NUREG-1790

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

Draft Report for Comment

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

NUREG-1790

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

Draft Report for Comment

Manuscript Completed: September 2004
Date Published: September 2004

Division of Waste Management and Environmental Protection
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

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, 2004a). 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. The facility would maintain the UBCs 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.

> ***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 3 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*

<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).

For the purpose of this Draft EIS, the NRC considers the DUF_6 generated by the proposed NEF to be a Class A low-level radioactive waste as defined in 10 CFR § 61.55(a)(6).

All DUF_6 would be disposed of before the site is decommissioned (LES, 2004a). This Draft 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, 2000b). Therefore, all the options evaluated in the Draft EIS include conversion of the DUF_6 to U_3O_8.

Two plausible 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 USEC Privatization Act of 1996 would be to ship the material to the DOE's conversion facility at Portsmouth, Ohio, or 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 environmental impact statements to construct and operate a conversion facility 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 Draft EIS.

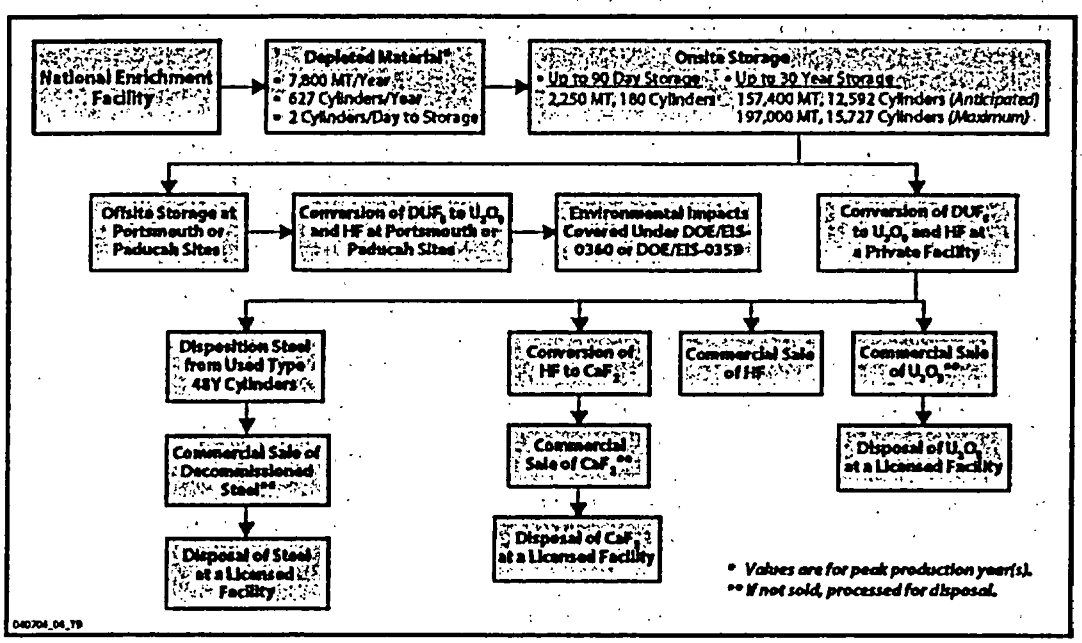

Figure 2-12 Disposal Flow Paths for DUF_6

In this Draft EIS, it is assumed that the proposed 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, 2004a).

Conversion of UF_6 to U_3O_8 generates hydrogen fluoride gas. This gas is dissolved in water to form hydrofluoric acid which is easier to store and handle than the hydrogen fluoride gas. The 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 hydrofluoric acid 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.

> ***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). 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 Class A low-level radioactive waste.*
>
> *Source: NRC, 1991.*

Option 1: Private Sector Conversion and Disposal

This disposition option is private sector conversion of the DUF_6 into U_3O_8 and hydrogen fluoride, disposal of the depleted U_3O_8, and possible commercial sale of the hydrofluoric acid. The conversion could occur within the region of influence of the proposed NEF or at some other site within the United States. Since no company has agreed to construct or operate a conversion facility within the region of influence of the proposed NEF, this Draft 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, 2004a; LES, 2004b).

No private company has yet agreed to construct or operate a DUF_6 to U_3O_8 conversion facility anywhere in the United States. 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 uranium dioxide (UO_2) (yellow cake) from mining and milling operations into UF_4 and 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, would allow the 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 dispositioning.

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 uranium dioxide 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 uranium dioxide ("yellowcake") to UF_6 (Converdyn, 2004).

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.

Source: (DOE, 2004a; DOE 2004b).

These assumptions bound the potential impacts of DUF_6 disposition. 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 Draft EIS also considers that the private conversion facility could be located close to 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.

Option 2: DOE Conversion and Disposal

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 *United States Enrichment Corporation 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)."

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 their 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. During its evaluation of disposal of the depleted uranium in a licensed low-level radioactive waste disposal facility, the NRC staff determined that, depending on the quantity of material to be deposited, additional environmental impact evaluations of the proposed disposal site may be required.

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 which 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 allow 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 all U.S. generators except those in the Rocky Mountain and Northwest compacts. 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. Because New Mexico is a member of the Rocky Mountain compact, the proposed NEF, at this time, would not be able to send low-level radioactive waste directly to Barnwell.

- 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. New Mexico is a member of the Rocky Mountain compact, therefore, the proposed NEF would be able to ship low-level radioactive waste to Hanford for disposal.

- Envirocare, located in Clive, Utah. Envirocare accepts waste from all regions of the United States. Envirocare is licensed by the State of Utah for 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 can not receive low-level radioactive wastes directly from private facilities such as the proposed NEF.

- 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 licensed to dispose of RCRA hazardous waste and 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 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, Maine, and Vermont joined together to form the Texas Compact for disposal of low-level radioactive waste generated by the member States. If the August 2, 2004 application is approved, WCS would become the low-level radioactive waste disposal site for the Texas Compact. As previously stated for the Barnwell site, a disposal site within the Texas Compact can only accept waste generated by the compact member States. Thus, any radioactive wastes generated at the proposed NEF could not be shipped directly to WCS for disposal.

  The Low-Level Radioactive Waste Policy Act also allows for a Federal disposal facility to be co-located. The WCS application includes a request for a 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). Thus, the WCS waste disposal facility would be able to accept wastes similar to the waste currently accepted by Hanford, Envirocare, and Nevada Test Site. A Federal Waste Disposal Facility can only accept waste from Federal facilities, thus, the proposed NEF would not be able to ship depleted uranium directly to the proposed WCS facility.

The disposition of the U_3O_8 generated from the DOE conversion facilities would be at either the Envirocare site near Clive, Utah (the proposed disposition site), or the Nevada Test Site (optional disposal site) (DOE, 2004a; DOE, 2004b). Due to the need for separate regulatory actions to accomplish

disposal at WCS, it is assumed that the U_3O_8 from the adjacent or offsite private conversion process would be disposed of at the Envirocare or Hanford disposal facilities.

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. 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 technology in the future could be constructed. In this regard, USEC has announced its intention to construct and operate a 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, 2004a). 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.

At the same time, nuclear-generating capacity within the United States is expected to increase, causing an increase in demand for low-enriched uranium. Given the expected increase in demand and the possible elimination of low-enriched uranium from downblending, along with the uncertainty that any additional

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, 2004a). Approximately 87,000 kilograms (191,800 pounds) of radiological and mixed waste would be generated annually with about 50 kilograms (110 pounds) of mixed wastes.

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 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 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 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, 2004a).

4.2.14.3 DUF_6 Waste-Management Options

As discussed in Chapter 2 of this Draft 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, 2004a).

Temporary Onsite Storage Impacts

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

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.

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 would be 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) for 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 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 and the proposed NEF. 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 would be a collective dose of 12 person-sieverts (12,000 person-rem) or equivalent to 7 latent cancer fatalities.

If a DUF_6 conversion facility is built adjacent to the proposed NEF site within New Mexico, its water could also come from the Hobbs and Eunice municipal systems. 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. This increase in water use would still be well within the capacity of the local municipal water supply systems. If such a facility were built in nearby Andrews County, Texas, it would use different water suppliers, although the water would still 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 Draft 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 similar building size as the proposed NEF. 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 C 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 2003a). 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 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 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

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

Conversion Product	Annual Waste Stream Portsmouth	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].
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.
Source: DOE, 2004a; DOE, 2004b.

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 4-17 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	$3\times10^{-4} - 4\times10^{-4}$	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	$3\times10^{-4} - 4\times10^{-4}$	$2\times10^{-3} - 3\times10^{-3}$	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.
Source: 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 Chapter 2 of this Draft 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 facilities. Final disposal of large quantities of depleted uranium at a licensed facility could require additional environmental impact evaluations depending on the location of the disposal facility and quantity of depleted uranium to be deposited.

The quantity of depleted uranium potentially requiring disposition could also affect the available disposal volume. However, a June 2004 Government Accounting Office report concluded that there is sufficient disposal volume for currently licensed Class A low-level radioactive wastes that would last for more than 20 years (GAO, 2004). Since U_3O_8 is a Class A low-level radioactive waste, the potential impact on national disposal space that would be incurred due to potential NEF 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 and 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

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}	3×10^{-11}	3×10^{-16}	3×10^{-14}
	Fish Ingestion	2×10^{-12}	2×10^{-10}	5×10^{-11}	5×10^{-9}

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, 2004a). 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 Draft 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 fully decontaminated to free release levels and suitable for use by the general public. Decommissioning activities are generally described in Section 2.1.8 of Chapter 2 of this Draft EIS based

(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.

(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, 2003) Lea County Water Users Association. "Municipal Water Audit Phase I–Building the Foundation." SEC Project No. 302100. Prepared by Smith Engineering Company, Albuquerque, New Mexico. December 2003.

(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. "National Enrichment Facility Environmental Report." Revision 2. NRC Docket No. 70-3103. July 2004.

(LES, 2004b) Louisiana Energy Services. "National Enrichment Facility Safety Analysis Report." Revision 2. NRC Docket No. 70-3103. July 2004.