

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

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**U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
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2.1.9 DUF₆ Disposition Options

At full production, the proposed NEF would generate 7,800 metric tons per year (8,600 tons per year) of DUF₆. Initially, the DUF₆ 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 DUF₆ every year. During the operation of the facility, the plant could generate and store up to 15,727 cylinders of DUF₆. 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.

Classification of DUF₆

The U.S. Department of Energy (DOE) has evaluated a number of alternative and potential beneficial uses for DUF₆ (DOE, 1999b; Brown et al, 1997). However, the current DUF₆ consumption rate is low compared to the existing DUF₆ inventory (DOE, 1999b), and the potential for a significant commercial market for the DUF₆ to be generated by the proposed NEF is considered to be low. The NRC has assumed that the excess DOE and commercial inventory of DUF₆ would be disposed of as waste (NRC, 1995).

For the purpose of this Draft EIS, the NRC considers the DUF₆ generated by the proposed NEF to be a Class A low-level radioactive waste as defined in 10 CFR § 61.55(a)(6).

All DUF₆ would be disposed of before the site is decommissioned (LES, 2004a). This Draft EIS evaluates in detail two DUF₆ disposition options. These options are described in the following subsections, and Chapter 4 discusses their potential environmental impacts. Section 2.2 discusses additional DUF₆ disposition options but, for the reasons discussed in that section, these options are not evaluated in detail.

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

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.

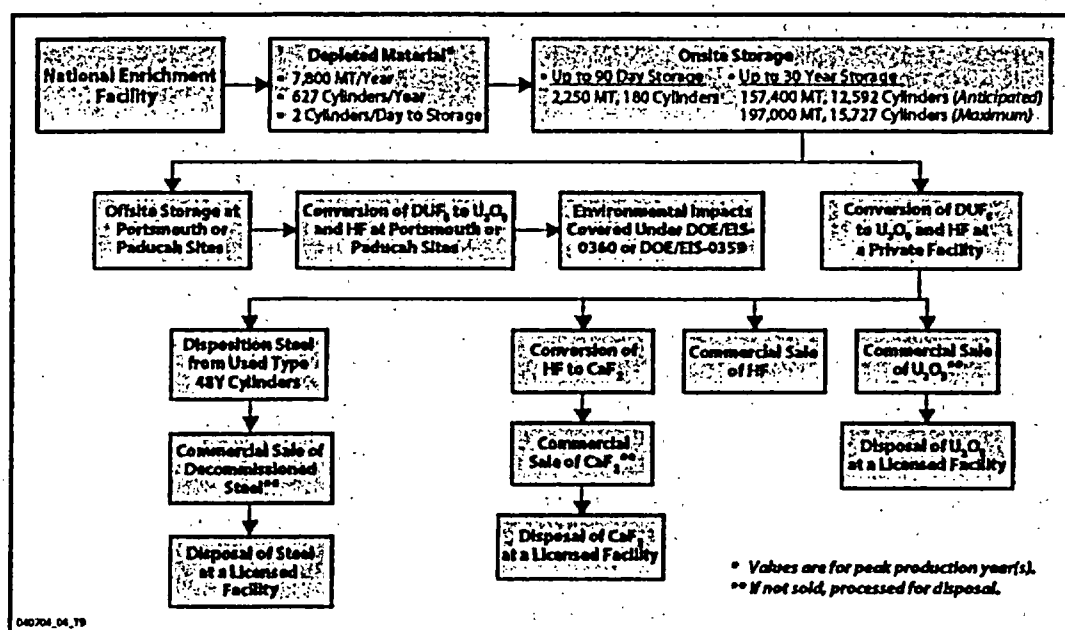


Figure 2-12 Disposal Flow Paths for DUF_6

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).

1 Conversion of UF_6 to U_3O_8 generates
2 hydrogen fluoride gas. This gas is
3 dissolved in water to form hydrofluoric
4 acid which is easier to store and handle
5 than the hydrogen fluoride gas. The
6 hydrofluoric acid could be sold to a
7 commercial hydrofluoric acid supplier for
8 reuse if the radioactive content is below
9 free release limits, or it could be converted
10 to calcium fluoride (CaF_2) for sale or
11 disposal. Because conversion of the large
12 quantities of DUF_6 at the DOE Portsmouth
13 and Paducah Gaseous Diffusion Plant sites
14 would be occurring at the same time the
15 proposed NEF would be in operation, it is
16 not certain that the market for hydrofluoric
17 acid and calcium fluoride would allow for
18 the economic reuse of the material
19 generated by the proposed NEF (DOE,
20 2000a; DOE, 2000b). Therefore, only
21 immediate neutralization of the

22 hydrofluoric acid by conversion to calcium fluoride with disposal at a licensed low-level radioactive
23 waste disposal facility is considered in this analysis. Descriptions of the options are set forth below.
24

25 Option 1: Private Sector Conversion and Disposal

26
27 This disposition option is private sector conversion of the DUF_6 into U_3O_8 and hydrogen fluoride,
28 disposal of the depleted U_3O_8 , and possible commercial sale of the hydrofluoric acid. The conversion
29 could occur within the region of influence of the proposed NEF or at some other site within the United
30 States. Since no company has agreed to construct or operate a conversion facility within the region of
31 influence of the proposed NEF, this Draft EIS considers that the private conversion facility could be
32 located beyond the region of influence of the proposed NEF site (this is known as Option 1a). One
33 potential location for a private conversion facility would be near the ConverDyn UF_6 generation facility
34 in Metropolis, Illinois (LES, 2004a; LES, 2004b).
35

36 No private company has yet agreed to construct or operate a DUF_6 to U_3O_8 conversion facility anywhere
37 in the United States. LES suggested the construction of a DUF_6 to U_3O_8 conversion facility near
38 Metropolis, Illinois. The existing ConverDyn plant at Metropolis, Illinois, converts natural uranium
39 dioxide (UO_2) (yellow cake) from mining and milling operations into UF_4 and UF_6 for feed to enrichment
40 facilities such as the proposed NEF (Converdyn, 2004). Construction of a private DUF_6 to U_3O_8
41 conversion facility near the ConverDyn plant in Metropolis, Illinois, would allow the hydrogen fluoride
42 produced during the DUF_6 to U_3O_8 conversion process to be reused to generate more UF_6 feed material
43 while the U_3O_8 would be shipped for final dispositioning.
44

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.

1 The NRC staff has determined that
2 construction of a private DUF₆ to U₃O₈
3 conversion plant near Metropolis, Illinois,
4 would have similar environmental impacts
5 as construction of an equivalent facility
6 anywhere in the United States. The
7 advantage of selecting the Metropolis,
8 Illinois, location is the proximity of the
9 ConverDyn uranium dioxide to UF₆
10 conversion facility and, for the purposes of
11 assessing impacts, the DOE conversion
12 facility in nearby Paducah, Kentucky, for
13 converting DOE-owned DUF₆ to U₃O₈.
14 Because the proposed private plant would
15 be similar in size and the effective area
16 would be the same as the Paducah
17 conversion plant, the environmental impacts
18 would be similar. DOE has completed an
19 EIS for the Paducah conversion facility
20 which defines the impacts of the proposed
21 DOE conversion facility (DOE, 2004a).

22
23 The DUF₆ would be shipped from the
24 proposed NEF site to the new conversion
25 facility. The hydrofluoric acid produced by
26 the conversion process could be re-used by
27 ConverDyn in its existing hydrofluorination
28 process to convert uranium dioxide
29 ("yellowcake") to UF₆ (Converdyn, 2004).

30 These assumptions bound the potential impacts of DUF₆ disposition. Once converted, U₃O₈ and the
31 associated waste streams would be transported to a licensed low-level radioactive waste disposal facility
32 for final disposition, as discussed below.

33
34 This Draft EIS also considers that the private conversion facility could be located close to the proposed
35 NEF (this is known as Option 1b). This would involve a private sector company constructing and
36 operating a new conversion facility close (within 6.4 kilometers [4 miles]) to the proposed NEF. By
37 constructing and operating a private conversion facility in close proximity to the proposed NEF, the
38 environmental impacts from the private conversion facility would affect the same area as the proposed
39 NEF. Additionally, shipping and conversion of the depleted uranium could be accomplished within days
40 of the filling of the Type 48Y cylinders, which would minimize the amount of DUF₆ stored onsite. The
41 nearby conversion facility would be proportionally sized to meet the annual generation of 7,800 metric
42 tons (8,600 tons) of DUF₆ per year. It is further assumed that the hydrofluoric acid generated at the
43 adjacent conversion facility would not be marketable for reuse due to the large amount that would be
44 available from the DOE conversion plants. The hydrofluoric acid would be converted to calcium fluoride
45 for disposal at a licensed low-level radioactive waste disposal site.
46
47

DUF₆ Conversion Process

DUF₆ conversion is a continuous process in which DUF₆ is vaporized and converted to U₃O₈ 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 U₃O₈ 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).

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.

- 1 • Hanford, located in Hanford, Washington. Hanford accepts waste from the Northwest and Rocky
2 Mountain compacts. Hanford is licensed by the State of Washington to receive Class A, B, and C
3 wastes. New Mexico is a member of the Rocky Mountain compact, therefore, the proposed NEF
4 would be able to ship low-level radioactive waste to Hanford for disposal.
5
- 6 • Envirocare, located in Clive, Utah. Envirocare accepts waste from all regions of the United States.
7 Envirocare is licensed by the State of Utah for Class A waste only. Therefore, Envirocare is a
8 disposal option for radioactive wastes generated at the proposed NEF.
9
- 10 • Nevada Test Site, located in southern Nye County, Nevada. The Nevada Test Site is a DOE disposal
11 site for low-level radioactive waste from the various DOE sites and facilities across the United
12 States. The Nevada Test Site was selected as the secondary disposal site for converted DUF₆
13 material generated at the Paducah, Kentucky, and Portsmouth, Ohio, DUF₆ conversion facilities
14 (DOE, 2004a; DOE, 2004b). Because the Nevada Test Site is a DOE disposal site, it can not receive
15 low-level radioactive wastes directly from private facilities such as the proposed NEF.
16
- 17 • Waste Control Specialists (WCS) disposal facility, located in Andrews County, Texas. The WCS
18 disposal facility is less than 3.2 kilometers (2 miles) east of the proposed NEF site. This facility is
19 currently licensed to dispose of RCRA hazardous waste and to temporarily store, but not dispose of,
20 radioactive material under its current State of Texas Bureau of Radiation Control license L04971
21 (BRC, 2003). WCS recently submitted an application to the State of Texas to allow them to dispose
22 of low-level radioactive waste (WCS, 2004). The application is for two separate facilities, a low-
23 level radioactive waste disposal facility for the Texas Compact and a low-level radioactive waste and
24 mixed low-level radioactive and hazardous waste Federal Waste Disposal Facility. Both the
25 Compact Facility and Federal Waste Disposal Facility would be located within the boundaries of the
26 WCS site in Andrews County, Texas.
27

28 In 1980, Congress passed the "Low-Level Radioactive Waste Policy Act" which requires States to
29 provide for disposal of low-level radioactive waste generated within their own borders. The States of
30 Texas, Maine, and Vermont joined together to form the Texas Compact for disposal of low-level
31 radioactive waste generated by the member States. If the August 2, 2004 application is approved,
32 WCS would become the low-level radioactive waste disposal site for the Texas Compact. As
33 previously stated for the Barnwell site, a disposal site within the Texas Compact can only accept
34 waste generated by the compact member States. Thus, any radioactive wastes generated at the
35 proposed NEF could not be shipped directly to WCS for disposal.
36

37 The Low-Level Radioactive Waste Policy Act also allows for a Federal disposal facility to be co-
38 located. The WCS application includes a request for a Federal Waste Disposal Facility to dispose of
39 both low-level radioactive waste and mixed low-level radioactive and hazardous wastes from federal
40 facilities such as the DOE. If the license application is approved, the WCS facility would be able to
41 dispose of Class A, B, and C low-level radioactive and mixed wastes (WCS, 2004). Thus, the WCS
42 waste disposal facility would be able to accept wastes similar to the waste currently accepted by
43 Hanford, Envirocare, and Nevada Test Site. A Federal Waste Disposal Facility can only accept
44 waste from Federal facilities, thus, the proposed NEF would not be able to ship depleted uranium
45 directly to the proposed WCS facility.
46

47 The disposition of the U₃O₈ generated from the DOE conversion facilities would be at either the
48 Envirocare site near Clive, Utah (the proposed disposition site), or the Nevada Test Site (optional
49 disposal site) (DOE, 2004a; DOE, 2004b). Due to the need for separate regulatory actions to accomplish

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

3 4 **2.2 Alternatives to the Proposed Action**

5
6 This section examines the alternatives considered for the proposed action described in Section 2.1. The
7 range of alternatives was determined by considering the underlying need and purpose for the proposed
8 action. From this analysis, a set of reasonable alternatives was developed and the impacts of the
9 proposed action were compared with the impacts that would result if a given alternative was
10 implemented. These alternatives include:

- 11
- 12 • A no-action alternative under which the proposed NEF would not be constructed.
- 13 • An evaluation of alternative sites for the proposed NEF.
- 14 • A discussion of alternative conversion and disposition methods for DUF_6 .
- 15 • A review of alternative technologies available for uranium enrichment.
- 16 • An evaluation of potential alternative sources of low-enriched uranium.
- 17

18 **2.2.1 No-Action Alternative**

19
20 The no-action alternative would be to not construct, operate, or decommission the proposed NEF in Lea
21 County, New Mexico. The NRC would not approve the license application for the proposed NEF.
22 Under the no-action alternative, the fuel-fabrication facilities in the United States would continue to
23 obtain low-enriched uranium from the currently available sources. Currently, the only domestic source
24 of low-enriched uranium available to fuel fabricators is from production of the Paducah Gaseous
25 Diffusion Plant, the only operating uranium enrichment facility in the United States, and the
26 downblending of highly enriched uranium under the "Megatons to Megawatts" program (USEC, 2003a).
27 Foreign enrichment sources are currently supplying more than 85 percent of the U.S. nuclear power
28 plants demand (EIA, 2004).

29
30 Currently, the "Megatons to Megawatts" program will expire by 2013, potentially eliminating
31 downblending as a source of low-enriched uranium. Opened in 1952, the Paducah Gaseous Diffusion
32 Plant utilizes gaseous diffusion technology (as described in Section 2.2.2.3) which is more energy
33 intensive and requires higher energy consumption. These issues and factors such as new and more
34 efficient enrichment technology (e.g., gas centrifuge) could lead to the eventual closure of the Paducah
35 Gaseous Diffusion Plant. On the other hand, USEC could continue operation of the Paducah Gaseous
36 Diffusion Plant to supply the needed low-enriched uranium.

37
38 Additional domestic enrichment facilities utilizing these more efficient technology in the future could be
39 constructed. In this regard, USEC has announced its intention to construct and operate a uranium
40 enrichment facility (i.e., proposed American Centrifuge Plant to be located near the Portsmouth Gaseous
41 Diffusion Plant) which could supplement domestic and international demands (USEC, 2004a). The
42 proposed American Centrifuge plant would have an initial annual production level of 3.5 million SWU
43 by 2010. If the proposed American Centrifuge Plant begins operations, this would represent a more
44 efficient and less costly means of producing low-enriched uranium.

45
46 At the same time, nuclear-generating capacity within the United States is expected to increase, causing an
47 increase in demand for low-enriched uranium. Given the expected increase in demand and the possible
48 elimination of low-enriched uranium from downblending, along with the uncertainty that any additional

1 for onsite treatment or shipment offsite. Gaseous releases would be minimized, liquid wastes would be
2 kept onsite, and solid wastes would be appropriately packaged and shipped offsite for further processing
3 or final disposition. The impacts from gaseous and liquid effluents are described in Sections 4.2.4, 4.2.6,
4 and 4.2.12. This section presents the onsite and offsite impacts from the management of solid wastes and
5 cites impacts from other *National Environmental Policy Act* (NEPA) assessments when appropriate.

7 The operation of the proposed NEF would generate approximately 172,500 kilograms (380,400 pounds)
8 of solid nonradioactive waste annually, including approximately 1,900 liters (500 gallons) of hazardous
9 liquid wastes (LES, 2004a). Approximately 87,000 kilograms (191,800 pounds) of radiological and
10 mixed waste would be generated annually with about 50 kilograms (110 pounds) of mixed wastes.

12 Solid wastes during operations would be segregated and processed based on whether the material can be
13 classified as wet solid or dry solid wastes and segregated into radioactive, hazardous, or mixed-waste
14 categories. The radioactive solid wastes would be Class A low-level radioactive wastes as defined in 10
15 CFR Part 61, appropriately packaged, and shipped to a commercial licensed low-level radioactive wastes
16 disposal facility or shipped for further processing for volume reduction. The annual volume of
17 nonradioactive solid wastes would be 1,184 cubic meters (1,549 cubic yards) assuming a standard
18 container with a volume of 7.65 cubic meters (10 cubic yards) holds 553 kilograms (0.61 tons) of
19 nonhazardous wastes (NJ, 2004). Nonhazardous wastes would be transported to the Lea County Landfill
20 for disposal. This landfill is expected to have received uncompacted gate receipts of approximately
21 16,000 cubic meters (20,927 cubic yards) per day, or 4,576,000 cubic meters (5,985,182 cubic yards) per
22 year in 2013, according to its permit application that assumes a 10-percent increase in gate receipts per
23 year (LCSWA, 1996). The nonradioactive solid waste generation from the proposed NEF would
24 potentially increase the volume at the landfill by less than 0.03 percent. Therefore, impacts to the Lea
25 County Landfill could be considered accounted for in the assumed 10-percent annual increase in gate
26 receipts previously documented in the landfill's permit application. Based on the quantities of solid
27 wastes and the application of industry-accepted procedures, the impacts from solid wastes would be
28 SMALL.

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

36 4.2.14.3 DUF₆ Waste-Management Options

38 As discussed in Chapter 2 of this Draft EIS, until a conversion facility is available, UBCs (i.e., DUF₆-
39 filled Type 48Y cylinders) would be temporarily stored on the UBC Storage Pad. Storage of UBCs at the
40 proposed NEF could occur for up to 30 years during operations and before removal of DUF₆ from the site
41 through one of the disposition options (see text box *DUF₆ Disposition Options Considered*). However,
42 LES has committed to a disposal path outside of the State of New Mexico which would be utilized as soon
43 as possible and would aggressively pursue economically viable paths for UBCs as soon as they become
44 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 DUF₆ (DNFSB, 1995a; DNFSB, 1995b; DNFSB, 1999). DOE has stored DUF₆ 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 DUF₆ 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 DUF₆ 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 U₃O₈, 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

DUF₆ 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 U₃O₈, 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 DUF₆ onsite by allowing for ship-as-you-generate waste management of the converted U₃O₈ and associated conversion byproducts (i.e., CaF₂). 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.

1 Type 48Y cylinders, and Section 4.2.11 summarizes the impacts. The selected routes would be from
2 Eunice, New Mexico, to Metropolis, Illinois.

3
4 If the private conversion facility cannot immediately process the Type 48Y cylinders upon arrival,
5 potential impacts would include radiological impacts proportional to the time of temporary storage at the
6 conversion facility. The DOE has previously assessed the impacts of temporary storage during the
7 operation of a DUF₆ conversion facility (DOE, 2004a; DOE, 2004b). The proposed action is not expected
8 to change the impacts of temporary storage of Type 48Y cylinders at the conversion facility site from that
9 previously considered in these DOE conversion facility Final EISs. Therefore, the NRC staff has
10 concluded that the environmental impacts of temporary storage at the private conversion facility are
11 bounded by the environmental impacts previously evaluated in the DOE conversion facility Final EISs.
12 At the Paducah and Portsmouth conversion facilities, the maximum collective dose to a worker would be
13 0.055 person-sieverts (5.5 person-rem) per year and 0.03 person-sieverts (3 person-rem) per year,
14 respectively. There would be no exposure to noninvolved workers or the public because air emissions
15 from the cylinder preparation and maintenance activities would be negligible (DOE, 2004a; DOE, 2004b).

16
17 Because Metropolis, Illinois, lies just across the Ohio River from the Paducah conversion facility site
18 (within 6.4 kilometer [4 miles]), if a private conversion facility is built at Metropolis, Illinois, then the
19 public and occupational health impacts from this conversion facility would be bounded by the impacts
20 from the Paducah conversion facility because both conversion facilities would be located in the same area
21 and would be approximately the same size. In addition, other impacts to resources such as land use,
22 historic and cultural, visual, air quality, geology, water quality, ecology, noise, and waste management,
23 would be similar to the Paducah conversion facility. Therefore, the NRC staff considers the impacts for
24 these resources from the construction and operation of a conversion facility at Metropolis, Illinois, to be
25 bounded by the impacts previously considered in the Paducah conversion facility Final EIS (DOE, 2004a).
26 Because the impacts to resources discussed above and the health impacts are within regulatory
27 requirements, the impacts from the private conversion facility would be SMALL.

28 29 Option 1b: Adjacent Private Conversion Facility Impacts

30
31 The conversion facility could be constructed adjacent to the proposed NEF. For the purposes of analyzing
32 impacts, "adjacent" is defined as being within at least 6.4 kilometers (4 miles) of the proposed NEF.
33 Although no adjacent conversion facility site has been identified, there would be advantages (i.e.,
34 transportation and speed of processing) for having a conversion facility adjacent to the proposed NEF.
35 With an adjacent conversion facility, transfer and conversion could be completed within days of the filling
36 of the Type 48Y cylinder, thus minimizing the amount of DUF₆ onsite. Once the waste was converted to
37 U₃O₈, depleted uranium and the associated waste streams would subsequently be transported to a licensed
38 disposal facility for final disposition. Such immediate waste-management action would allow for no
39 buildup of DUF₆ wastes at the proposed NEF and would remove the impacts and risks associated with the
40 temporary storage of UBCs at the proposed NEF and the potential conversion facility.

41
42 Because the operations would be the same as the DOE conversion facilities, the environmental impacts
43 from normal operations of an adjacent conversion facility would be representative of the impacts of the
44 DOE facilities and the proposed NEF. Therefore, the maximum occupational and member of the public
45 annual exposures would be approximately 6.9 millisieverts (690 millirem) and 5.3×10^{-3} millisieverts
46 (5.3×10^{-3} millirem), respectively. The impacts due to accidents would be bounded by the proposed NEF's
47 highest accident consequence—the hydraulic rupture of a UF₆ cylinder. This maximum accident impact
48 would be a collective dose of 12 person-sieverts (12,000 person-rem) or equivalent to 7 latent cancer
49 fatalities.

1 If a DUF₆ conversion facility is built adjacent to the proposed NEF site within New Mexico, its water
2 could also come from the Hobbs and Eunice municipal systems. Based on water use at the existing
3 conversion facility at Portsmouth, Ohio (DOE, 2004b), and allowing for the decreased throughput of a
4 facility built to handle only the proposed NEF's output, such a facility's operational water needs could be
5 approximately 200 cubic meters per day (19 million gallons per year), approximately 82 percent of the
6 water use of the proposed NEF. This increase in water use would still be well within the capacity of the
7 local municipal water supply systems. If such a facility were built in nearby Andrews County, Texas, it
8 would use different water suppliers, although the water would still be withdrawn from the Ogallala
9 Aquifer. Therefore, the water resource impacts would be SMALL.

10
11 Other impacts to resources such as land use, historic and cultural, visual and scenic, geology, ecology,
12 socioeconomics, and environmental justice would be similar to the proposed NEF because they would be
13 located in the same area and would be approximately the same size. Therefore, the NRC staff considers
14 the impacts for these resources from the construction and operation of an adjacent conversion facility to
15 be bounded by the impacts considered in this Draft EIS for the proposed NEF. Based on the description
16 and design parameters of the Portsmouth DOE conversion facility, the adjacent conversion facility would
17 likely affect a similar area of land, employ a similar number of workers, and similar building size as the
18 proposed NEF. Due to similar construction methods and design, impacts to resources at the adjacent
19 conversion facility, such as air quality, water quality, noise, and waste management, would be similar to
20 the Portsmouth conversion facility (DOE, 2004b). Because the radiological impacts are within regulatory
21 requirements, the impacts from an adjacent conversion facility would be SMALL.

22 23 Option 2: DOE Conversion Facilities Impacts

24
25 Under option 2, the Type 48Y cylinders would be transported from the proposed NEF to either of the
26 DOE's conversion facilities (Paducah, Kentucky, or Portsmouth, Ohio). After being converted to U₃O₈,
27 the waste would be further transported to a licensed disposal facility. The transportation of the Type 48Y
28 cylinders from the proposed NEF to the conversion facility would have environmental impacts. Appendix
29 C provides the transportation impact analysis of shipping the Type 48Y cylinders, and Section 4.2.11
30 summarizes the impacts. The selected routes are from Eunice, New Mexico, to Paducah, Kentucky, and
31 Portsmouth, Ohio.

32
33 If the DOE conversion facility could not immediately process the UBCs upon arrival, potential impacts
34 would include radiological impacts proportional to the time of temporary storage at the conversion
35 facility. The DOE has previously assessed the impacts of UBC storage during the operation of a DUF₆
36 conversion facility (DOE, 2004a; DOE, 2004b) and bound the impacts of temporary storage of LES's
37 UBCs at the conversion facility site. At the Paducah and Portsmouth conversion facilities, the maximum
38 collective dose to a worker (i.e., a worker at the cylinder yard) would be 0.055 person-sieverts (5.5
39 person-rem) per year and 0.03 person-sieverts (3 person-rem) per year, respectively. There would be no
40 exposure to noninvolved workers or the public because air emissions from the cylinder preparation and
41 maintenance activities would be negligible (DOE, 2004a; DOE, 2004b).

42
43 To assess the impacts of the proposed NEF generated DUF₆ on the DOE's conversion facilities, one must
44 understand the relative amount of additional material as compared to the DOE's existing DUF₆ inventory.
45 The Paducah conversion facility would operate for approximately 25 years beginning in 2006 to process
46 436,400 metric tons (481,000 tons) (DOE, 2004a). The Portsmouth conversion facility would operate for
47 18 years also beginning in 2006 to process 243,000 metric tons (268,000 tons) (DOE, 2004b). Based on
48 the projected maximum amount of DUF₆ generated by the proposed NEF (197,000 metric tons [217,000
49 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 DUF₆ 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 DUF₆ 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 DUF₆ 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 DUF₆ originating at

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 ₃ O 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 ^c .
CaF ₂	18 MT (20 tons)	24 MT (26 tons)	Similar to depleted U ₃ O 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 U₃O₈ 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 U₃O₈ disposal containers.

^c For DUF₆ 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 DUF₆ from the proposed NEF at an offsite location such as Portsmouth or Paducah. The additional impacts for converting the proposed NEF DUF₆ at these conversion facilities would be SMALL.

Table 4-17 Radiological Impacts from an Offsite DUF₆ Conversion Facility During Normal Operations

		Occupational		Members of the Public	
		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)
Radiation Doses					
Portsmouth Conversion Facility		0.75 (75)	0.101 (10.1)	$<2.1 \times 10^{-7}$ ($<2.1 \times 10^{-5}$)	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)	$<3.9 \times 10^{-7}$ ($<3.9 \times 10^{-5}$)	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^{-3}
Portsmouth Cylinder Yard		$3 \times 10^{-4} - 4 \times 10^{-4}$	2×10^{-3}	N/A	N/A
Paducah Conversion Facility		5×10^{-5}	6×10^{-3}	2×10^{-11}	3×10^{-3}
Paducah Cylinder Yard		$3 \times 10^{-4} - 4 \times 10^{-4}$	$2 \times 10^{-3} - 3 \times 10^{-3}$	N/A	N/A

^a DOE risk values adjusted for a conversion factor of 6×10^{-4} LCF per person-rem.

LCF - latent cancer fatalities; Sv - sieverts; mSv - millisieverts; mrem - millirem; MEI - maximally exposed individual.

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

Table 4-18 Radiological Impacts from an Offsite DUF₆ Conversion Facility Under Accident Conditions

Accident	Frequency (per year)	Onsite Worker		Members of the Public	
		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	$>1.0 \times 10^{-2}$	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 ₃ O ₈ Container While in Transit	$>1.0 \times 10^{-2}$	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 U₃O₈, 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 U₃O₈ 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 DUF₆ 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

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