.*
- *Munitions – depleted uranium metal can be used for tank armor and armor-piercing projectiles. This demand is decreasing as environmental regulations become more complex.*
- *Biological shielding – depleted uranium metal has a high density, which makes it suitable for shielding from x-rays or gamma rays for radiation protection.*
- *Counterweights – Because of its high density, depleted uranium has been used to make small but heavy counterweights such as in the aircraft industry.*

Sources: DOE 1999b; Brown et al., 1997.

Use of DUF_6

As discussed above, the NRC staff views DUF_6 as a potential resource with very limited use. If storage of DUF_6 beyond 30 years occurs, then the impacts described in Chapter 4 of this EIS would be extended for that storage period. If a viable use for DUF_6 is found, it could reduce the environmental impacts associated with its disposition. However, the likelihood of a significant commercial market for the DUF_6 generated by the proposed NEF site is considered to be low.

DOE has evaluated a number of alternatives and potentially beneficial uses for DUF_6, and some of these applications have the potential to use a portion of the existing DUF_6 inventory (DOE, 1999b; Brown et al., 1997). However, the current DUF_6 consumption rate is low compared to the DUF_6 inventory (DOE, 1999b), and the NRC has assumed that excess DOE and commercial inventory of DUF_6 would be disposed of as a waste product (NRC, 1995).

The NRC staff has determined that unless LES can demonstrate a viable use, the DUF_6 generated by the proposed NEF should be considered a waste product. Because the current available inventory of depleted uranium in the form of metal (UF_6 and U_3O_8) is in excess of the current and projected future demand for the material, this EIS will not further evaluate DUF_6 disposition alternatives involving its use as a resource, including continued storage at the proposed NEF site for more than 30 years in order to be used in the future.

Conversion at Existing Fuel Fabrication Facilities

Another potential alternative disposition strategy would be to perform the conversion of DUF_6 to U_3O_8 at an existing fuel-fabrication facility. The existing fuel-fabrication facilities are Global Nuclear Fuel-Americas, LLC, in Wilmington, North Carolina; Westinghouse Electric Company, LLC, in Columbia, South Carolina; and Framatome ANP, Inc., in Richland, Washington. These facilities have existing processes and conversion capacities. They also use Type 30B cylinders. Therefore, the existing fuel-fabrication facilities would need to install new equipment to handle the larger Type 48Y cylinders. The facilities would probably need to install separate capacity to process the DUF_6 to avoid quality control issues related to processing enriched UF_6. The facilities would also need to manage and dispose of the hydrofluoric acid that would be generated from the conversion process. Furthermore, these existing facilities have not expressed an interest in performing these services, and the cost for the services would be difficult to estimate. For these reasons, this alternative is eliminated from further consideration in this EIS.

Conclusion

Although DUF_6 does have alternative and beneficial uses, the current U.S. inventory is estimated to be approximately 480,000 metric tons of uranium (OECD, 2001), which far exceeds the existing and projected demand for the material. Consequently, the NRC staff has assumed that all of the DUF_6 to be generated by the proposed NEF would be converted to U_3O_8 and disposed of in a licensed disposal facility.

2.2.2.5 Anhydrous Hydrofluoric Acid Option

As discussed in section 2.1.9, a byproduct of the conversion from DUF_6 to U_3O_8 is hydrofluoric acid. The hydrofluoric acid can be processed in two forms, aqueous (dissolved in water) or anhydrous (without water; especially without water of crystallization). In a Programmatic EIS (DOE, 1999b) addressing the potential impacts of alternative management strategies for DUF_6 stored at various DOE facilities, DOE proposed and discussed the potential environmental impacts from further processing of the aqueous hydrofluoric acid with a yet to be determined distillation process to generate anhydrous hydrofluoric acid. This process was proposed by DOE, because anhydrous hydrofluoric acid has a greater commercial value than does aqueous hydrofluoric acid. DOE assessed the impacts of two conversion options for the DUF_6. The two conversion options considered were (1) a distillation process for anhydrous hydrofluoric acid; and (2) the neutralization of the aqueous hydrofluoric acid with lime to generate calcium fluoride (CaF_2).

Based on its Programmatic EIS, DOE published a request for proposals for the construction and operation of two DUF_6 conversion facilities, one each at DOE's Paducah, Kentucky, and Portsmouth, Ohio, gaseous diffusion plant sites, to process its large inventory of DUF_6. In the request for proposals, DOE allowed for a range of potential conversion product forms and process technologies; however, DOE required that any of the proposed conversion forms must have an assured, environmentally acceptable path for final disposition (DOE, 2004a; DOE, 2004b).

In response to the request for proposals, DOE received five proposals, three of which were deemed to be in the competitive range. Of the three, two proposals would either sell or neutralize aqueous hydrofluoric acid and the other proposal would sell anhydrous hydrofluoric acid. DOE selected a proposal that did not involve the distillation to anhydrous hydrofluoric acid, but rather the sale of aqueous hydrofluoric acid with neutralization to form CaF_2 if the aqueous hydrofluoric acid could not be sold. Therefore, the possibility of distilling the aqueous hydrofluoric acid was not presented as a conversion process in either of DOE's site specific Final EISs prepared for DUF_6 conversion facilities at the Paducah and Portsmouth sites.

Cogema has experience with efforts to generate anhydrous hydrofluoric acid from aqueous hydrofluoric acid. At its DUF_6 conversion facility in Pierrelatte, France, Cogema attempted to generate anhydrous hydrofluoric acid using a process similar to that proposed in the DOE Programmatic EIS (Hartmann, 2001). However, technical issues proved difficult and so Cogema canceled further efforts to generate anhydrous hydrofluoric acid from aqueous hydrofluoric acid.

LES has reviewed the issue of the generation of anhydrous hydrofluoric acid from aqueous hydrofluoric acid. In Revision 4 of its Environmental Report, LES states that "LES will not use a deconversion facility that employs a process that results in the production of anhydrous [hydrofluoric acid]" (LES, 2005a).

In summary, the option of generating anhydrous hydrofluoric acid has not been analyzed because:

- A proven commercially viable technology is not available to distill the aqueous hydrofluoric acid. Cogema was unable to develop a conversion technology to effectively generate anhydrous hydrofluoric acid from the aqueous form.

- DOE selected sale of aqueous hydrofluoric acid followed by sale or by neutralization with lime to generate CaF_2, rather than distillation of aqueous hydrofluoric acid to anhydrous hydrofluoric acid, for its conversion facilities being built at Paducah and Portsmouth.

- LES has committed to not pursuing a private conversion process that employs a process that results in the production of anhydrous hydrofluoric acid. In a letter dated March 29, 2005, LES formally requested a license condition be issued stating that "For the disposition of depleted UF_6, LES shall not use a depleted UF_6 deconversion facility that employs a process that results in the production of anhydrous [hydrofluoric acid]" (LES, 2005e). The NRC staff is proposing the following license condition:

  For the disposition of depleted UF_6, the licensee shall not use a depleted UF_6 deconversion facility that employs a process that results in the production of anhydrous hydrofluoric acid.

For these reasons, distillation to anhydrous hydrofluoric acid was eliminated from further consideration in this EIS.

2.3 Comparison of Predicted Environmental Impacts

Chapter 4 of this EIS presents a more detailed evaluation of the environmental impacts of the proposed action and the no-action alternative. Table 2-9 summarizes the environmental impacts for the proposed NEF and the no-action alternative.

2.4 Staff Recommendation Regarding the Proposed Action

After weighing the impacts of the proposed action and comparing alternatives, the NRC staff, in accordance with 10 CFR § 51.71(e), sets forth its NEPA recommendation regarding the proposed action. The NRC staff recommends that, unless safety issues mandate otherwise, the proposed license be issued to LES. In this regard, the NRC staff has concluded that the applicable environmental monitoring program described in Chapter 6 and the proposed mitigation measures discussed in Chapter 5 would eliminate or substantially lessen any potential adverse environmental impacts associated with the proposed action.

The NRC staff has concluded the overall benefits of the proposed NEF outweigh the environmental disadvantages and costs based on consideration of the following:

- The need for an additional, reliable, economical, domestic source of enrichment services.
- The beneficial economic impacts of the proposed NEF on the local communities which have been determined to be MODERATE.
- The remaining impacts on the physical environment and human communities would be small with the exception of short-term impacts associated with construction traffic, accidents, and waste management, which would be SMALL to MODERATE.

Table 2-9 Summary of Environmental Impacts for the Proposed NEF and the No-Action Alternative

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Land Use	SMALL. Construction activities would occur on about 81 hectares (200 acres) of a 220-hectare (543-acre) site that would be fenced. While the land is currently undisturbed except for an access road, CO_2 pipeline, and cattle grazing, there are sufficient lands surrounding the proposed NEF for relocation of the cattle grazing and the CO_2 pipeline. Impacts from installation of municipal water supply piping, natural gas supply piping, and electrical transmission lines would also be SMALL.	SMALL. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Historical and Cultural Resources	SMALL. Seven archaeological sites were recorded on the proposed site. All of these sites are considered potentially eligible for listing on the National Register of Historic Places. Two sites would be impacted by construction activities, and a third is located along the access road. Based on the terms and conditions of a Memorandum of Agreement, a historic properties treatment plan would be fully implemented prior to construction of the proposed NEF. Once measures from the treatment plan are implemented, adverse impacts would be mitigated.	SMALL to MODERATE. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Visual and Scenic Resources	SMALL. Impacts from construction activities would be limited to fugitive dust emissions that can be controlled using dust-suppression techniques. The proposed NEF cooling towers could contribute to the formation of local fog less than 0.5 percent of the total number of hours per year (44 hours per year). The proposed NEF site received the lowest scenic-quality rating using the BLM visual resource inventory process.	SMALL. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Air Quality	SMALL. Air concentrations of the criteria pollutants predicted for vehicle emissions and PM_{10} emissions for fugitive dust during construction would all be below the National Ambient Air Quality Standards, temporary, and highly localized. A NESHAP Title V permit would not be required for operations due to the low levels of estimated emissions.	SMALL. 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. The 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. 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.

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Geology and Soils	SMALL. Construction-related impacts to soil would occur within the 81-hectare (200-acre) portion of the site that would contain the proposed NEF structures. Only onsite soils would be used during construction except for clay and gravel from a nearby quarry. No soil contamination would be expected during construction and operations although soil contamination could occur. A plan would be in place to address any spills that may occur during operations and any contaminated soil in excess of regulatory limits would be properly disposed of.	SMALL. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Water Resources	SMALL. There are no existing surface water resources, and groundwater resources under the proposed NEF site are not considered potable or near the surface. NPDES general permits for construction and operations would be required to manage stormwater runoff. Construction-related impacts would be SMALL to both surface water and groundwater. Retention basins (i.e., the Treated Effluent Evaporative Basin and the UBC Storage Pad Stormwater Retention Basin) would be lined to minimize infiltration of water into the subsurface. Infiltration from the Site Stormwater Detention Basin and septic systems' leach fields could be expected to form a perched layer on top of the Chinle Formation, but there would be limited downgradient transport due to soil-storage capacity and upward flux to the root zone. Operations impacts would be SMALL. Impacts on water use would be SMALL due to the availability of excess capacity in the Hobbs and Eunice water systems. The proposed NEF's use of Ogallala waters indirectly through the Eunice and Hobbs water-supply systems would constitute a small portion of the aquifer reserves in New Mexico.	SMALL. 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. The 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. 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

Affected Environment	Proposed Action: *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	No-Action Alternative: *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Ecological Resources	SMALL. There are no wetlands or unique habitats for threatened or endangered plant or animal species on the proposed NEF site. Impacts from use of stormwater detention/retention basins would be SMALL. Animal-friendly fencing and netting or other suitable material over the basins (where appropriate) would be used to minimize animal intrusion. Revegetation using native plant species would be conducted in any areas impacted by construction, operation, and decommissioning activities.	SMALL. 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 The 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. 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.
Socioeconomics	MODERATE. During the 8-year construction period, there would be an average of 397 jobs per year created (about 19 percent of the Lea, Andrews, and Gaines counties' construction labor force) with employment peaking at 800 jobs in the fourth year. Construction would cost $1.24 billion (2004 dollars). Spending on goods and services and wages would create 582 new jobs on average. About 15 percent of the construction work force would take up residency in the surrounding	SMALL to MODERATE. 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. The 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

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
	community, and about 15 percent of the local housing units are unoccupied. The impact to housing and the educational system would be SMALL. Gross receipts taxes paid by LES and local businesses could approach \$3.1 million during the 8-year construction period. Income taxes during construction are estimated to be about \$4.1 million annually. LES would employ 210 people annually during peak operations with an additional 173 indirect jobs with about \$20.8 million in annual operations spending. Increase in demand for public services would be SMALL. Decommissioning would have a SMALL impact. Approximately 300 direct and indirect jobs at Paducah, Kentucky, or Portsmouth, Ohio, would be extended for 11 to 15 years, respectively, if DUF_6 conversion takes place at either site. If a private conversion facility is constructed, approximately 180 total jobs would be created. 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 collection and gross receipts taxes received from the State of New Mexico.	documentation and historical environmental monitoring. 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.

Affected Environment	**Proposed Action:** *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	**No-Action Alternative:** *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Environmental Justice	SMALL. The environmental justice study was chosen to encompass an 80-kilometer (50-mile) radius around the proposed NEF site. Demographic data from the 2000 census data were analyzed to characterize minority and low-income populations near the proposed NEF site. In addition, state and local governments and representatives of the minority community were contacted. The largest minority population within 80 kilometers (50 miles) of the proposed NEF site is the Hispanics/Latino population. Although the impacts to the general population were SMALL to MODERATE, examination of the various environmental pathways by which low-income and minority populations could be affected found no disproportionately high and adverse impacts from construction, operation or decommissioning would occur to minority and low-income populations living near the proposed NEF or along the transportation routes into and out of the proposed NEF.	SMALL. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Noise	SMALL. Noise levels would be predominately due to traffic noise. Construction and decommissioning activities could be limited to normal daytime working hours. The nearest residence would be 4.3 kilometers (2.6 miles) away from the proposed site, and noises at this distance from construction activities would be SMALL. Noise levels during operations would primarily be confined to inside buildings and would be within the U.S. Department of Housing and Urban Development guidelines.	SMALL. 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. The 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. 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.

Affected Environment	**Proposed Action:** *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	**No-Action Alternative:** *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Transportation	SMALL to MODERATE during construction. Traffic on New Mexico Highway 234 would almost double during construction for a period of approximately two years, and three injuries and less than one fatality could occur during the peak construction employment year due to work force traffic. Peak truck traffic during construction could cause less than one injury and less than one fatality. New Mexico Highway 18 is a four-lane road; therefore impacts to it would be smaller than to New Mexico Highway 234. SMALL during operations. Truck trips removing nonradioactive waste and delivering supplies would have a small impact on the traffic on New Mexico Highway 234. Work force traffic would also have a SMALL impact on New Mexico Highways 18 and 234 with less than one injury and less than one fatality annually due to traffic accidents. All truck shipments of feed, product, and waste materials would result in less than 3×10^{-2} latent cancer fatalities to the public and workers from direct radiation and two or less from vehicle emissions. All rail shipments of feed, product, waste materials, and empty cylinders would result in less than 1×10^{-1} latent cancer fatalities to the public and workers from direct radiation and less than 8×10^{-2} from vehicle emissions during the life of the facility.	SMALL to MODERATE. 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. The 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. 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.

Affected Environment	**Proposed Action:** ***LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.***	**No-Action Alternative:** ***The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.***
Transportation *(continued)*	SMALL to MODERATE during accidents. If a rail accident involving the shipment of DUF_6 occurs in an urban area, approximately 28,000 people could suffer adverse, but temporary, health effects with no fatalities due to chemical impacts. A truck accident involving the shipment of DUF_6 in an urban area could cause temporary adverse chemical impacts to approximately 1,700 people. SMALL during decommissioning if DUF_6 is temporarily stored at the proposed NEF for the duration of operations. Assuming that all material is shipped during the first 8 years (the final radiation survey and decontamination would occur during year 9), the proposed NEF would make about 1,966 truck shipments per year. If the trucks are limited to weekday, non-holiday shipments, approximately 10 trucks per day or 2-1/2 railcars per day would leave the site for the DUF_6 conversion facility.	

Affected Environment	**Proposed Action:** *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	**No-Action Alternative:** *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Public and Occupational Health	SMALL during construction and normal operations. During construction, there could be less than one fatality per year based on State statistics from the year 2002. Construction workers could receive up to 0.05 millisieverts (5 millirem) of radiation exposure per year once proposed NEF operations are initiated. Precautions would be taken to prevent injuries and fatalities. During operations, there would be approximately eight injuries per year and 4×10^{-4} fatalities per year due to nonradiological occurrences based on statistical probabilities. A typical operations or maintenance technician could receive 1 millisievert (100 mrem) of radiation exposure annually. A typical cylinder yard worker could receive 3 millisievert (300 mrem) of radiation exposure annually. All public radiological 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. The nearest resident would receive less than 1.3×10^{-5} millisievert (1.3×10^{-3} millirem) due to proposed NEF operations. SMALL to MODERATE for accidents. Although highly unlikely, the most severe accident is estimated to be the release of UF_6 caused by rupturing an over-filled and/or	SMALL to MODERATE. 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. The 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. 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.

Affected Environment	**Proposed Action:** *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	**No-Action Alternative:** *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Public and Occupational Health *(continued)*	over-heated cylinder, which could incur a collective population dose of 120 person-sieverts (12,000 person-rem) and seven latent cancer fatalities. The proposed NEF design reduces the likelihood of this event by using redundant heater controller trips.	
Waste Management	SMALL. Solid wastes would be generated during construction and operations. Existing disposal facilities would have the capacity to dispose of the nonhazardous solid wastes. The proposed NEF would implement waste management programs to minimize waste generation and promote recycling where appropriate. In particular, impacts to the Lea County Landfill would be SMALL. There would be enough existing national capacity to accept the low-level radioactive waste that could be generated at the proposed NEF. SMALL to MODERATE impact for DUF_6 Waste Management. Public and occupational exposures would be monitored and controlled to meet NRC regulations for radiation protection. LES identified two potential pathways for the disposition of DUF_6, either by private conversion and disposal facilities or by DOE through Section 3113 of the USEC Privatization Act. LES's preferred strategy is to have the DUF_6 byproduct converted and disposed of using private facilities outside of the State of New Mexico. No final location has yet been determined for a private conversion facility. Alternatively, DOE's processing of the DUF_6 would	SMALL to MODERATE. 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. The 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. 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.

Affected Environment	**Proposed Action:** *LES would construct, operate, and decommission the proposed NEF in Lea County, New Mexico.*	**No-Action Alternative:** *The proposed NEF would not be constructed, operated and decommissioned. Enrichment services would continue to be met with existing domestic and foreign uranium enrichment suppliers.*
Waste Management (continued)	extend operation of its conversion facilities. This would prolong their associated impacts as described in DOE's NEPA documentation. A private conversion facility would have comparable impacts to the planned DOE conversion facilities at Paducah, Kentucky, and Portsmouth, Ohio.	

2.5 References

(Abousleman, 2004) Abousleman, R. Personal communication between R. Abousleman, City Manager of the Eunice City Government, New Mexico, and M. Gorden, Advanced Technologies and Laboratories International, Inc. March 17, 2004.

(Boschult, 2005) Boschult, L., Chair of the Board, Nevada Member of the Board, Rocky Mountain Low-Level Radioactive Waste Board, letter to J. Ferland, President and Chief Executive Officer, Louisiana Energy Services, L.P. January 26, 2005.

(BRC, 2003) Bureau of Radiation Control, Texas Department of Health. Radioactive Material License L04971, Amendment 23. June 16, 2003.

(Brown et al., 1997) Brown, C., et al. "Beneficial Uses of Depleted Uranium." Beneficial Re-Use '97 Conference, Knoxville, Tennessee, August 5-7, 1997. <http://web.ead.anl.gov/uranium/pdf/Dubu97KE.pdf> (Accessed 4/19/04).

(ConverDyn, 2004) Converdyn. "Your Link to a Consistent and Reliable UF_6 Supply." <http://www.converdyn.com/index.html> (Accessed 4/23/04).

(DNFSB, 1995) U.S. Defense Nuclear Facilities Safety Board. "Integrity of Uranium Hexafluoride Cylinders." Technical Report DNFSB/TECH-4. May 5, 1995.

(DOE, 1995) U.S. Department of Energy. "Electricity Generation and Environmental Externalities: Case Studies." DOE/EIA-059. Energy Information Administration, Office of Coal, Nuclear Electric, and Alternative Fuels, Coal and Electric Analysis Branch. September 1995.

(DOE, 1999a) U.S. Department of Energy. "Environmental Assessment, Disposition of Russian Federation Titles Natural Uranium." DOE/EA-1290. Office of Nuclear Energy, Science, and Technology. Washington, D.C. June 1999.

(DOE, 1999b) U.S. Department of Energy. "Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride." DOE/EIS-0269. Volume 1. Office of Nuclear Energy, Science, and Technology. Washington, D.C. April 1999.

(DOE, 2000a) U.S. Department of Energy. "Assessment of Preferred Depleted Uranium Disposal Forms." ORNL/TM-2000/161. June 2000.

(DOE, 2000b) U.S. Department of Energy. "Report to Congress on Maintenance of Viable Domestic Uranium, Conversion and Enrichment Industries." December 2000.

(DOE, 2003) U.S. Department of Energy. "Cold Standby Program at the Portsmouth Gaseous Diffusion Plant." DOE/IG-0634. Audit Report. Office of Inspector General, Office of Audit Services. December 2003.

(DOE, 2004a) U.S. Department of Energy. "Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky Site." DOE/EIS-0359. Office of Environmental Management. June 2004.

(DOE, 2004b) U.S. Department of Energy. "Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site." DOE/EIS-0360. Office of Environmental Management. June 2004.

(DOE, 2004c) U.S. Department of Energy. "Record of Decision for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site." July 20, 2004.

(DOE, 2004d) U.S. Department of Energy. "Record of Decision for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site." July 20, 2004.

(DOE, 2005) U.S. Department of Energy. "Department of Energy FY2006 Congressional Budget Request." DOE/ME-0053. Budget Highlights and Volume 5. Office of Management, Budget, and Evaluation/CFO. February 2005.

(EIA, 2004) Energy Information Administration. "Uranium Marketing Annual Report." U.S. Department of Energy. (Released May 28, 2004; last modified June 30, 2004). <http://www.eia.dow.gov/cneaf/nuclear/umar/umar.html> (Accessed 7/11/04).

(Envirocare, 2004) Envirocare of Utah, LLC. State of Utah Radioactive Material License Amendment 20. November 23, 2004. <http://www.envirocareutah.com/pages/lp/pdf/Amendment20final.pdf> (Accessed 4/20/05).

(EPA, 2003) U.S. Environmental Protection Agency. "New Mexico: Incorporation by Reference of Approved State Hazardous Waste Management Program." 40 CFR Part 272. *Federal Register*, Vol. 68, No. 166. August 27, 2003.

(Hartmann, 2001) Hartmann, D., et al. *The French Approach for Management of Depleted Uranium a Constantly Improved Technology*. Waste Management 2001 Conference. Tucson, Arizona. February 25 to March 1, 2001.

(Heilbron et al., 1981) Heilbron, J.L., et al. *Lawrence and His Laboratory—A Historian's View of History*. June 1981. <http://www.lbl.gov/Science-Articles/Research-Review/Magazine/1981/> (Accessed 3/23/04).

(LES, 2004) Louisiana Energy Services. "Response to NRC Request for Additional Information Regarding the National Enrichment Facility Environmental Report." NEF#04-019. NRC Docket No. 70-3103. May 20, 2004.

(LES, 2005a) Louisiana Energy Services. "National Enrichment Facility Environmental Report." Revision 4. NRC Docket No. 70-3103. April 2005.

(LES, 2005b) Louisiana Energy Services. "National Enrichment Facility Safety Analysis Report." Revision 4. NRC Docket No. 70-3103. April 2005.

(LES, 2005c) Louisiana Energy Services. "Clarifying Information Related to Preparation of the Final Environmental Impact Statement for the National Enrichment Facility." NEF #05-010. NRC Docket No. 70-3103. March 11, 2005.

(LES, 2005d) Louisiana Energy Services. "Response to NRC Request for Additional Information Related to Preparation of the Final Environmental Impact Statement for the National Enrichment Facility." NEF #05-004. NRC Docket No. 70-3103. February 11, 2005.

(LES, 2005e) Louisiana Energy Services. "Clarifying Information Related to Depleted UF_6 Disposition Costs and Request for License Condition." NEF #05-016. NRC Docket No. 70-3103. March 29, 2005.

(LLNL, 2004) Lawrence Livermore National Laboratory. "Laser Technology Follows in Lawrence's Footsteps, Laser Isotope Separation." <http://www.llnl.gov/str/Hargrove.html> (Accessed 3/23/04).

(NMDOT, 2004a) New Mexico Department of Transportation. Maps. New Mexico State Map. <http://nmshtd.state.nm.us/general/BPE/images/citymapL.jpg> (Accessed 7/21/04).

(NMDOT, 2004b) New Mexico Department of Transportation. Personal communication between B. Kurtz, the New Mexico Department of Transportation, and M. Gorden, Advanced Technologies and Laboratories International, Inc. July 19, 2004.

(NMWQCC, 2002) New Mexico Water Quality Control Commission. "Standards for Interstate and Intrastate Surface Waters." 20.6.4 NMAC. Effective October 11, 2002.

(NRC, 1991) U.S. Nuclear Regulatory Commission. Policy Issue "Disposition of Depleted Uranium Tails from Enrichment Plant." SECY-91-019. January 25, 1991.

(NRC, 1994) U.S. Nuclear Regulatory Commission. "Final Environmental Impact Statement for the Construction and Operation of Claiborne Enrichment Center, Homer, Louisiana." NUREG-1484. August 1994.

(NRC, 1995) U.S. Nuclear Regulatory Commission. Letter from R. Bernero, Director, Office of Nuclear Materials Safety and Safeguards (NMSS), to C. Bradley, DOE Office of Uranium Programs, Office of Nuclear Energy. January 3, 1995.

(NRC, 2002) U.S. Nuclear Regulatory Commission. "Denial of Petition for Rulemaking to Eliminate Review of Alternative Sites, Alternative Energy Sources, and Need for Power in Nuclear Power Reactor Siting and Licensing Reviews (PRM-52-2)." SECY-02-0175. September 27, 2002.

(NRC, 2003) U.S. Nuclear Regulatory Commission. "Locations of Low-Level Waste Disposal Facilities." June 23, 2003. <http://www.nrc.gov/waste/llw-disposal/locations.html> (Accessed July 26, 2004)

(NRC, 2005) U.S. Nuclear Regulatory Commission. "Memorandum and Order." CLI-05-05. NRC Docket No. 70-3103. January 18, 2005.

(OECD, 2001) Organization for Economic Co-Operation and Development. "Management of Depleted Uranium." A joint report by the OECD Nuclear Energy Agency and the International Atomic Energy Agency. 2001.

(Rafati, 2005) Rafati, A., Executive Vice President, Envirocare of Utah, LLC, letter to J. Ferland, President and Chief Executive Officer, Louisiana Energy Services, L.P. February 3, 2005.

(Settle, 2004) Settle, F. "Nuclear Chemistry, Uranium Enrichment." Kennesaw State University. <http://chemcases.com/nuclear/nc-07.htm> (Accessed 3/23/04).

(Sorensen, 2004) Sorensen, P., the Bureau of Land Management, personal communication with M. Orr, Advanced Technologies and Laboratories International, Inc. March 9, 2004.

(Urenco, 2003) Urenco Deutschland. "Uranium Enrichment." June 2003. <http://www.urenco.de/pdf_archiv/Enrichment2003.pdf> (Accessed 7/22/04).

(Urenco, 2004a) Urenco Deutschland. "Uranhexafluorid-Transporte." <http://www.urenco.de/pdf_archiv/transport_brosch.pdf> (Accessed 04/06/04).

(Urenco, 2004b) Urenco Deutschland. "Uranium Enrichment by Centrifuge." <http://www.urenco.de/englisch/eseiten/eura/eura002.htm> (Accessed 3/15/04).

(USEC, 1995) United States Enrichment Corporation. "Uranium Hexafluoride: A Manual of Good Handling Practices." USEC-651 Revision 7. January 1995.

(USEC, 1999) United States Enrichment Corporation. "USEC Inc. Suspends AVLIS Technology Development." News Release. June 9, 1999. <http://www.usec.com/v2001_02/Content/News/NewsTemplate.asp?page=/v2001_02/Content/News/NewsFiles/06-09-99b.htm> (Accessed 3/23/04).

(USEC, 2000) United States Enrichment Corporation. Press release. USEC to Cease Uranium Enrichment at the Portsmouth, Ohio, Facility in June 2001. June 21, 2000.

(USEC, 2003a) United States Enrichment Corporation. "Megatons to Megawatts, Turning Nuclear Warheads into Electricity." Report to the U.S. Senate Committee on Foreign Relations. March 19, 2003.

(USEC, 2003b) United States Enrichment Corporation. "USEC Ends Funding of Research on SILEX Process." News Release. April 30, 2003. <http://www.usec.com/v2001_02/Content/News/NewsTemplate.asp?page=/v2001_02/Content/News/NewsFiles/04-30-03.htm> (Accessed 3/23/04).

(USEC, 2004) United States Enrichment Corporation. "News Release: USEC to Site American Centrifuge Plant in Piketon, Ohio." January 12, 2004. <http://www.usec.com/v2001_02/Content/News/NewsTemplate.asp?page=/v2001_02/Content/News/NewsFiles/01-12-04.htm> (Accessed 7/25/04).

(WCS, 2004) Waste Control Specialists LLC. "Application for License to Authorize Near-Surface Land Disposal of Low-Level Radioactive Waste." August 2, 2004.

(WNA, 2003) World Nuclear Association. "Uranium Enrichment." June 2003. <http://www.world-nuclear.org/info/inf28.htm> (Accessed 7/22/2004).

(WNTI, 2004) World Nuclear Transport Institute. "Transport Types." Nuclear Transport Fact File. <http://www.wnti.co.uk/pages/transover1.html> (Accessed 4/1/04).

(Woomer, 2004) Woomer, T., Director of Utilities for the City of Hobbs, personal communication with A. Zeitoun, Advanced Technologies and Laboratories International, Inc. March 8, 2004.

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

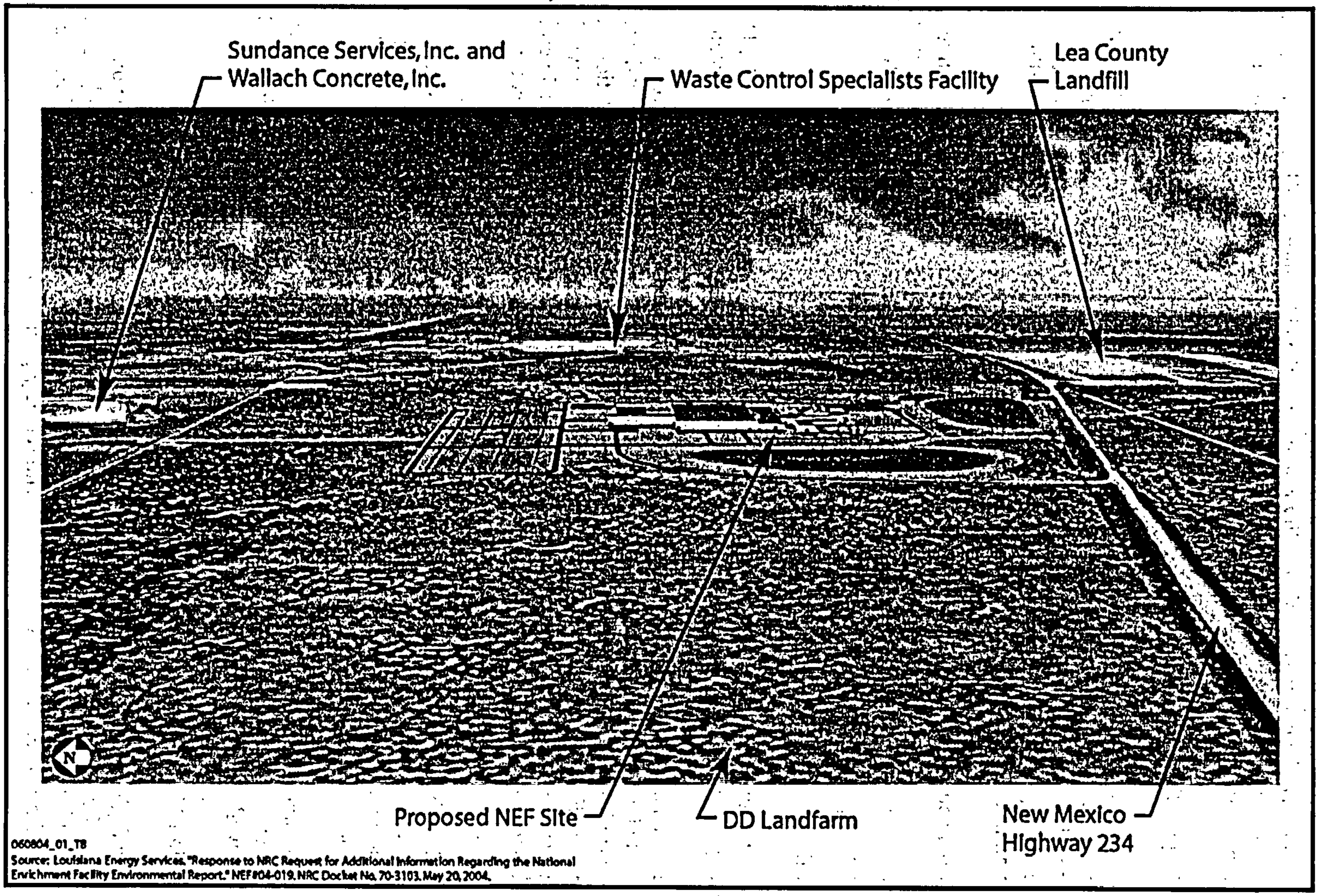

Figure 4-1 Visual Impact of the Proposed NEF on Nearby Facilities (LES, 2005a)

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 ($\mu g/m^3$)						
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 ($\mu g/m^3$)						
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; $\mu g/m^3$ - 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/m^3.

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.

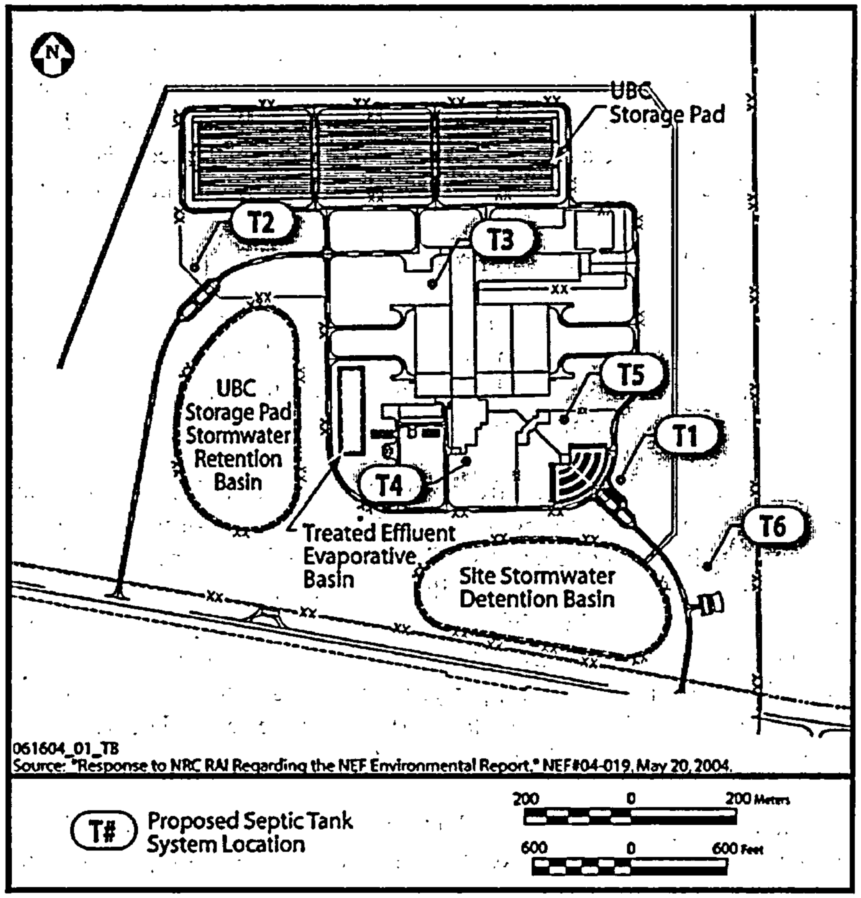

Figure 4-2 Basins and Septic Tank System Locations (LES, 2005a)

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

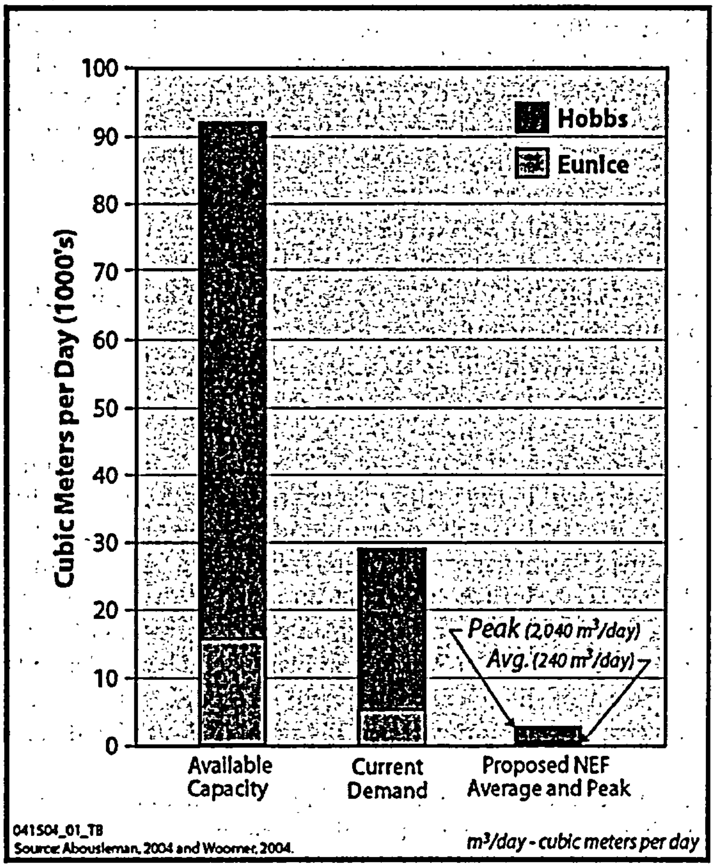

Figure 4-3 Eunice and Hobbs Water Capacities in Relation to the Proposed NEF Requirements (LES, 2005a; Abousleman, 2004b; Woomer, 2004)

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 (*Sceloporün 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.

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[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:

- *<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.*

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

<u>Employment and Economic Activity</u>

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.

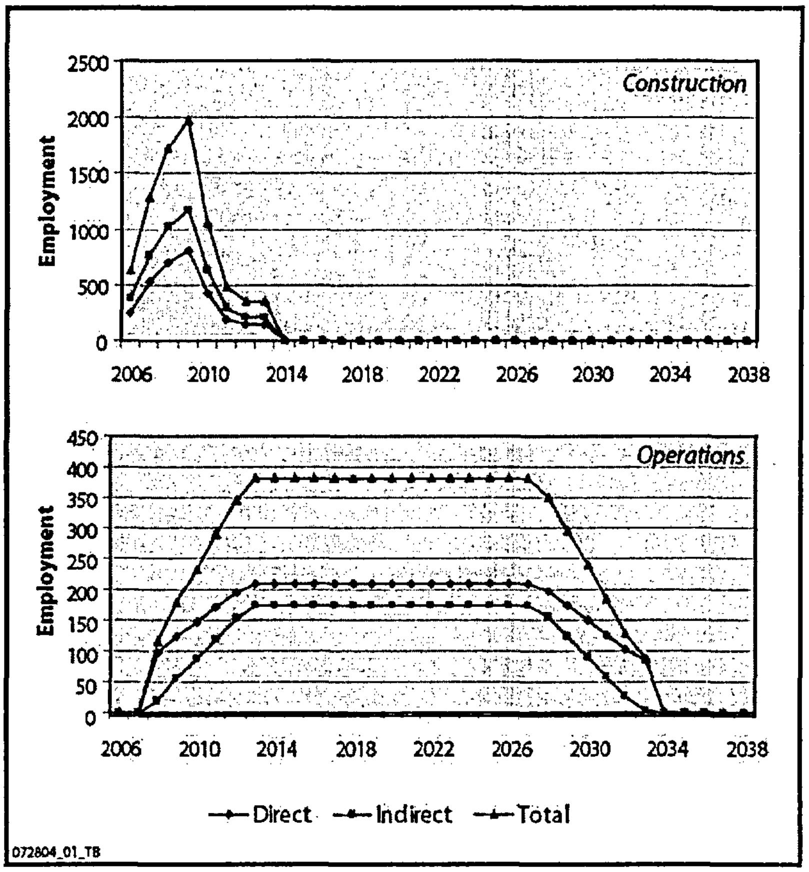

Figure 4-4 Estimated Total Employment (Direct and Indirect) over the Construction and Operation Phases of the Proposed NEF

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.

Radiological Shipments by Truck

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

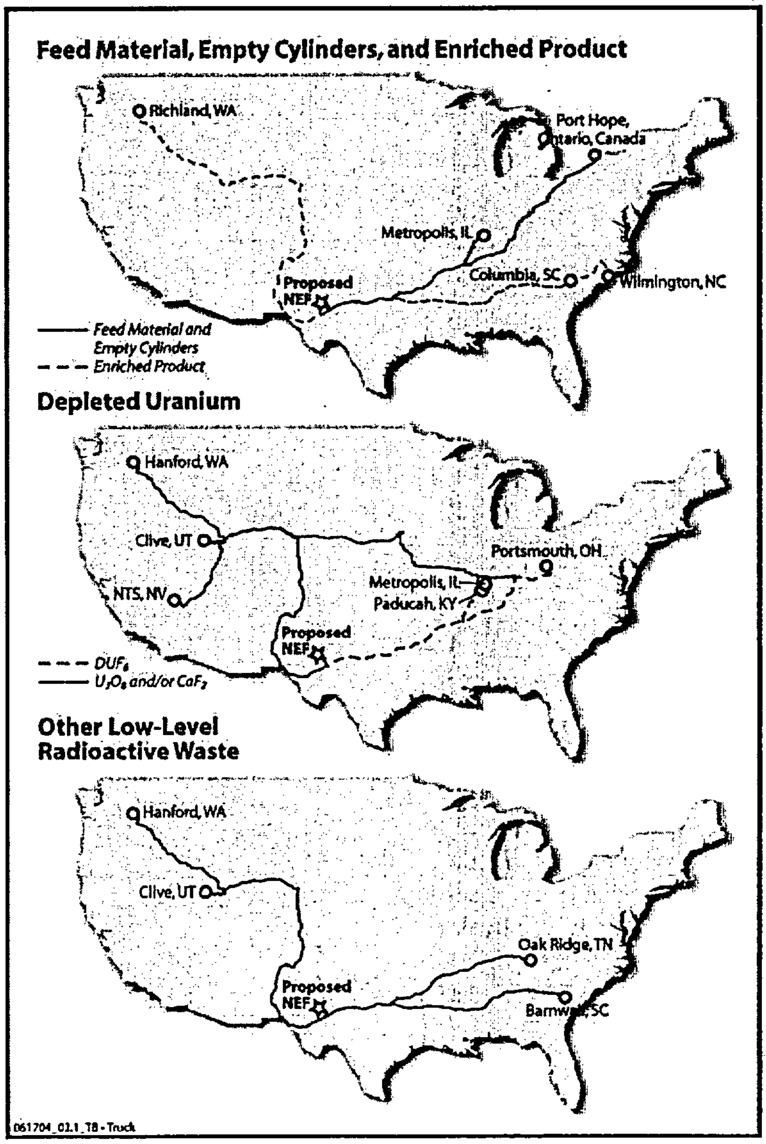

Figure 4-5 Proposed Transportation Routes via Truck for Radioactive Shipments

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: General Population: Traffic Accidents (Fatalities)	Incident-Free: General Population: LCF: Vehicle Emissions	Incident-Free: General Population: LCF: Direct Radiation	Incident-Free: Occupational Workers: Traffic Accidents (Fatalities)	Incident-Free: Occupational Workers: LCF: Vehicle Emissions	Incident-Free: Occupational Workers: LCF: Direct Radiation	Incident-Free: Maximum Individual In-Transit (Increased Risk of LCF)	Accident (Risk of LCF to the General Population)
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.

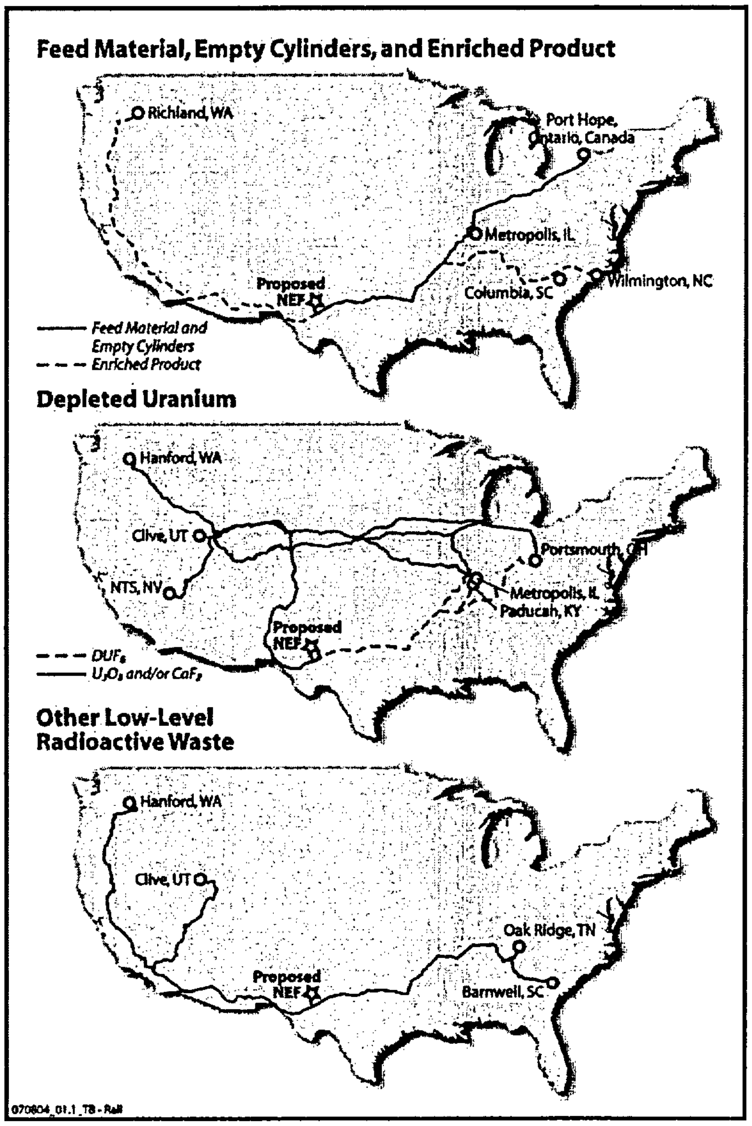

Figure 4-6 Proposed Transportation Routes via Rail for Radioactive Shipments

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

Nonradiological Impacts

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}	~4×10^{-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

Radionuclide	Estimated Releases[a] TSB GEVS kBq/year (μCi/year)	Estimated Releases[a] SB GEVS kBq/year (μCi/year)	Bounding Releases TSB GEVS kBq/year (μCi/year)	Bounding Releases SB GEVS kBq/year (μCi/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; μCi - 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/m³ (rem)	[HF], mg/m³	[U] mg/m³	[U] mg/m³ (rem)	[HF], mg/m³	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/m³ - 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.*

<u>Temporary Onsite Storage Impacts</u>

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}	$2\times10^{-3} – 3\times10^{-3}$	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 staffs 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.

4.9 References

(Abousleman, 2004a) Abousleman, R. Personal communication between R. Abousleman, City Manager of the Eunice City Government, New Mexico, and S. Massengill, Planner Director of the Land and Water Conservation Fund for the State of New Mexico. May 24, 2004.

(Abousleman, 2004b) Abousleman, R. Personal communication between R. Abousleman, City Manager of the Eunice City Government, New Mexico, and M. Gorden, Advanced Technologies and Laboratories International, Inc. Water Utilities Information. March 17, 2004.

(ANL, 2001) Argonne National Laboratory. "Transportation Impact Assessment for Shipment of Uranium Hexafluoride (UF_6) Cylinders from the East Tennessee Technology Park to the Portsmouth and Paducah Gaseous Diffusion Plants." ALN/EAD/TM-112. October 2001.

(BEA, 1997) Bureau of Economic Analysis. *Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II).* Washington, D.C.: U.S. Department of Commerce. March 1997.

(BEA, 2004) Bureau of Economic Analysis. *RIMS II Multipliers for the Hobbs, New Mexico, and Odessa-Midland, Texas, Region.* Washington, D.C.: U.S. Department of Commerce. March 2004.

(BRC, 2003) Bureau of Radiation Control. Radioactive Material License L04971. Amendment Number 23. Texas Department of Health. June 16, 2003. <http://www.wcstexas.com/doc_pdf/RadLicenseAmendment.pdf> (Accessed 9/3/04).

(Bruce et al., 2003) Bruce, R.D., et al. "Noise, Vibration, and Ultrasound." *In The Occupational Environment: Its Evaluation, Control, and Management.* (Salvatore R. Dinardi, ed.). Fairfax, Virginia: American Industrial Hygiene Association. 2003.

(Congress, 2004) U.S. Congress. *Consolidated Appropriations Act*, 2005. Pub. L. No. 108–447. 118 Stat. 2809. December 8, 2004.

(ConverDyn, 2004) ConverDyn. "Your Link to a Consistent and Reliable UF_6 Supply." <http://www.converdyn.com/index.html> (Accessed 4/23/04).

(DHHS, 2004) U.S. Department of Health and Human Services. "NIOSH Pocket Guide to Chemical Hazards." Centers for Disease Control and Prevention. National Institute for Occupational Safety and Health. February 2004. <http://www.cdc.gov/niosh/npg/npg.html> (Accessed 9/3/04).

(DNFSB, 1995a) Defense Nuclear Facility Safety Board. "Integrity of Uranium Hexafluoride Cylinders." Technical Report DNFSB/TECH-4. May 5, 1995.

(DNFSB, 1995b) Defense Nuclear Facility Safety Board. "Improved Safety of Cylinders Containing Depleted Uranium." Recommendation 95-1 to the Secretary of Energy. May 5, 1995.

(DNFSB, 1999) Defense Nuclear Facility Safety Board. Letter from J. Conway to B. Richardson, Secretary of Energy. Closing of Recommendation 95-1. December 16, 1999.

(DOE, 1994) U.S. Department of Energy. "DOE Handbook: Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities." DOE-HDBK-3010-94. December 1994.

(DOE, 1999) U.S. Department of Energy. "Final Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride." DOE/EIS-0269. April 1999.

(DOE, 2002) U.S. Department of Energy. "Recommendations for Analyzing Accidents under the National Environmental Policy Act." July 2002.

(DOE, 2004a) U.S. Department of Energy. "Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Paducah, Kentucky, Site." DOE/EIS-0359. Office of Environmental Management. June 2004.

(DOE, 2004b) U.S. Department of Energy. "Final Environmental Impact Statement for Construction and Operation of a Depleted Uranium Hexafluoride Conversion Facility at the Portsmouth, Ohio, Site." DOE/EIS-0360. Office of Environmental Management. June 2004.

(DOL, 2004) U.S. Department of Labor. "State Occupational Injuries, Illnesses, and Fatalities." Bureau of Labor Statistics. January 21, 2004. <http://www.bls.gov/iif/oshstate.htm#NM> (Accessed 4/15/04).

(Dornbusch, 1999) David M. Dornbusch & Company. "Water Use Scenarios for Southern Ute and Ute Mountain Ute Indian Tribes, Colorado." San Francisco, California. Prepared for Southern Ute Indian Tribe. June 7, 1999.

(Eckerman et al., 1999) Eckerman, K.F., et al. "Cancer Risk Coefficients for Environmental Exposure to Radionuclides." Federal Guidance Report No. 13. EAP 402-R-99-001. Prepared by Oak Ridge National Laboratory, Oak Ridge, Tennessee, for U.S. Environmental Protection Agency, Office of Radiation and Indoor Air, Washington, D.C. September 1999.

(EEI, 2004) Eagle Environmental, Inc. "Lesser Prairie-Chicken Surveys on the National Enrichment Facility Proposed Project Site." Prepared for G.L. Environmental, Inc. May 5, 2004.

(EIA, 2004) Energy Information Administration. "Uranium Marketing Annual Report." U.S. Department of Energy. (Released May 28, 2004; Last Modified June 30, 2004). <http://www.eia.dow.gov/cneaf/nuclear/umar/umar.html> (Accessed 7/11/04).

(Envirocare, 2004) Envirocare of Utah, LLC. State of Utah Radioactive Material License Amendment 20. November 23, 2004. <http://www.envirocareutah.com/pages/lp/pdf/Amendment20final.pdf> (Accessed 4/20/05).

(EPA, 1995a) U.S. Environmental Protection Agency. "User's Guide for the Industrial Source Complex (ISC3) Dispersion Models." Volume I. EPA-454/B-95-003a. September 1995.

(EPA, 1995b) U.S. Environmental Protection Agency. "Compilation of Air Pollutant Emission Factors." AP-42. U.S. Environmental Protection Agency. Research Triangle Park, North Carolina. 1995.

(EPA, 2003) U.S. Environmental Protection Agency. "Air & Radiation–National Ambient Air Quality Standards (NAAQS)." December 10, 2003. <http://www.epa.gov/air/criteria.html> (Accessed 6/2/04).

(EPA, 2004) U.S. Environmental Protection Agency. "Welcome to the Green Book Nonattainment Areas for Criteria Pollutants." January 20, 2004. <http://www.epa.gov/oar/oaqps/greenbk/> (Accessed 3/2/2004).

(FAA, 1992) Federal Aviation Administration. "Change 2 to Obstruction Marking and Lighting." Advisory Circular. AC No. 70/7460-1H. U.S. Department of Transportation. July 15, 1992.

(FWS, 1995) U.S. Department of the Interior, Fish and Wildlife Service. "Endangered and Threatened Wildlife and Plants; 12-Month Finding for a Petition to List the Swift Fox as Endangered." 50 CFR Part 17. *Federal Register*, Vol. 60, p. 31663. June 16, 1995.

(FWS, 2004) U.S. Department of the Interior, Fish and Wildlife Service. Letter from S. MacMullin to L.E. Kokajko, U.S. Nuclear Regulatory Commission. Cons. # 2-22-04-I-349. March 26, 2004.

(GAO, 2004) U.S. General Accounting Office. "Low-Level Radioactive Waste: Disposal Availability Adequate in the Short Term, But Oversight Needed to Identify Any Future Shortfalls." Report to the Chairman, Committee on Energy and Natural Resources, U.S. Senate. GAO-04-604. June 2004.

(Graves, 2004) Graves, T. "An Intensive Cultural Resource Inventory of 543 Acres for the National Enrichment Facility near Eunice, Lea County, New Mexico." Project No. 03F048, Report No. WCRM(F)294, NMCRIS No. 85083. Western Cultural Resource Management, Inc. January 24, 2004.

(Hobbs, 2005) City of Hobbs, New Mexico. Personal communication between T. Randall, City Engineer; M. Gorden, Advanced Technologies and Laboratories International, Inc.; and C. Schulte and C., U.S. Nuclear Regulatory Commission. April 5, 2005.

(HPWD, 2004) High Plains Water District #1. "The Ogallala Aquifer." May 5, 2004. <http://www.hpwd.com/ogallala/ogallala.asp> (Accessed 5/31/04).

(HUD, 2002) U.S. Department of Housing and Urban Development. "The Noise Guidebook." Office of Community Planning and Development. June 5, 2002.

(IAEA, 1992) International Atomic Energy Agency. "Effect of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards." Technical Report Series No. 332. IAEA, Vienna, Austria. 1992.

(LCSWA, 1996) Lea County Solid Waste Authority. "Application for Permit: Lea County Landfill." 1996.

(LCWUA, 2000) Lea County Water Users Association. "Lea County Regional Water Plan." December 7, 2000.

(Lea County, 2005) Lea County, New Mexico. Personal communication between N. Maranavich, Road Superintendent, Lea County Planning and Mapping; M. Gorden, Advanced Technologies and Laboratories International, Inc.; and C. Schulte and C. Barr, U.S. Nuclear Regulatory Commission. April 5, 2005.

(Lenders, 2001) Lenders, M. "Uranium Enrichment by Gaseous Centrifuge." Urenco Limited Presentation to the Deutsches Atomforum Annual Meeting on Nuclear Technology 2001. May 16, 2001.

(LES, 2004a) Louisiana Energy Services. Letter from R. M. Krich to the U.S. Nuclear Regulatory Commission. Response to NRC request for additional information regarding the National Enrichment Facility Environmental Report. NRC Docket No. 70-3103. May 20, 2004.

(LES, 2004b) Louisiana Energy Services. "National Enrichment Facility Economic Impact." March 16, 2004. <http://www.nefnm.com/pages/economics.php> (Accessed 6/23/04).

(LES, 2004c) Louisiana Energy Services. "National Enrichment Facility Emergency Plan." Revision 2. NRC Docket No. 70-3103. September 2004.

(LES, 2005a) Louisiana Energy Services. "National Enrichment Facility Environmental Report." Revision 4. NRC Docket No. 70-3103. April 2005.

(LES, 2005b) Louisiana Energy Services. Letter from R.M. Krich to the U.S. Nuclear Regulatory Commission. Response to NRC Request for Additional Information Related to Preparation of the Final Environmental Impact Statement for the National Enrichment Facility. NRC Docket No. 70-3103. February 11, 2005.

(LES, 2005c) Louisiana Energy Services. Letter from R.M. Krich to the U.S. Nuclear Regulatory Commission. Clarifying information Related to Preparation of the Final Environmental Impact Statement for the National Enrichment Facility. NEF #05-010. March 11, 2005.

(LES, 2005d) Louisiana Energy Services. "National Enrichment Facility Safety Analysis Report." Revision 4. NRC Docket No. 70-3103. April 2005.

(Mactec, 2003) Mactec Engineering and Consulting, Inc. "Report of Preliminary Subsurface Exploration, Proposed National Enrichment Facility, Lea County New Mexico." Prepared for Lockwood Greene, Spartanburg, S.C., by Mactec Engineering and Consulting, Inc., Knoxville, Tennessee. October 17, 2003.

(Musharrafieh and Chudnoff, 1999) Musharrafieh, G., and M. Chudnoff. "Numerical Simulation of Groundwater Flow for Water Rights Administration in the Lea County Underground Water Basin New Mexico." New Mexico Office of the State Engineer, Technical Division. Hydrology Bureau Report 99-1. January 1999.

(NCDC, 1998) National Climate Data Center. "International Surface Weather Observations 1982-1997." CDROM. September 1998. <http://ols.nndc.noaa.gov/plolstore/plsql/olstore.prodspecific?prodnum=C00442-CDR-A0001> (Accessed 9/3/04).

(Neuhauser and Kanipe, 2003) Neuhauser, K. and F. Kanipe. "RADTRAN 5 User Guide." SAND2000-2354. Sandia National Laboratories. July 7, 2003. <http://ttd.sandia.gov/risk/docs/R5userguide.pdf> (Accessed 4/19/04).

(NJ, 2004) State of New Jersey, Passaic County. Office of Natural Resource Programs. Solid Waste Conversions. <http://www.passaiccountynj.org/Departments/naturalresources/comaudit.htm#Solid%20Waste%20Conversions> (Accessed 6/15/04).

(NMDCA, 2004) State of New Mexico Department of Cultural Affairs, Historic Preservation Division. Letter from M. Ensey to M. Blevins, U.S. Nuclear Regulatory Commission. Docket No. 70-3103. April 26, 2004.

(NMDOT, 2005a) New Mexico Department of Transportation. Personal communication between G. Shubert, New Mexico Department of Transportation; M. Gorden, Advanced Technologies and Laboratories International, Inc.; and C. Schulte and Cynthia Barr, U.S. Nuclear Regulatory Commission. April 5, 2005.

(NMDOT, 2005b) New Mexico Department of Transportation. Personal communication between G. Shubert, New Mexico Department of Transportation, and M. Gorden and D. Palmrose, Advanced Technologies and Laboratories International, Inc. January 26, 2005.

(NMEDAQB, 2005) New Mexico Environment Department Air Quality Bureau. Personal communication between A. Berger, New Mexico Environment Department Air Quality Bureau, and M. Gorden, Advanced Technologies and Laboratories International, Inc. February 11, 2005.

(NMEMN, 2004) New Mexico Department of Energy, Minerals, and Natural Resources. Personal communication between S. Massengill, Planner Director of Land and Water Conservation Fund for the State of New Mexico, and A. Zeitoun, Advanced Technologies and Laboratories, International, Inc. May 24, 2004.

(NMGF, 2004) New Mexico Department of Game and Fish. Letter from L. Kirkpatrick, Chief of Conservation Services Division, to Chief Rules Review and Directives Branch of the U.S. Nuclear Regulatory Commission. November 1, 2004.

(NRC, 1990) U.S. Nuclear Regulatory Commission. "Control Room Habitability System Review Models." NUREG/CR-5659. December 1990.

(NRC, 1991) U.S. Nuclear Regulatory Commission. "Chemical Toxicity of Uranium Hexafluoride Compared to Acute Effects of Radiation." NUREG-1391. February 1991.

(NRC, 1994) U.S. Nuclear Regulatory Commission. "Final Environmental Impact Statement for the Construction and Operation of Claiborne Enrichment Center, Homer, Louisiana." NUREG-1484. Vol. 1. August 1994.

(NRC, 1996) U.S. Nuclear Regulatory Commission. "Generic Environmental Impact Statement for License Renewal of Nuclear Plants." NUREG-1437. Office of Nuclear Reactor Regulation. May, 1996.

(NRC, 1998) U.S. Nuclear Regulatory Commission. "Nuclear Fuel Cycle Facility Accident Analysis Handbook." NUREG/CR-6410. March 1998.

(NRC, 2001) U.S. Nuclear Regulatory Commission. "RASCAL 3.0: Description of Models and Methods." NUREG-1741. March 2001.

(NRC, 2003a) U.S. Nuclear Regulatory Commission. "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs." NUREG-1748. Office of Nuclear Material Safety and Safeguards, Washington, D.C. August 2003.

(NRC, 2004a) U.S. Nuclear Regulatory Commission. Memorandum from S. Hernandez to M. Delligatti, U.S. Nuclear Regulatory Commission. June 9, 2004.

(NRC, 2004b) U.S. Nuclear Regulatory Commission. "Environmental Impact Statement for the Proposed Idaho Spent Fuel Facility at the Idaho National Engineering and Environmental Laboratory in Butte County, Idaho." NUREG-1773. Office of Nuclear Material Safety and Safeguards, Washington, D.C. January 2004.

(NRC, 2005a) U.S. Nuclear Regulatory Commission. "Environmental Impact Statement on the Construction and Operation of a Mixed Oxide Fuel Fabrication Facility at the Savannah River Site, South Carolina." NUREG-1767. Office of Nuclear Material Safety and Safeguards, Washington, D.C. January 2005.

(NRC, 2005b) U.S. Nuclear Regulatory Commission. "Telecon with R. M. Krich Related to the Preparation of an Environmental Impact Statement for the Louisiana Energy Services Proposed National Enrichment Facility." Note to File. NRC Docket No. 70-3103. April 20, 2005.

(NRC, 2005c) U.S. Nuclear Regulatory Commission. Memo from M. Blevins to S. Flanders. NRC Docket No. 70-3103. April 6, 2005.

(NRCS, 1978) Natural Resources Conservation Service. "Potential Natural Vegetation Map, New Mexico." January 1978. <http://www.nm.nrcs.usda.gov/technical/fotg/section-1/maps/potentialnatvege.jpg> (Accessed 2/19/04).

(ORNL 2003) Oak Ridge National Laboratory. "Transport Routing Analysis Geographic Information System (TRAGIS) User's Manual." ORNL/NTRC-006. Revision 0. June 2003.

(OSHA, 2004) Occupational Safety and Health Administration. "Safety and Health Regulations for Construction," Subpart D, "Occupational Health and Environmental Controls." Standard Number 52, "Occupational Noise Exposure." 29 CFR § 1926.52.

(Proper, 2004) Proper, Michael J. "A Multiple Property Treatment Plan for the National Enrichment Facility near Eunice, Lea County, New Mexico." DRAFT 7/8/04. Farmington, N.M.: Western Cultural Resource Management, Inc.

(Sias, 2004) Sias, D.S. "The habitat and geographic range of the sand dune lizard, *Sceloporus arenicolus* in Lea County, New Mexico in the vicinity of Section 32, Township 21S, Range 38E." A survey report for the LES National Enrichment Facility project. July 29, 2004.

(Sutter, 2002) Sutter, A.H. "Construction Noise: Exposure, Effects, and the Potential for Remediation; A Review and Analysis." *AIHA Journal* 63: 768-789.

(TCEQ, 2004) Texas Commission on Environmental Quality. "2002 State Sum as of June 2004 sorted by County." 2002_cnty.rls. June 24, 2004. <http://www.tnrcc.state.tx.us/air/aqp/eidata/2002sum_cnty.pdf> (Accessed 7/27/04).

(Thalheimer, 2000) Thalheimer, E. "Construction Noise Control Program and Mitigation Strategy at the Central Artery/Tunnel Project." August 4, 2000.

(The Nature Conservancy, 2004) The Nature Conservancy. "Burrowing Owl." <http://nature.org/exclude/print.php> (Accessed 7/21/04).

(Trulio, 1997) Trulio, L.A. "Strategies for Protecting Western Burrowing Owls (Speotyto cunicularia hypugaea) from Human Activities." Biology and Conservation of Owls of the Northern Hemisphere, Second International Symposium, Winnipeg, Manitoba, Canada. February 5-9, 1997.

(UNM, 2003) University of New Mexico. "Lea County Crash History." May 8, 2003. <http://www.unm.edu/~dgrint/CountyCrashHistory/LeaCounty.html> (Accessed 4/16/04).

(Urenco, 2004) Urenco Deutschland. "Uranium Enrichment by Centrifuge." <http://www.urenco.de/englisch/eseiten/eura/eura003.htm> (Accessed 8/12/04).

(USCB, 2002) U.S. Census Bureau. "Table DP-1. Profile of General Demographic Characteristics: 2000." May 7, 2002. <http://censtats.census.gov/data/NM/05035025.pdf> (Accessed 2/26/04).

(USEC, 2004a) United States Enrichment Corporation. "Investor Fact Sheet." Spring 2004. <http://media.corporate-ir.net/media_files/NYS/USU/presentations/Spring_2004.pdf> (Accessed 7/19/04).

(USEC, 2004b) United States Enrichment Corporation. "USEC to Site American Centrifuge Plant in Piketon, Ohio." News Release. January 12, 2004.

(Valdez, 2004) Valdez, E. Personal communication between E. Valdez, Interim Executive Director of the Economic Development Corporation of Lea County, and M. Gorden, Advanced Technologies and Laboratories International, Inc. Casino/racetrack information. June 23, 2004.

(WCS, 2004) Waste Control Specialists. "Application for License to Authorize Near-Surface Land Disposal of Low-Level Radioactive Waste." Volumes 1–12. August 2, 2004.

(Woomer, 2004) Woomer, T. Personal communication between T. Woomer, the City of Hobbs, New Mexico, and A. Zeitoun, Advanced Technologies and Laboratories International, Inc. Hobbs, New Mexico, water supply and potential impacts. March 8, 2004.