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# EA - May 25, 1995

ENVIRONMENTAL ASSESSMENT FOR THE DISPOSITION OF  
HIGHLY ENRICHED URANIUM FROM THE REPUBLIC OF KAZAKHSTAN

May 25, 1995

Section 1: INTRODUCTION

## 1.1 BACKGROUND

On September 27, 1993, President Clinton announced a policy to prevent the proliferation of weapons of mass destruction. The President mandated in the Nonproliferation and Export Control Policy (Appendix A) that the United States would:

- \* Seek to eliminate, where possible, the accumulation of stockpiles of highly enriched uranium (HEU); and
- \* Pursue the purchase of HEU from the former Soviet Union and other countries and its conversion to peaceful use as reactor fuel.

The Department of Energy (DOE) is the Federal agency responsible for the management, storage, and disposition of weapons-usable fissile materials, including HEU. In November 1994, DOE acquired approximately 600 kilograms (kg) of HEU from the former Soviet Republic of Kazakhstan. This purchase was conducted as a classified operation under the code

name "Project Sapphire." A classified Environmental Assessment (EA) was prepared to assess the potential environmental impacts associated with the transportation of Project Sapphire material from Kazakhstan to DOE's Oak Ridge Reservation (ORR) Y-12 Plant for interim storage (DOE/EA 1006). DOE issued a classified Finding of No Significant Impact (FONSI) in October 1994, and the Kazakhstan-origin HEU is currently in safe secure interim storage at the Y-12 Plant. Versions of those documents with the classified material deleted are currently available to the public.

The Department now proposes to convert the Kazakhstan-origin HEU to a material that cannot be used directly for nuclear weapons. DOE proposes to accomplish this by blending the HEU with a low-enriched uranium (LEU) blending stock to produce LEU in the form of uranyl nitrate that can be used to fabricate commercial nuclear reactor fuel.

The Energy Policy Act of 1992 established the United States Enrichment Corporation (USEC) as a wholly-owned Government corporation responsible for the United States' uranium enrichment activities. In accordance with these responsibilities, USEC is obtaining the blending services associated with the Proposed Action on the behalf of DOE. After the HEU has been blended to LEU in the form of uranyl nitrate, USEC also would act on the behalf of DOE in the sale of that material.

On February 7, 1995, USEC issued a Request for Proposal to obtain the required blending services to the only two commercial facilities in the United States capable of providing these services: the Babcock & Wilcox facility in Lynchburg, Virginia (B&W Lynchburg) and the Nuclear Fuel Services, Inc. facility in Erwin, Tennessee (NFS Erwin). USEC received proposals from both contractors and is currently evaluating them in preparation of making a blending contractor selection. Both B&W

Lynchburg and NFS Erwin have indicated that they would likely enter negotiations with General Electric's Nuclear Energy Production facility in Wilmington, North Carolina (GE Wilmington) to provide blending stock conversion services associated with the Proposed Action. Therefore, this EA considers two blending site options, B&W Lynchburg and NFS Erwin, and one representative blending stock conversion facility, GE Wilmington.

In addition to the two commercial blending sites considered in this EA, there are two DOE sites that could be capable of performing the required blending services: the Y-12 Plant and the Savannah River Site near Aiken, South Carolina (SRS).

The Y-12 Plant nuclear operations are currently shut down, and the facilities that would be required to process the Kazakhstan-origin HEU are not expected to be returned to service until late 1996 or early 1997.

The facilities at SRS that would have the capability to process the Kazakhstan-origin HEU would be the F-Canyon or the H-Canyon. The F Canyon is only partially operational at this time, and even when fully operational can only process LEU with enrichments of one percent or less. The H-Canyon is capable of processing all forms and enrichments of uranium, but would not be available until September 1997, at the earliest. Under the Proposed Action, the shipments of the HEU and blending stock would commence by June 1995, and it is anticipated that the Proposed Action would be completed within one year. Therefore, neither the Y-12 Plant nor SRS would be capable of providing the blending services associated with the Proposed Action in a timely manner and are not considered in this EA.

In evaluating alternatives for the disposition of the Kazakhstan-origin HEU, DOE considered the following options: blending the material down

to LEU with less than 20 percent but greater than four percent enrichment and storing the LEU for potential future use; and blending the material down to waste with an enrichment of less than one percent. The option of blending to less than 20 percent but greater than four percent enrichment would require the continued storage of the LEU until a use was determined. Further blending would be required for use in commercial nuclear reactor fuel if that disposition method were chosen. Disposal of this material as waste at this enrichment level (less than 20 percent but greater than four percent) may involve criticality concerns that would need to be accommodated. The impacts from the initial blending would likely be similar to the impacts associated with the Proposed Action. Non-radiological transportation impacts would likely be slightly smaller than those associated with the Proposed Action, given the smaller quantity of blending stock and resulting LEU, with no fatalities occurring under accident-free conditions.

The option of blending to less than one percent enrichment and return to DOE jurisdiction for disposal as waste would require transportation, storage (until disposal), and disposal of an even larger quantity of material. The impacts from the initial blending would likely be similar to, but slightly greater than, the impacts associated with the Proposed Action given the larger quantity of blending stock and resulting LEU. Non-radiological transportation impacts would likely be greater than those associated with the Proposed Action, but with no fatalities occurring under accident-free conditions. Storage and disposal costs would be the responsibility of the government since the material would not be sold to a commercial vendor. Indirect impacts associated with further processing of the uranyl nitrate into, and eventual use as, commercial nuclear reactor fuel (including impacts associated with spent nuclear fuel) would not occur. However, by not using the material in commercial nuclear reactor fuel, new material may have to be mined, milled, fluorinated, and enriched to produce an equivalent amount of

commercial nuclear reactor fuel. The creation of this new fuel material would likely have a more substantial impact on the environment than LEU blended from HEU as a result of the greater degree of processing and transportation required and the creation of mill tails. Neither of these alternatives would convert the Kazakhstan-origin HEU to peaceful use as commercial nuclear reactor fuel. Accordingly, the more reasonable and effective means of disposing of the Kazakhstan-origin HEU would be to blend it to LEU for use in commercial nuclear reactor fuel consistent with the President's Nonproliferation Policy.

A detailed cost-benefit analysis for the blending of this HEU was not prepared for this EA nor required under the National Environmental Policy Act (NEPA). However, DOE did consider the economic differences between blending the material for use in commercial nuclear reactor fuel versus blending it to less than one percent enrichment. The blending of this HEU to less than one percent enrichment would result in a net cost to the government, while blending the material to LEU for use in commercial nuclear reactor fuel would generate revenue to offset the cost of the purchase and blending of the HEU. Use in commercial nuclear reactor fuel would also avoid the need to produce an equivalent amount of new material and the environmental impacts associated with the mining, processing and transportation of this material and the disposal of mill tails.

This EA assesses the potential environmental impacts associated with DOE's Proposed Action. The Proposed Action includes:

- \* Transportation of approximately 600 kg of Kazakhstan-origin HEU from the Y-12 Plant to the blending site (B&W Lynchburg or NFS Erwin);
- \* Transportation of low-enriched uranium hexafluoride (UF<sub>6</sub>) blending stock from either USEC's Paducah Gaseous Diffusion Plant in Kentucky (USEC Paducah) or USEC's Portsmouth Gaseous Diffusion Plant in Ohio

(USEC Portsmouth) to GE Wilmington for conversion into low-enriched uranium oxide blending stock;

\* Transportation of the uranium oxide blending stock to the blending site;

\* Blending of the HEU and uranium oxide blending stock to produce LEU in the form of uranyl nitrate; and

\* Transportation of the uranyl nitrate from the blending site to USEC Portsmouth.

The Proposed Action is presented in Figure 1.1-1. Figure 1.1-2 shows the location of the sites involved in the Proposed Action.

A Preapproval Copy of this EA was distributed to representatives of the affected states and Native American Tribes, and other groups and individuals, in April 1995, for review and comment. Appendix B contains a list of the commentors, a summary of their comments, and DOE's responses to these comments. Based on these comments, a number of changes have been made throughout the document to improve its clarity, completeness, and accuracy. Appendix B also explains the modifications made to this EA in response to these comments.

## 1.2 KEY ISSUES ADDRESSED

This EA addresses three key issues related to the Proposed Action: impacts associated with the transportation of the Kazakhstan-origin HEU, blending stock, and uranyl nitrate; impacts associated with the conversion of the UF<sub>6</sub> blending stock to uranium oxide blending stock; and impacts associated with the blending of the Kazakhstan-origin HEU and uranium oxide blending stock, including the scope of the blending

sites' current Nuclear Regulatory Commission (NRC) licenses regarding the receipt and blending of these materials and the handling and disposal of associated wastes. The discussion of the licensing issues specifically considers the beryllium and plutonium constituents of the Kazakhstan-origin HEU. A summary of the constituents of the Kazakhstan origin HEU is included in Appendix C.

This EA also addresses potential environmental impacts with respect to environmental justice issues. On February 11, 1994, President Clinton signed Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." The order requires each Federal agency to make environmental justice part of its mission by identifying and addressing, as appropriate, "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations."

The Environmental Protection Agency (EPA) has convened an interagency working group to assist in providing guidance on the implementation of the Executive Order. In coordination with the working group, DOE is also in the process of developing implementation guidance. Because this guidance will describe the extent to which environmental justice issues should be included in an EA, the approach taken in this EA may differ somewhat from the guidance that is eventually issued and from the approach taken in subsequent EAs.

This EA does not analyze in detail the potential impacts to biotic resources, cultural resources, geologic resources, or socioeconomics except where these resources may be affected during the transportation of nuclear materials. The analysis of impacts to water resources is based on an evaluation of existing environmental documentation. Below are brief descriptions of why a detailed analysis of potential impacts is not necessary for these resources.

\* Biotic, Cultural, and Geologic Resources: The Proposed Action does not involve any construction or other ground-disturbing activities, such as grading, that could potentially impact any biotic, archaeological, or cultural resources. No habitat would be altered or removed from natural productivity as a result of the Proposed Action. Additionally, no structures would be built which could either impact or be impacted by geologic conditions, such as faulting, or by expansive or erosive soils.

\* Socioeconomics: The Proposed Action would not substantially modify the number of workers or the regional population at any location, although a small number of additional workers would potentially be employed at some locations as a result of the Proposed Action.

\* Water Resources: Except as discussed in Section 4.3, the Proposed Action would not require any additional withdrawals from or discharges to surface water or groundwater other than negligible potable water withdrawals and sanitary discharges. Section 4.3 considers the potential impacts to water resources associated with the Proposed Action with respect to the blending sites' current environmental permits.

This EA does not analyze potential indirect impacts (including transportation impacts) associated with either further processing of the uranyl nitrate into commercial nuclear reactor fuel or use in commercial nuclear reactors to furnish electrical power. Following blending, this material would be made available and provided to fuel fabricators for use in fabricating commercial nuclear reactor fuel. Currently, there are five potential domestic commercial facilities that could process the uranyl nitrate into commercial nuclear reactor fuel, and 109 domestic commercial electrical power nuclear reactors that could eventually use the commercial nuclear reactor fuel. There are also foreign processing facilities and commercial nuclear reactors. The exact allocation and

site-specific location and timing of the eventual processing and commercial nuclear reactor use is not known at this time, has not been specifically proposed, and would be contingent upon the needs and specifications of the potential customers for the fuel. Therefore, such indirect impacts would be conjectural, and not subject to meaningful NEPA analysis. In this regard, potential domestic processing facilities and commercial nuclear reactors would be subject to NRC-licensing requirements and appropriate NEPA documentation associated with the licenses. The domestic spent fuel would be stored, and potentially disposed of, in a repository or other alternative, pursuant to the Nuclear Waste Policy Act as amended (42 U.S.C. 10101 et seq.). DOE is in the process of characterizing and will prepare an Environmental Impact Statement (EIS) concerning the potential use of the Yucca Mountain Site as a repository.

### 1.3 REGULATORY REQUIREMENTS

The Proposed Action involves transporting nuclear materials between a DOE site, USEC sites, and sites that are regulated by the NRC. Accordingly, this EA considers a number of environmental statutes and requirements, including the following:

- \* The National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4321 et seq.);
- \* The Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] 1500-1508);
- \* DOE's NEPA Implementing Procedures (10 CFR 1021); and
- \* NRC's Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions (10 CFR 51).

Appendix D provides a detailed listing of related regulatory issues and authorizing agencies.

#### 1.4 RELATIONSHIP TO OTHER DOE NEPA ACTIONS

On June 21, 1994, DOE published a Notice of Intent (NOI) in the Federal Register (59 FR 31985) to prepare the Long-Term Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement (PEIS). (Weapons-usable fissile materials consist primarily of HEU and plutonium.) The purpose of the NOI was to inform the public of the PEIS proposal, solicit public input, and announce that public scoping would be conducted through October 1994. In the course of the public scoping process and through subsequent meetings with the public and industry on HEU disposition, DOE concluded that it would be appropriate to analyze the environmental impacts of the disposition of HEU separately from the analysis of plutonium disposition options. In accordance with this conclusion, DOE announced in the Federal Register (60 FR 17344) on April 5, 1995, its plans to prepare an EIS to evaluate alternatives for the disposition of the United States' HEU declared surplus to national defense needs by the President.

The Kazakhstan-origin HEU is not part of the United States-origin stockpiles and was obtained through a separate action. The disposition of this material is not connected to the action to be analyzed in the EIS, and this EA can proceed independently of the EIS. The disposition of the Kazakhstan-origin HEU is a high-priority action related to international goals and arrangements between the United States and the Republic of Kazakhstan. It involves a small quantity of HEU that is of foreign origin and must be completed as expeditiously as possible in order to strengthen international relations and non-proliferation goals, encourage future cooperation, and minimize security concerns.

When the United States acquired this HEU from the Republic of Kazakhstan in consultation with the Russian Federation, the unified purpose of our governments was to prevent this material from falling into the hands of those that might want to use it for nuclear weapons. Central to this course of action is the need to assure trust and confidence among our governments that these weapons-usable fissile materials would not be used in the United States nuclear arsenal. Therefore, it is important to blend the Kazakhstan-origin HEU to LEU as promptly as possible to demonstrate to other nations, especially the republics of the former Soviet Union, that the United States has converted the material to a form that cannot be used for nuclear weapons. In this manner, the United States hopes to encourage other nations to reduce their stockpiles of weapons-usable fissile materials and advance global nonproliferation goals.

The Proposed Action analyzed in this EA for the Kazakhstan-origin HEU would not affect or trigger decisions to be made pursuant to the EIS for the disposition of United States-origin surplus HEU, is not a part of the larger United States-origin surplus HEU action, involves different reasonable alternatives, and can proceed regardless of any action eventually taken concerning the United States-origin surplus HEU. The Proposed Action is independently justified by, among other things, the need to demonstrate to other nations the United States' commitment to remove weapons-usable fissile materials from the world's stockpiles and convert these materials to peaceful use as quickly as possible.

## Section 2: PURPOSE AND NEED

The purpose is to blend the Kazakhstan-origin HEU to LEU in the form of uranyl nitrate that cannot be used directly for nuclear weapons but that can be used to fabricate commercial nuclear reactor fuel.

The need is to:

- \* Meet the objectives of the President's Nonproliferation and Export Control Policy, including the conversion of the HEU to peaceful use in commercial nuclear reactor fuel (Appendix A);
- \* Meet the goals of the President and the Secretary of Energy to commence with the blending of the Kazakhstan-origin HEU within six to nine months of its arrival in the United States (Appendix E);
- \* Follow through on the United States' commitment to remove the proliferation potential of the Kazakhstan-origin HEU;
- \* Remove the accountability and security concerns regarding these weapons-usable fissile materials as quickly as possible rather than depend upon continued storage;
- \* Demonstrate the ability of the United States to perform this type of operation in order to create an environment where other nations would seek to enlist our aid in removing similar weapons-usable fissile materials from the world's stockpiles;
- \* Provide an example to other nations of the United States' commitment to remove weapons-usable fissile materials from the world's stockpiles;
- \* Encourage other nations to take similar actions towards reducing the world's stockpiles of weapons-usable fissile materials; and
- \* Meet all of these needs in the most expeditious and economical manner possible, and in a manner that allows for the peaceful, economical, and beneficial use of the material.

### Section 3: PROPOSED ACTION

#### 3.1 THE PROPOSED ACTION

The Proposed Action, as detailed in Section 1.1, is to transport approximately 600 kg of Kazakhstan-origin HEU from the Y-12 Plant to the blending site; transport approximately 30 metric tons of UF<sub>6</sub> blending stock (LEU) from either USEC Paducah or USEC Portsmouth to GE Wilmington for conversion into uranium oxide blending stock (LEU); transport approximately 24 metric tons of uranium oxide blending stock from GE Wilmington to the blending site; blend the HEU with the uranium oxide blending stock to produce LEU in the form of uranyl nitrate; and transport approximately 43 metric tons of uranyl nitrate to USEC Portsmouth. This EA assesses the potential environmental impacts associated with the Proposed Action for two alternative blending sites, B&W Lynchburg and NFS Erwin.

Under the Proposed Action, the shipments of HEU and blending stock would commence by June 1995. It is anticipated that the Proposed Action would be completed within one year after the shipments commence.

#### 3.2 NO ACTION

The no action alternative is to leave the Kazakhstan-origin HEU in safe secure storage at the Y-12 Plant. The following activities would not occur: transportation of the HEU, blending stock, and uranyl nitrate; conversion of the blending stock from UF<sub>6</sub> to uranium oxide; and blending of the HEU and blending stock to LEU in the form of uranyl nitrate.

Indirect impacts associated with the following would not occur: transportation of the uranyl nitrate to a fuel fabricator; fuel fabrication; transportation of the fuel to commercial nuclear reactors; use of this fuel to generate power; and the generation and disposal of spent nuclear fuel. The HEU would remain in a form that could be used

for nuclear weapons and could not be used to fabricate commercial nuclear reactor fuel without further processing.

The no action alternative would not meet the goals of the Nonproliferation and Export Control Policy, would not follow through on the United States' commitment to remove the proliferation potential of the Kazakhstan-origin HEU, and would not meet the other aspects of the Purpose and Need.

#### Section 4: ENVIRONMENTAL IMPACTS

##### 4.1 INTRODUCTION

The six sites involved in the Proposed Action are: DOE's Y-12 Plant, Oak Ridge, Tennessee; B&W Lynchburg, Virginia; NFS Erwin, Tennessee; USEC Paducah, Kentucky; USEC Portsmouth, Ohio; and GE Wilmington, North Carolina (Figure 1.1-2). Appendix F provides a brief description of the affected environment at each site, and Section 5 provides a list of reference documents which contain additional environmental information about each of these sites. This section presents an analysis of the potential environmental impacts associated with the Proposed Action.

This section includes an analysis of the loading, transportation, and unloading of the Kazakhstan-origin HEU, UF<sub>6</sub> and uranium oxide blending stock, and uranyl nitrate. Also included is a discussion of the potential environmental impacts associated with the conversion of the UF<sub>6</sub> blending stock to uranium oxide blending stock, the blending of the Kazakhstan-origin HEU and uranium oxide blending stock, the receipt and interim storage of these materials, and the handling and disposal of associated wastes.

##### 4.2 METHODOLOGY

#### 4.2.1 Transportation Risk Analysis Methodology

For each of the radioactive materials involved, the radiological risk analyses were performed using the RADTRAN 4 computer code developed and maintained by Sandia National Laboratories, New Mexico. Health effects were estimated on a per shipment (truckload) basis for each material for the routes between each of the sites. The analysis considered the following elements: mode; weight of material; curies; proximity dose rates (transport index); type of packaging; and potentially affected population. Transportation health risks were estimated for accident radiological dose rates, normal (accident-free) transportation radiological dose rates, and nonradiological air pollution and accident impacts (i.e., highway fatalities). Appendix G presents a summary of the RADTRAN transportation risk analysis methodology.

For transportation, the HEU would be placed in DOE-approved and NRC certified packaging and transported in DOE-owned and -operated safe secure trailers (SST). The UF<sub>6</sub> and uranium oxide blending stock and the uranyl nitrate would be placed in approved packaging and transported by commercial carrier.

Although DOE has experienced traffic accidents related to the intersite transportation of radioactive materials, there has never been a traffic accident involving the release of radioactive materials. DOE's hazardous material (radioactive and nonradioactive) shipments are small compared to the large shipment volume from non-DOE hazardous material transport activities. The Department of Transportation (DOT) estimates that approximately 4 billion tons of regulated hazardous materials are transported each year and that approximately 500,000 movements of hazardous materials occur each day. There are also approximately 2 million annual shipments of radioactive materials involving about 2.8 million packages, which represents about two percent of the annual

hazardous materials shipments. Most radioactive shipments involve small or moderate quantities of material in relatively small packages. In comparison, DOE ships about 6,200 radioactive packages (commercial and classified) annually among its sites. DOE's annual shipments of radioactive packages represents less than 0.3 percent of all radioactive shipments in the United States, and less than 0.006 percent of all hazardous material shipments. The volume of radioactive shipments associated with the Proposed Action would be small, as explained later in the EA, although the radioactivity of the HEU shipments to the blending site may exceed the radioactivity of non-DOE shipments typically transported by the private, non-government sector.

DOE's unclassified radioactive and other hazardous materials are transported by commercial carrier (truck, rail, and/or air carriers). Special nuclear material, such as the HEU included in this assessment, is transported by DOE-owned and -operated SSTs. The SSTs are vehicles designed specifically for the safety and security of the cargo. These special nuclear materials receive continual surveillance and accountability by DOE's Transportation Safeguards Division in Albuquerque, New Mexico. Shipments by SST are accompanied by armed guards and are monitored by a tracking system. Appendix H presents a summary of a general assessment of transport by SST.

Approved packaging refers to a container and all accompanying components or materials necessary to perform its containment function. Packagings used by DOE for radioactive and hazardous materials shipments are either certified to meet specific performance requirements or built to specifications described in the DOT hazardous materials regulations (49 CFR 100-199). For relatively low-level radioactive materials, DOT Specification Type A packagings are used. These packagings are designed to retain their contents under normal transportation conditions. Type A fissile packaging would be used for the transportation of the uranium oxide blending stock and uranyl nitrate shipments by commercial carrier.

More sensitive radioactive materials shipments, including HEU and UF<sub>6</sub>, require the use of Type B packaging, which is designed to prevent the release of contents under all credible transportation accident conditions.

A stainless steel model 6M, Type B packaging, which resembles a 55 gallon drum, would be used for the transportation of HEU from the Y-12 Plant to the blending site in SSTs. A description of the test sequence performed prior to safety certification for 6M, Type B packaging is included in Appendix I. Appendix J, Figure J.1-1 presents a graphic depicting a typical assembly for 6M, Type B packaging. The UF<sub>6</sub> blending stock would be shipped in NRC-certified, Type B packagings (overpacks) as shown in Appendix J, Figure J.1-2. Historically, the use of Type B packaging has demonstrated that an accidental release of radioactive material is extremely unlikely.

Radiological doses to crew members, workers, and the general public were calculated for each transportation route and for the corresponding loading and unloading operations.

#### 4.2.2 Additional Environmental Analysis Methodology

In addition to the analysis of potential transportation-related impacts, this section also addresses potential impacts associated with the interim storage, conversion, and blending of the materials involved in the Proposed Action and the handling and disposal of associated wastes. This analysis is based on the review of current environmental and other documentation from the sites involved in the Proposed Action. The analysis focuses on the ability of the sites to receive, store, convert, and blend the materials involved and to handle and dispose of any waste associated with these operations. Documentation reviewed include current NRC licensing NEPA documents, DOE site-specific NEPA documents,

NRC licenses, safety documentation, and other applicable environmental documents. Section 5 includes a list of the documents referenced in this EA.

#### 4.3 IMPACTS

##### 4.3.1 Impacts from HEU Loading at the Y-12 Plant

The shipments of Kazakhstan-origin HEU would consist of 1,299 "cans" (similar in size to one-gallon or smaller paint cans) containing HEU oxide, uranium-beryllium alloy rods, uranium-beryllium oxide rods, uranium-beryllium oxide scrap in chunks and powder, HEU graphite, and assay samples (Appendix C). The HEU is currently stored in 6M, Type B packagings at the Y-12 Plant and would be shipped to the blending site in its current packagings. The complete packagings consist of the HEU cans in Type 2R inner-containers (a containment barrier) with the 2R inner-containers in 6M, Type B packagings (Appendix J, Figure J.1-1). Up to three cans are placed in each 6M, Type B packaging.

Eight 6M, Type B packagings would be placed in a cargo restraint transporter (CRT), which palletizes the cargo and constrains it during transport. A graphic depicting a typical CRT loaded with 6M, Type B packagings is shown in Appendix J, Figure J.1-3. Each SST would carry up to six CRTs.

The HEU would be removed from storage, loaded on SSTs at the storage facility, and transported off of the Y-12 Plant site. There would be no other onsite transportation; therefore, onsite risks would be limited to loading operations. Onsite over-the-road risks are included in the analysis of the SST transportation to the blending site.

The potential health risks associated with the loading of SSTs at the Y-12 Plant are based on the following criteria and assumptions:

\* There would be approximately 600 kg of HEU material to be transported in up to six CRTs per SST, or about 56 CRTs in total (this is rounded up to 60 CRTs for calculation purposes).

\* Three SSTs would be required for each of four shipments. This requirement is due primarily to safeguard and security concerns in multiple SST shipments. Accordingly, 12 SST shipments would be required for the transportation of all of the HEU.

\* The HEU would be transferred directly from storage into the SSTs within the Y-12 Plant's "Protected Area."

\* It would take about eight hours to prepare and stage the HEU for each SST load. This includes the preparation of documentation, radiation surveys, and actual loading. Most of the transportation-related radiation exposure would occur during the 15 minutes it would take for two cargo handlers to load each CRT into an SST. The complete transfer of all CRTs into SSTs would take approximately 96 hours.

\* The SSTs would mount flush with the st>

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**Transfer interrupted!**

e of loading.

\* Only fork lifts would be utilized to move the HEU from storage, place it in the CRTs, and load the SSTs for shipment.

\* There would be only two cargo handlers. Thirty-five other workers would be within 50 meters (m) of the loading site. This includes ten people involved in the loading of the SSTs (warehouse, health physics, and nuclear material control and accountability personnel).

There has never been a transportation-related accident or incident involving special nuclear material at the Y-12 Plant (DOE, 1995a). Because of the low speeds (less than eight km (five miles) per hour) involved in transferring the Kazakhstan-origin HEU from the storage facility to the SSTs and the rigid design standards used for 6M, Type B packagings that allow them to withstand an accident, it is extremely unlikely that a package would be breached. A summary of the rigorous testing sequence for the 6M, Type B packaging is presented in Appendix I.

The estimated probability of a package being damaged so severely (e.g., by forklift puncture, high winds, or tornados) that the inner and outer containers would fail and some fraction of the contents would be dispersed is extremely low (i.e., less than  $1 \times 10^{-12}$ ). Therefore, the probability of an accident-induced radiological exposure or fatality during the transfer of the HEU from storage to SSTs at the Y-12 Plant would be negligible.

Accident-free radiological exposures to cargo handlers, other workers, and the public while transferring the HEU from storage to the SSTs are summarized in Table 4.3.1-1. The exposed groups of workers are the two cargo handlers and 35 other workers within a 50 m radius.

TABLE 4.3.1-1. Accident-Free Radiological Exposure for HEU Transfer from Storage to SSTs at the Y-12 Plant

Types of Population		Transfer of HEU From Storage to SSTs		
		Population Size	Dose	Latent Cancer Fatalities
Cargo	Collective	2	0.051	$2.1 \times 10^{-5}$
Handlers	Population		person-rem	

	Average	1	0.026	1.0x10E-5
	Individual		rem	
	Dose			
Other	Collective	35	0.012	4.8x10E-7
Workers	Population		person-rem	
	Average	1	3.3x10E-4	1.3x10E-7
	Individual		rem	
	Dose			
Public	Collective	N/A	0	0
	Population			

The loading would occur onsite in a secured area away from the general public; therefore, there would be no exposure to the public under accident-free conditions.

The highest dose to an average individual would be received by a cargo handler and is estimated to be a total of 0.026 rem over the duration of the loading activity. The collective dose to the two cargo handlers is estimated to be 0.051 person-rem. Using the worker dose-to-risk conversion factor of 4x10E-4 cancer fatalities per person-rem multiplied by the collective dose, 2.1x10E-5 latent cancer fatalities are estimated to result.

The risk of fatalities resulting from additional air pollution caused by the operation of equipment and from accidents not involving a radiological release would be negligible.

4.3.2 Impacts from Transportation of the HEU from the Y-12 Plant to the

## Blending Site

The Kazakhstan-origin HEU would be transported to the blending site by DOE-owned and -operated SSTs. Typical SST transport routes were selected for the analysis. The selected routes maximize the use of interstate highways, as established by HIGHWAY (a computer routing code). Urban, suburban, and rural population data were used to define the populations and characteristics along the routes. Credit was not given for the special shielding provided by the SST walls, which provides additional protection and decreases the risk of radiation exposure. The RADTRAN 4 computer code was used to determine radiological risks. The selected routes, methodology, and other criteria were developed by Sandia National Laboratories, New Mexico (SNL, 1995).

Because there has never been a release of radioactive material during SST transportation, a postulated SST transport accident scenario was developed to estimate the risks. Under postulated SST accident conditions, radiological consequences would result primarily from the release of respirable radioactive particulates and subsequent inhalation by persons downwind of the accident, either directly or after resuspension. Other exposures would include direct radiation from airborne material and from contamination on the ground. Details of the postulated accident scenario were developed by Sandia National Laboratories, New Mexico. A separate assessment for SSTs carrying special nuclear material in-transit is described in Appendix H.

Under the Proposed Action, the dose due to the bounding SST accident (that is, the accident with the greatest potential consequences, even though it has a small probability of occurrence) is estimated to be 5.4 person-rem for the B&W Lynchburg option in an urban area and 4.4 person-rem for the NFS Erwin option. The probability of the bounding SST accident occurring in an urban area is estimated to be  $3.8 \times 10^{-13}$  for

B&W Lynchburg and  $3.9 \times 10^{-12}$  for NFS Erwin. Given the conservative nature of these estimates and the fact that an SST accident has never occurred that resulted in the release of radiological material, the actual probability may be much lower. In addition, the consequences would be diminished if the accident occurred in a suburban or rural area. The transportation crew and the public are considered as one population for the purposes of the accident consequences. The general population dose-to-risk conversion factor is  $5 \times 10^{-4}$  cancer fatalities per person-rem (ICRP, 1991). The maximum collective dose of 5.4 person rem in the SST accident would be estimated to result in  $2.7 \times 10^{-3}$  latent cancer fatalities for B&W Lynchburg.

Table 4.3.2-1 summarizes the potential radiological exposure from a potential urban accident during the transportation of the HEU from the Y-12 Plant to either B&W Lynchburg or NFS Erwin. The population size shown in this table represents the maximum population which could be affected in an urban area along the routes for this scenario.

Radiological risks during normal (accident-free) transportation of the HEU from the Y-12 Plant to the blending sites are shown in Table 4.3.2 2. The maximum impact would be to the truck crew, and the highest dose to an average individual crew member is estimated to be 0.014 rem.

TABLE 4.3.2-1. Radiological Exposure for SST Shipments of HEU Due to a Bounding Accident in an Urban Area

Route	Population Size	Probability of Occurrence	Population Dose (person-rem)	Latent Cancer Fatalities
Y-12 Plant to B&W	$2.9 \times 10^6$	$3.8 \times 10^{-13}$	5.4	$2.7 \times 10^{-3}$

Lynchburg

Y-12 Plant 2.4x10E6 3.9x10E-12 4.4 2.2x10E-3

to NFS

Erwin

TABLE 4.3.2-2. Accident-Free Radiological Exposure for SST Shipments of HEU

from the Y-12 Plant to the Blending Site at B&W Lynchburg

Types of Population

		Population Size	Dose	Latent Cancer Fatalities
Transport Crew	Collective Population	3	0.042 person-rem	1.7x10E-5
	Average Individual Dose	1	0.014 rem	5.6x10E-6
Workers at SST Stop	Collective Population	10	4.1x10E-3 person-rem	1.6x10E-6
	Average Individual Dose	1	4.4x10E-4 rem	1.6x10E-7
Public	Collective Population	1.1x10E5	1.1x10E-5 person-rem	0.013
	Maximum Individual	1	6.2x10E-7 rem	3.1x10E-10

(In-transit)

TABLE 4.3.2-2. Accident-Free Radiological Exposure for SST Shipments of HEU from the Y-12 Plant to the Blending Site at NFS Erwin

## Types of Population

		Population	Dose	Latent Cancer
		Size		Fatalities
Transport	Collective	3	0.018	7.4x10E-6
Crew	Population		person-rem	
	Average	1	6.1x10E-3	2.5x10E-6
	Individual		rem	
	Dose			
Workers at	Collective	N/A	0	0
SST Stop	Population			
	Average	N/A	0	0
	Individual			
	Dose			
Public	Collective	6.5x10E4	7.2x10E-3	3.6x10E-6
	Population	person-rem		person-rem
	Maximum	1	6.2x10E-7	3.1x10E-10
	Individual	rem		
	(In-transit)			

Nonradiological risks of highway transportation (those risks which are caused by added air pollution or by highway accidents not involving a

radiological release) are low. The risk of fatalities resulting from additional air pollution caused by the operation of trucks was estimated on the basis of  $1 \times 10^{-7}$  fatalities per kilometer (km) of travel in urban zones (SNL, 1982). Accident fatalities incurred by the crew and public were estimated on the basis of fatality rates per km of travel in rural, suburban, and urban zones. For occupational (crew) risks, these rates per km are  $1.50 \times 10^{-8}$  rural,  $3.70 \times 10^{-9}$  suburban, and  $2.10 \times 10^{-9}$  urban. For public risks, these rates per km are  $5.30 \times 10^{-8}$  rural,  $1.30 \times 10^{-8}$  suburban, and  $7.50 \times 10^{-9}$  urban (SNL, 1986).

The nonradiological transportation risks associated with the Proposed Action are consistently greater than those from radiological effects; however, they are no greater than similar nonradiological risks experienced by the vehicle population as a whole. These risks are summarized in Table 4.3.2-3.

#### 4.3.3 Impacts from Onsite Transportation at the Blending Site

Neither B&W Lynchburg or NFS Erwin has ever experienced a transportation-related accident involving special nuclear materials (B&W, 1995; NFS, 1995). Using similar assumptions and the postulated maximum credible accident scenario for the loading of the SSTs at the Y-12 Plant presented in Section 4.3.1, the estimated health effects of unloading the trucks and placing the Kazakhstan-origin HEU into interim storage at the blending sites have been determined.

TABLE 4.3.2-3. Nonradiological Impacts for SST Shipments of HEU from the Y-12 Plant to the Blending Site

Health Effects	Nonradiological Risk	
	B&W Lynchburg	NFS Erwin
Pollution	$1.2 \times 10^{-5}$	$1.2 \times 10^{-5}$

(Latent Cancer  
Fatalities)

Occupational Accident Fatalities	1.5x10E-4	5.9x10E-5
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Public Accident Fatalities	5.2x10E-4	2.1x10E-4
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Upon arrival at the blending site, the HEU would be immediately unloaded from the SSTs and placed in the interim storage facility. Onsite road risks from the site gate to the unloading dock are included in the transportation assessment from the Y-12 Plant to the blending site. At B&W Lynchburg, there would be no other onsite transportation. At NFS Erwin, the SSTs would be unloaded in a secure area and the HEU transported by sealed NFS truck under security escort to an interim storage facility, a distance of approximately 0.6 km (0.4 miles). At B&W Lynchburg, unloading would take about 15 minutes for each CRT; and at NFS Erwin, unloading and other handling would take about 30 minutes for each CRT. Risk analyses are limited to unloading operations and the transport of HEU to interim storage.

A radiological accident is unlikely to occur during the unloading of SSTs and the transfer of materials to an interim storage facility. The estimated probability of a package being damaged so severely (e.g., by forklift puncture, high winds, or tornados) that the inner and outer containers would fail and some fraction of the contents would be dispersed is extremely low (i.e., less than  $1 \times 10^{-12}$ ). Therefore, the probability of an accident-induced radiological exposure or fatality during the transfer of the HEU from SSTs to storage at the blending site would be negligible.

Accident-free radiological exposures to cargo handlers, other workers, and the public while transferring HEU from the SSTs to the blending site interim storage facility are summarized in Table 4.3.3-1. The exposed workers would be the two cargo handlers and 30 other workers (e.g., guards) within a 50 m radius. The unloading would occur onsite in a secured area away from the general public; therefore, there would be no exposure to the public under accident-free conditions. The highest dose to an average individual would be received by a cargo handler at NFS Erwin and is estimated to be 0.051 rem. The collective dose to two cargo handlers is estimated to be 0.10 person-rem at NFS Erwin and 0.051 person-rem at B&W Lynchburg.

Using the worker dose-to-risk conversion factor of  $4 \times 10^{-4}$  cancer fatalities per person-rem multiplied by the collective dose,  $4.1 \times 10^{-5}$  latent cancer fatalities are estimated to result at NFS Erwin.

The risk of fatalities resulting from additional air pollution caused by the operation of equipment and from accidents not involving a radiological release would be negligible.

#### 4.3.4 Impacts Associated with Interim Storage and Blending at the Blending Site

This section discusses the potential environmental impacts associated with the blending of the Kazakhstan-origin HEU and uranium oxide blending stock, receipt and interim storage of these materials, and the handling and disposal of associated wastes at B&W Lynchburg and NFS Erwin. As detailed in Appendix C, the Kazakhstan-origin HEU contains primarily uranium and beryllium with small but measurable quantities of plutonium. The blending stock would be received at the blending site as uranium oxide.

TABLE 4.3.3-1. Accident-Free Radiological Exposure for HEU Transfer  
from SSTs to Interim Storage at the Blending Site

## B&amp;W LYNCHBURG:

## Types of Population                      Transfer of HEU From SSTs to Interim Storage

		Population	Dose	Latent Cancer
		Size		Fatalities
Cargo	Collective	2	0.051	2.1x10E-5
Handlers	Population		person-rem	
	Average	1	0.026	1.0x10E-5
	Individual		rem	
	Dose			
Other	Collective	30	9.9x10E-3	4.0x10E-6
Workers	Population		person-rem	
	Average	1	3.3x10E-4	1.3x10E-7
	Individual		rem	
	Dose			
Public	Collective	N/A	0	0
(beyond	Population			
500m)	Maximum	N/A	0	0
	Individual			
	Dose			

## NFS ERWIN:

Types of Population		Transfer of HEU From SSTs to Interim Storage		
		Population Size	Dose	Latent Cancer Fatalities
Cargo	Collective	2	0.10	4.1x10E-5
Handlers	Population		person-rem	
	Average	1	0.051	2.1x10E-5
	Individual		rem	
	Dose			
Other	Collective	30	9.9x10E-3	4.0x10E-6
Workers	Population		person-rem	
	Average	1	3.3x10E-4	1.3x10E-7
	Individual		rem	
	Dose			
Public	Collective	N/A	0	0
(beyond	Population			
500m)	Maximum	N/A	0	0
	Individual			
	Dose			

Both of the blending sites operate under NRC licenses and have existing approved NEPA documentation assessing their operations in support of their licenses. These sites also are required to operate in compliance with all applicable environmental regulations and permits regarding air emissions, effluent discharges, and waste management. The discussions in this section focus on only those materials or operations involved in

the Proposed Action.

#### 4.3.4.1 B&W Lynchburg

B&W Lynchburg operates under NRC License SNM-42, Docket Number 70-27. The most recent NEPA document addressing its operations is the Environment Assessment for Renewal of Special Material License No. SNM 42 dated August 1991 (B&W, 1991). That document states that during normal operations at B&W Lynchburg the dose to the maximally exposed individual is estimated to be 0.05 mrem per year, and the cumulative dose to the surrounding population within 80 km (50 miles) of the site is approximately one person-rem per year.

B&W Lynchburg is licensed to possess up to 60,000 kg (60 metric tons) of U-235 in any form except UF<sub>6</sub> and at any enrichment. The quantities of Kazakhstan-origin HEU and uranium oxide blending stock would be within these limits and no UF<sub>6</sub> would be received by B&W Lynchburg. The NRC license also allows B&W Lynchburg to possess and process fission products and transuranium elements at low concentrations (i.e., less than 10E-6 grams of plutonium per gram of U-235). Because the Kazakhstan-origin HEU contains only trace quantities of plutonium in low concentrations, B&W Lynchburg could receive and process these materials under the current license without amendment. B&W Lynchburg contacted the NRC regarding this interpretation and received the NRC's concurrence (B&W, 1995).

Beryllium, a toxic but nonradioactive material, is not specifically addressed in the NRC license and is not typically regulated by the NRC. Although B&W Lynchburg may not require a modification to their NRC license to process these materials, B&W Lynchburg must ensure that it would remain in compliance with all applicable environmental regulations and criteria. B&W Lynchburg would use a recovery process for the Kazakhstan-origin HEU that consists of dissolution followed by solvent

extraction and neutralization of the liquid waste effluent. Within this process, there are three potential pathways for beryllium to enter the environment: air emissions, liquid effluent, and solid waste.

B&W Lynchburg has had limited operational experience processing uranium material containing high concentrations of beryllium. Because of the beryllium levels in the Kazakhstan-origin HEU B&W anticipates that additional controls would be installed for the protection of workers and the environment. For example, B&W would use both stationary and lapel air samplers for detecting beryllium. The stationary and lapel air monitors would be evaluated after each shift and are in addition to the existing air monitoring devices used to detect uranium exposure. Worker exposure would be limited to 50 percent of the Occupational Safety and Health Administration (OSHA) ambient air level limit of two micrograms per m<sup>3</sup> ( $\mu\text{g}/\text{m}^3$ ). Current research indicates that workers with existing and prior respiratory conditions are more susceptible to pneumonitis. Since it is projected that this project would be a short-term operation (approximately 38 days), B&W anticipates that a modified medical compliance program would be utilized. Additional training would be given by industrial hygienists to alert workers to the hazards of handling beryllium. Procedures for all operations involving the material would be reviewed and updated to implement additional safety measures if necessary.

Since beryllium is both an excellent neutron moderator and reflector, a new criticality analysis would be performed for all areas where uranium and beryllium would be co-located. Additional criticality controls (such as greater spacing of materials in storage, etc.) would be implemented as necessary.

Dissolution of uranium-beryllium metals would be performed in fume hoods since there initially would be no particulate matter; however,

dissolution of uranium-beryllium oxides would be performed in gloveboxes because particulate matter could exist initially. No machining, polishing, or grinding operations are anticipated but a separate glovebox is available if necessary for grinding/crushing of the material. Gloveboxes are under negative pressure to assure that material is not released to the workers.

The potential beryllium emissions have been evaluated by B&W Lynchburg to determine what air quality regulations would apply. If the beryllium emissions exceed exemption levels established in Part V, Rule 5-3, and Appendix R of the Virginia Air Regulations, a permit for a modified source would be required. Initial reviews also indicate that Subpart C of the National Emission Standard for Hazardous Air Pollutants (NESHAP) (40 CFR 61) may apply. If this standard applies, a stack test would be required to verify that beryllium emissions would not exceed ten grams over a 24-hour period. B&W Lynchburg has calculated that the potential worst-case beryllium emission rate for this process (without emission controls) would be approximately  $3.5 \times 10^{-4}$  grams per hour, which represents less than one percent of the Virginia permit exemption level. The emission controls for the ventilation system associated with the processing of the Kazakhstan-origin HEU would be upgraded by adding a demister followed by a high efficiency particulate air (HEPA) filter to the existing scrubber. These controls would further reduce the potential beryllium emission rate to approximately  $6.1 \times 10^{-8}$  grams of beryllium per hour. Both the process and the projected emissions would be reviewed with the Virginia Department of Environmental Quality (DEQ) Air Division prior to implementation. The DEQ has the option of establishing discharge limits and requiring monitoring, and there is a high probability that stack sampling would be required to verify emission levels (B&W, 1995).

The processing of the Kazakhstan-origin HEU would be based on dissolution with a centrifuge operation to recirculate wet, undissolved

material. The uranium-beryllium solution then would go through a tertiary solvent extraction to remove over 99 percent of the uranium. An ion exchange system would then be used on the acidic wastewater to remove most of the remaining uranium. The acid wastewater then would be neutralized with caustics generating a filtercake that would be disposed of as low-level radioactive waste (although B&W also may consider selling the beryllium filtercake if a sufficient amount of the uranium has been removed). The filtercake would be a beryllium hydroxide compound with chemically bound water with a moisture content of approximately 50 percent. The filtercake pressing operation would not be done in the waste treatment facility as usual but in the uranium recovery facility to ensure that the wastewater would not go to the drying operation in the waste treatment facility. The low-level radioactive wastewater filtrate would be processed in the onsite waste treatment system, and would represent only a small fraction of the average daily amount of wastewater processed.

B&W Lynchburg estimates that a maximum of 450 grams of beryllium would be discharged to the onsite waste treatment system. The average flow to the system is approximately 113,500 liters (30,000 gallons) per day; therefore, the concentration of beryllium in the waste solution is estimated to be approximately four parts per million (ppm). After the waste treatment operation is completed, B&W estimates that the discharge from the system would contain approximately 0.4 ppm of beryllium, and after mixing with other industrial and sanitary discharges from the site, the final level of beryllium in the site's Virginia Pollutant Discharge Elimination System (VPDES) discharge would be 0.08 ppm. Although no effluent limitations or water quality standards for beryllium have been established for B&W Lynchburg, the process and potential discharges would be reviewed with the Virginia DEQ Water Division prior to implementation. The Virginia DEQ may establish a discharge level for beryllium as part of B&W Lynchburg's VPDES permit

after this consultation (B&W, 1995).

As described above, low-level radioactive filtercake containing beryllium would be generated by the processing of Kazakhstan-origin HEU. The EPA issued a clarification in 1994 that beryllium would only be considered a hazardous waste if it is in the form of a dust from beryllium metal, which it would not be in the filtercake because of the large water content. The Virginia DEQ was contacted by B&W Lynchburg, and confirmed that this filtercake could be handled as a low-level radioactive but not a hazardous or mixed (radioactive and hazardous) waste. B&W Lynchburg would handle this waste in accordance with established procedures and monitor the filtercake at its point of generation to ensure that compliance levels established by OSHA for personnel exposure are met. B&W has not defined the total volume of wastes associated with the processing of the Kazakhstan-origin material, but estimates that 20 batches of neutralization filtercake containing a total of 40.6 kg of beryllium would be generated over the duration of the project. B&W's waste treatment system typically generates three 55-gallon drums of low-level radioactive filtercake per day, and this volume is reduced by a factor of two by using a supercompactor. The filtercake generated by the waste treatment system would contain the beryllium (approximately 450 grams) that would not be removed in the neutralization filtercake. B&W also estimates that approximately 11 HEPA filters that would require handling as low-level waste would be generated by the operation. These waste volumes would not be a significant addition to the waste volumes generated at B&W Lynchburg during normal operations (B&W, 1995).

B&W Lynchburg would dispose of the solid low-level waste containing beryllium offsite. The Commonwealth of Virginia is a member of the Southeast Compact which utilizes an NRC/State of South Carolina-licensed burial facility operated by Chem Nuclear Systems, Inc., in Barnwell, South Carolina. Until this facility closes on December 31, 1995, B&W

Lynchburg would utilize this facility to dispose of this waste. After that time, the waste would be staged onsite in an existing licensed facility until a new licensed Southeast Compact facility is available. Other waste volumes containing graphite or other non-radioactive, non-hazardous constituents of the Kazakhstan-origin HEU would be recycled or disposed of as non-hazardous solid waste. Any of these constituents containing radioactive contamination would be disposed of as low-level radioactive waste (B&W, 1995).

#### 4.3.4.2 NFS Erwin

NFS Erwin operates under NRC License SNM-124, Docket Number 70-143. The most recent NEPA document addressing its operations is the Environmental Assessment for Renewal of Special Nuclear Material License No. SNM-124 dated August 1991 (NFS, 1991). That document states that during normal operations at NFS Erwin the dose to the maximally exposed individual is estimated to be 2.3 mrem per year, and the cumulative dose to the surrounding population within 80 km (50 miles) of the site is approximately 14.6 person-rem per year.

NFS Erwin is licensed to possess up to 7,000 kg (seven metric tons) of U-235 in essentially any chemical or physical form and at any enrichment. The total quantities of Kazakhstan-origin HEU and uranium oxide blending stock would not exceed these limits. NFS Erwin would, however, schedule and stage the receipt and processing of these materials so that the quantity of uranium metal on site would not exceed any NRC or DOE requirements (NFS, 1995).

On May 7, 1993, the NRC issued Amendment No. 3 to SNM-124 which authorizes NFS to perform downblending of HEU (NRC-TAC L21676). This amendment was based on the analysis in the Safety Evaluation Report

(Docket No. 70-143). Upon reviewing the report, the NRC determined that there would not be a significant impact to health, safety, or the environment and that because the provisions of 10 CFR 51.22(c)(11) had been met, neither an EA nor an EIS was necessary for the amendment (NFS, 1995).

Although NFS Erwin is authorized to possess up to 200 grams of plutonium associated with residual contamination of facilities from previous operations or in storage as material used in previous operations, this amendment does not apply specifically to the plutonium present in trace quantities in the Kazakhstan-origin HEU. The NRC has been contacted regarding the issue of obtaining an amendment to the license for this material. Although the NRC has verbally indicated that small amounts (i.e., in the range of  $10E-6$  grams of plutonium per gram of U-235) of plutonium contained in uranium should pose no significant safety concern, NFS Erwin would be required to obtain an amendment to their license in order to accept the Kazakhstan-origin HEU for blending. The blending operation and the quantity of plutonium in the Kazakhstan origin HEU would fall within the bounds of NFS Erwin's capacity and capability to process, and would be covered under its current license and Safety Evaluation Report for the license amendment to perform downblending operations (NFS, 1995).

Uranium material containing high concentrations of beryllium was handled at NFS Erwin in the 1970s. Because the facility has not recently handled similar material, additional controls would be instituted for protection of the workers and the environment. For example, NFS Erwin would use stationary and lapel air samplers for determining beryllium exposure. Both the stationary and lapel air monitors would be evaluated after each shift in addition to the existing devices used to detect uranium exposure. Initial operations would be done in respirators until sufficient data are gathered to assure that worker exposure limits would not be exceeded. Worker exposure would be limited to 25 percent of the

OSHA ambient air level limit of two  $\mu\text{g}/\text{m}^3$ . Since the operation is anticipated to last 120 days, workers would be screened for existing lung conditions. Workers with existing lung conditions would be excluded from working with this material. Additional training would be given by industrial hygienists to alert workers to the hazards of handling beryllium. Procedures for all operations involving the material would be reviewed and updated as necessary to implement additional safety measures.

A new criticality analysis has been performed for all areas where uranium and beryllium would be co-located to establish new mass criticality safety limits. Uranium-beryllium metals dissolution in nitric acid would be done in fume hoods since there initially would be no particulate matter. The fume hoods have a dual layer of air flow to reduce exposure to the workers. Uranium-beryllium oxide dissolution in hydrofluoric acid would be done in gloveboxes since particulate matter could exist. The gloveboxes would be under negative pressure at all times to assure that material is not released into the worker area. This division of metals and oxides is already done for all uranium operations. The first glovebox in the line contains equipment that would be used if grinding/crushing is required. Preliminary tests would be done with the material to determine if the acids would completely dissolve the material or if grinding/crushing would be necessary as a first step. All operations where particulate material is present would be posted for workers and noted in the operation procedures.

As noted previously, beryllium is not specifically addressed in the NRC license and is not typically regulated by the NRC. NFS Erwin would, however, be required to receive modifications to their Tennessee Air Pollution and National Pollutant Discharge Elimination System (NPDES) permits. The maximum allowable effluent discharges would be established by the State of Tennessee Division of Air Pollution Control and Water

Pollution Control. NFS Erwin has air pollution control systems and liquid effluent treatment systems in place that would allow the facility to comply with permit modifications since these current systems enable the facility to meet permit requirements for uranium and other hazardous pollutants in accordance with 10 CFR 20 and State of Tennessee Rule 1200-3-11.03 (NFS, 1995).

The ventilation system used for the processing of the Kazakhstan-origin HEU would be the current system in place. For dissolution of metals in the hoods, this consists of a prefilter, a venturi scrubber, a demister, and a HEPA filter. For dissolution of oxides in the gloveboxes, there is an additional HEPA filter located at the top of the glovebox. This would limit beryllium emissions in the same manner as similar controls in place limit uranium emissions. NFS estimates that beryllium emissions would be limited to less than one percent (approximately  $4.2 \times 10^{-3}$  grams per hour) of the ten gram per 24-hour period standard codified in Tennessee State Rule 1200-3-11-03. Limits below those specified in the State Rule may be imposed by the State of Tennessee, and emissions would be monitored to ensure compliance with permit limits (NFS, 1995).

Most of the beryllium waste would be in either the filter solids after dissolution or raffinate wastewater after the solvent extraction process. The raffinate wastewater would be neutralized with caustics, and the neutralized wastewater then would be discharged into the onsite waste treatment facility. The wastewater from this process would represent only a small part of the total liquid waste treated onsite, the majority of which is from high efficiency process ventilated scrubbing systems. After treatment, the effluent would be discharged in accordance with NFS Erwin's State of Tennessee NPDES permit. Although this permit does not currently include beryllium, a beryllium limit would be established with the state of Tennessee and effluents would be monitored to ensure compliance (NFS, 1995).

The process also would generate a filtercake that would be disposed of as low-level radioactive waste. The filtercake would be a beryllium hydroxide compound with chemically bound water with a moisture content of approximately 50 percent. As discussed previously, the beryllium would only be considered a hazardous waste if it is in the form of a dust from beryllium metal, which it would not be in the filtercake because of the large water content. NFS Erwin estimates that the total quantity of solid waste resulting from this process to be in the range of 57 to 142 m<sup>3</sup>, and that it will contain virtually all of the estimated 1,600 kg of beryllium present in the Kazakhstan-origin HEU. Both the solid and liquid waste streams are estimated to be of the same volume as those generated during normal operations, although they will contain beryllium as an impurity. Other waste volumes containing graphite or other non-radioactive, non-hazardous constituents of the Kazakhstan-origin HEU would be recycled or disposed of as non-hazardous solid waste. Any of these constituents containing radioactive contamination would be disposed of as low-level radioactive waste (NFS, 1995).

NFS Erwin would dispose of the solid low-level waste containing beryllium offsite. The State of Tennessee is a member of the Southeast Compact which utilizes an NRC/State of South Carolina-licensed burial facility operated by Chem Nuclear Systems, Inc., in Barnwell, South Carolina. Until this facility closes on December 31, 1995, NFS Erwin would utilize this facility to dispose of this waste. After that time, the waste would be staged onsite in an existing licensed facility until a new licensed Southeast Compact facility is available (NFS, 1995).

#### 4.4 TRANSPORTATION AND CONVERSION OF BLENDING STOCK

Both the UF<sub>6</sub> and uranium oxide blending stock are LEU materials that are routinely shipped in NRC-certified shipping containers by commercial

carrier. There are no unusual shipping criteria (as is required for special nuclear material) other than meeting standards established by DOT (49 CFR 100-199) and supplemented by state, local, and DOE regulations. These standards require the shipper to comply with selecting the proper, authorized packaging for the material; preparing hazardous materials shipping papers; properly certifying what is being shipped; properly marking, labeling, loading, blocking, and bracing the material; and meeting safety requirements.

#### 4.4.1 Transportation of the UF6 Blending Stock from either USEC Paducah or USEC Portsmouth to GE Wilmington

The UF6 blending stock would be of less than three percent enrichment and shipped as a solid. The material would be placed in a specification UF6 cylinder (inner packaging), which is then placed in NRC-certified, Type B packagings (overpacks) for shipment by commercial carrier. Up to 13 cylinders, each containing approximately 2.3 metric tons, would be required. It is estimated that three truckloads would be needed to transport the material. This material has been successfully transported throughout the world via ship, rail, and truck without loss of life or property due to a radiological or chemical release. The overall risk of transporting UF6 is estimated to be low.

The potential health effects from the transportation (loading, transportation, and unloading) of the blending stock materials are presented in Table 4.4-1.

#### 4.4.2 Conversion of the Blending Stock from UF6 to Uranium Oxide at GE Wilmington

GE Wilmington operates under NRC License SNM-1097, Docket Number 70-1113. The most recent NEPA document addressing its operations is the Environmental Impact Appraisal for Renewal of Special Nuclear Material

License No. SNM-1097 dated June 1984 (GE, 1984). That document states that during normal operations at GE Wilmington the dose to the maximally exposed individual is estimated to be 0.13 mrem per year, and the cumulative dose to the surrounding population within 80 km (50 miles) of the site is approximately 0.15 person-rem per year.

This section discusses the potential impacts associated with the conversion of the UF<sub>6</sub> blending stock to uranium oxide blending stock at GE Wilmington. The conversion of UF<sub>6</sub> to uranium oxide is a process that GE Wilmington currently performs under its NRC License. This license permits GE Wilmington to possess up to 50,000 kg (50 metric tons) of uranium enriched to less than six percent U-235 in the form of UF<sub>6</sub> or uranium oxide. Section 1.7.1.1 of their most recent license application (Revision 21, May 16, 1988) specifically addresses the conversion of UF<sub>6</sub> to uranium oxide. Waste handling and disposal activities are addressed in Section 1.7.5 (Revision 21, May 16, 1990). The quantity of UF<sub>6</sub> involved in the Proposed Action represents approximately 2.5 percent of the average yearly quantity of UF<sub>6</sub> converted at GE Wilmington (GE, 1995).

The conversion of the blending stock would use the ammonium diuranate (ADU) process. The ADU process first vaporizes the UF<sub>6</sub>, then hydrolyzes it to soluble uranyl fluoride and hydrofluoric acid, and then ADU slurry is precipitated by mixing the uranyl fluoride with ammonium hydroxide. The hydrofluoric acid is mixed with calcium to create calcium fluoride, which is then either sold for commercial use or disposed of as a non-radioactive, non-hazardous solid waste. The liquid phase is removed from the slurry, passed through a quarantine filter system for further uranium removal, and then routed to the onsite waste treatment system. The ADU product is fed to a defluorinator-calciner where it is dried, decomposed, and reduced to the uranium oxide product. The offgas from the defluorinator is scrubbed to remove uranium and fluoride compounds

and then routed to a combined scrubber/HEPA filter exhaust system. The effluents and emissions associated with this process are uranium particulate, fluorides, and ammonia. These effluents and emissions are continuously monitored and are in compliance with all state and Federal requirements. Solid waste associated with this process are incinerated onsite and the resultant solids are then compacted to yield a very small quantity of solid waste requiring disposal (GE, 1995).

GE Wilmington would dispose of the solid low-level waste offsite. The State of North Carolina is a member of the Southeast Compact which utilizes an NRC/State of South Carolina-licensed burial facility operated by Chem Nuclear Systems, Inc., in Barnwell, South Carolina. Until this facility closes on December 31, 1995, GE Wilmington would utilize this facility to dispose of this waste. After that time, the waste would be staged onsite in an existing licensed facility until a new licensed Southeast Compact facility is available (GE, 1995).

#### 4.4.3 Transportation of the Uranium Oxide Blending Stock from GE Wilmington to the Blending Site

At GE Wilmington, the UF<sub>6</sub> would be converted into uranium oxide, which would be shipped to either B&W Lynchburg or NFS Erwin. The uranium oxide would be transported in up to 570 NRC-certified, Type A fissile packages. Each package would contain between 35 and 60 kg of uranium, depending upon the material assay. The material would be transported by up to five commercial truckloads to the blending site. The potential health effects from the transportation of the blending stock materials are presented in Table 4.4-1.

GE Wilmington was used as a representative site for the conversion of UF<sub>6</sub> to uranium oxide. If another site were used for this process, the transportation risks would be slightly different due to differences in the distance the material would be transported and the population along

the transportation routes; however, impacts would not be expected to differ substantially from those described in this EA.

#### 4.5 TRANSPORTATION OF THE URANYL NITRATE FROM THE BLENDING SITE TO USEC PORTSMOUTH

Uranyl nitrate crystals would be the product of the blending process. Once the Kazakhstan-origin HEU is blended into a material containing less than five percent enriched uranyl nitrate, the material would be shipped in NRC-certified, Type A fissile packaging via commercial carrier to USEC Portsmouth. It is estimated that 14 truckloads would be required for the shipping of this material. The risk of transporting this material, in any form, is low.

The material would be transported by commercial truck in compliance with DOT (49 CFR 100-199) and other regulatory requirements that govern the movement of hazardous materials. The blending site is under the compliance jurisdiction of the NRC. The NRC has oversight responsibilities for these shipments to USEC Portsmouth. The material being transported, however, contains a low level of radiation that is no greater risk than other uranium materials that have been shipped commercially without a radiological release or death in over 40 years. The transportation health risks for these shipments are shown in Table 4.5-1.

TABLE 4.4-1 Health Effects of Transporting UF<sub>6</sub> and Uranium Oxide Blending Stock

Route	Health Risks (Latent Fatal Cancer or Accident Fatality)
	Radiological

	Accident		Accident-Free	
	Conditions		Transportation	
			Public	Crew
UF6 from USEC Portsmouth to GE Wilmington	4.5x10E-7		5.1x10E-6	5.9x10E-6
UF6 from USEC Paducah to GE Wilmington	3.9x10E-7		4.0x10E-6	5.7x10E-6
Uranium Oxide from GE Wilmington to B&W Lynchburg	1.5x10E-6		2.1x10E-6	7.6x10E-6
Uranium Oxide from GE Wilmington to NFS Erwin	2.3x10E-6		2.4x10E-6	1.1x10E-5
Route	Health Risks (Latent Fatal Cancer or Accident Fatality)			
	Non-Radiological			
	Accident		Air	
	Fatalities		Pollution	
			Public	Crew
UF6 from	3.1x10E-4		8.8x10E-5	7.4x10E-6

USEC Portsmouth  
to GE Wilmington

UF6 from	2.3x10E-4	6.4x10E-5	1.1x10E-5
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USEC Paducah  
to GE Wilmington

Uranium Oxide	1.8x10E-4	5.2x10E-5	4.7x10E-6
---------------	-----------	-----------	-----------

from GE Wilmington  
to B&W Lynchburg

Uranium Oxide	3.0x10E-4	8.4x10E-5	8.1x10E-6
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from GE Wilmington  
to NFS Erwin

The transportation of the uranyl nitrate from the blending site to USEC Portsmouth was used as a representative transportation activity for this material. If another destination (e.g., a domestic fuel fabricator selected by USEC) were selected for the uranyl nitrate, the transportation risks would be slightly different due to differences in the distance the material would be transported and the population along the transportation routes; however, impacts associated with transportation to a domestic fuel fabrication facility would not be expected to differ substantially from those described in this EA.

Table 4.5-1. Health Effects of Transporting Uranyl Nitrate Crystals  
From the Blending Plant to USEC Portsmouth

Route	Health Risks (Latent Fatal Cancer or Accident Fatality)
-------	--

Radiological

	Accident	Accident-Free	
	Conditions	Transportation	
		Public	Crew
B&W Lynchburg to USEC Portsmouth	4.2x10E-6	0	0
NFS Erwin to USEC Portsmouth	5.0x10E-6	0	0

Route Health Risks (Latent Fatal Cancer or Accident Fatality)

Non-Radiological

	Accident	Air	
	Fatalities	Pollution	
	Public	Crew	
B&W Lynchburg to USEC Portsmouth	6.2x10E-4	1.8x10E-4	3.6x10E-5
NFS Erwin to USEC Portsmouth	6.3x10E-4	1.8x10E-4	4.3x10E-5

4.6 NO ACTION IMPACTS

Under the no action alternative, which is to leave the Kazakhstan-origin HEU in safe secure storage at the Y-12 Plant, there would be no transportation or blending of the HEU and blending stock or transportation of the uranyl nitrate. Accordingly, there would be no transportation, blending, or waste-related impacts. As the Kazakhstan origin HEU is currently stored in 6M, Type B packagings (as described in Section 4.3.1) in a secure facility, the continued storage of this material at the Y-12 Plant would result in a negligible risk.

The Department has also completed the predecisional September 1994 Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee (DOE, 1994a). That document evaluates the potential environmental impacts of storing up to 500,000 kg (500 metric tons) of HEU at the Y-12 Plant. Under no action, the 600 kg of Kazakhstan-origin HEU would remain in storage at the facilities described and evaluated in that EA.

#### 4.7 SUMMARY OF IMPACTS

Of the potential risks associated with the transportation of all of the materials addressed in this EA, the maximum number of total fatalities associated with the Proposed Action that would occur within one year would not exceed 0.0023. The maximum total risk option includes transporting the Kazakhstan-origin HEU from the Y-12 Plant to B&W

Lynchburg, the UF6 blending stock from USEC Paducah to GE Wilmington, the uranium oxide blending stock from GE Wilmington to B&W Lynchburg, and the uranyl nitrate from B&W Lynchburg to USEC Portsmouth. For NFS Erwin, the maximum number of total fatalities associated with the Proposed Action that would occur within one year would not exceed 0.0021. It is unlikely that a fatality would occur as a result of the

transportation activities associated with the Proposed Action regardless of the blending site.

The analyses of the other activities associated with the Proposed Action focused on impacts associated with the conversion of the UF6 blending stock to uranium oxide blending stock and impacts associated with the blending of the Kazakhstan-origin HEU and uranium oxide blending stock. As described in previous sections, the potential impacts identified regarding the receipt and blending of the materials involved in the Proposed Action, and the handling and disposal of any associated wastes were small.

With respect to environmental justice issues, high and adverse health effects are measured in risks and rates that could result in latent cancer fatalities, as well as other fatal or non-fatal risks to human health. Disproportionately high and adverse human health effects occur when the risk or rate for a minority population or low-income population from an environmental hazard significantly exceeds the risk or rate to the general population. The Proposed Action would not have high and adverse impacts that could disproportionately affect minority populations or low-income populations. The Proposed Action would not require the selection of any new site; rather, all activities would take place at existing sites. The potential impacts identified at facilities considered for interim storage and/or blending activities are small. Accordingly, because the potential impacts would present no significant risk and do not constitute a reasonable foreseeable adverse impact to the surrounding population, no disproportionately high and adverse effects would be expected for any particular segment of the population, including minority and low-income populations.

The other potential source of impacts is the transportation of the HEU, UF6 and uranium oxide blending stock, and uranyl nitrate. The

transportation analyses in this EA are based on representative routes. The exact transportation routes for the HEU addressed in this EA are classified and cannot be specifically identified and compared with minority and low-income population distribution data. However, because the health risks to the public resulting from the proposed transportation routes would be low, there would not be disproportionately high and adverse impacts to minority or low-income populations.

#### 4.8 CUMULATIVE IMPACTS

Section 4.7 describes the total transportation impacts, including nonradiological impacts, associated with the Proposed Action. Cumulative impacts would result from the addition of those impacts to the impacts resulting from the blending and conversion operations at B&W Lynchburg, NFS Erwin, and GE Wilmington.

Nonradiological impacts are caused by vehicle accidents and air pollution, and are not associated with a radiological release. Although nonradiological impacts are included in the summary of impacts described above, it should be noted that the total of 34 shipments of radioactive materials (both HEU and LEU) associated with the Proposed Action represent only 0.0017 percent of the average annual radioactive shipments in the United States, and a much smaller percentage of the total annual domestic truck shipments of all types of materials. Therefore, the cumulative nonradiological impacts associated with the Proposed Action are extremely small.

The doses to the maximally exposed individual and collective population within an 80 km (50 mile) radius during normal operations at B&W Lynchburg, NFS Erwin, and GE Wilmington are presented in Sections

4.3.4.1, 4.3.4.2, and 4.4.2, respectively. Impacts resulting from these doses would increase as a result of the transportation impacts associated with the Proposed Action at these sites. As shown in Section 4.7, it is unlikely that a fatality would occur as a result of the transportation activities associated with the Proposed Action regardless of the blending site.

The quantity of UF<sub>6</sub> to be converted to uranium oxide represents approximately 2.5 percent of GE Wilmington's average yearly volume from normal operations. B&W Lynchburg estimates that the blending activities associated with the Proposed Action would take approximately 38 days, and is also a small percentage of their normal operations. Both of these sites are currently operational, and the addition of the materials associated with the Proposed Action would not cause either of these sites to exceed their normal throughput capacities. Therefore, the normal yearly operation dose estimates for these sites would be representative of the total doses at these sites over the estimated one year duration of the Proposed Action.

NFS Erwin estimates that the blending activities associated with the Proposed Action would take approximately 120 days. If these activities were to occur at NFS Erwin, the normal operational doses that resulted during past activities would provide a conservative estimate of the total doses associated with the Proposed Action.

The cumulative impacts resulting from the addition of transportation and blending impacts associated with the Proposed Action to the impacts resulting from the normal operations at the sites involved would still be extremely low. It would be unlikely that a fatality would occur as a result of the cumulative impacts associated with the Proposed Action.

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Appendix A: Nonproliferation and Export Control Policy Fact Sheet

This appendix contains a copy of the fact sheet on the President's Nonproliferation and Export Control Policy released by the White House on September 27, 1993. The fact sheet describes the major principles that guide the policy and the key elements of the policy.

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release

September 27, 1993

FACT SHEET

## NONPROLIFERATION AND EXPORT CONTROL POLICY

The President today established a framework for U.S. Efforts to prevent the proliferation of weapons of mass destruction and the missiles that deliver them. He outlined three major principles to guide our nonproliferation and export control policy:

\* Our national security requires us to accord higher priority to nonproliferation, and to make it an integral element of our relations with other countries.

\* To strengthen U.S. economic growth, democratization abroad and international stability, we actively seek expanded trade and technology exchange with nations, including former adversaries, that abide by global nonproliferation norms.

\* We need to build a new consensus -- embracing the Executive and Legislative branches, industry and public, and friends abroad -- to promote effective nonproliferation efforts and integrate our nonproliferation and economic goals.

The President reaffirmed U.S. support for a strong, effective nonproliferation regime that enjoys broad multilateral support and employs all of the means at our disposal to advance our objectives.

Key elements of the policy follow.

## Fissile Material

The U.S. will undertake a comprehensive approach to the growing accumulation of fissile material from dismantled nuclear weapons and

within civil nuclear programs. Under this approach, the U.S. will:

- \* Seek to eliminate where possible the accumulation of stockpiles of highly-enriched uranium or plutonium to ensure that where these materials already exist they are subject to the highest standards of safety, security, and international accountability.
- \* Propose a multilateral convention prohibiting the production of highly-enriched uranium or plutonium for nuclear explosives purposes or outside of international safeguards.
- \* Encourage more restrictive regional arrangements to constrain fissile material production in regions of instability and high proliferation risk.
- \* Submit U.S. fissile material no longer needed for our deterrent to inspection by the International Atomic Energy Act.
- \* Pursue the purchase of highly-enriched uranium from the former Soviet Union and other countries and its conversion to peaceful use as reactor fuel.
- \* Explore means to limit the stockpiling of plutonium from civil nuclear programs, and seek to minimize the civil use of highly-enriched uranium.
- \* Initiate a comprehensive review of long-term options for plutonium disposition, taking into account technical, nonproliferation, environmental, budgetary and economic considerations. Russia and other nations with relevant interests and experience will be invited to participate in this study.

The United States does not encourage the civil use of plutonium and,

accordingly, does not itself engage in plutonium reprocessing for either nuclear power or nuclear explosive purposes. The United States, however, will maintain its existing commitments regarding the use of plutonium in civil nuclear programs in Western Europe and Japan.

#### Export Controls

To be truly effective, export controls should be applied uniformly by all suppliers. The United States will harmonize domestic and multilateral controls to the greatest extent possible. At the same time, the need to lead the international community or overriding national security or foreign policy interests may justify unilateral export controls in specific cases. We will review our unilateral dual use export controls and policies, and eliminate them unless such controls are essential to national security and foreign policy interests.

We will streamline the implementation of U.S. nonproliferation export controls. Our system must be more responsible and efficient, and not inhibit legitimate exports that play a key role in American economic strength while preventing exports that would make a material contribution to the proliferation of weapons of mass destruction and the missile that deliver them.

#### Nuclear Proliferation

The U.S. will make every effort to secure the indefinite extension of the Non-Proliferation Treaty in 1995. We will seek to ensure that the International Atomic Energy Agency has the resources needed to implement its vital safeguards responsibilities, and will work to strengthen the IAEA's ability to detect clandestine nuclear activities.

## Missile Proliferation

We will maintain our strong support for the Missile Technology Control Regime. We will promote the principles of the MTCR Guidelines as a global missile nonproliferation norm and seek to use the MTCR as a mechanism for taking joint action to combat missile proliferation. We will support prudent expansion of the MTCR's membership to include additional countries that subscribe to international nonproliferation standards, enforce effective export controls and abandon offensive ballistic missile programs. The United States will also promote regional efforts to reduce the demand for missile capabilities.

The United States will continue to oppose missile programs of proliferation concern, and will exercise particular restraint in missile-related cooperation. We will continue to retain a strong presumption of denial against exports to any country of complete space launch vehicles or major components.

The United States will not support the development or acquisition of space-launch vehicles in countries outside the MTCR.

For MTCR member countries, we will not encourage new space launch vehicle programs, which raise questions on both nonproliferation and economic viability grounds. The United States will, however, consider exports of MTCR-controlled items to MTCR member countries for peaceful space launch programs on a case-by-case basis. We will review whether additional constraints or safeguards could reduce the risk of misuse of space launch technology. We will seek adoption by all MTCR partners of policies as vigilant as our own.

## Chemical and Biological Weapons

To help deter violations of the Biological Weapons Convention, we will

promote new measures to provide increased transparency of activities and facilities that could have biological weapons applications. We call on all nations -- including our own -- to ratify the Chemical Weapons Convention quickly so that it may enter into force by January 13, 1995. We will work with others to support the international Organization for the Prohibition of Chemical Weapons created by the Convention.

#### Regional Nonproliferation Initiatives

Nonproliferation will receive greater priority in our diplomacy, and will be taken into account in our relations with countries around the world. We will make special efforts to address the proliferation threat in regions of tension such as the Korean peninsula, the Middle East and South Asia, including efforts to address the underlying motivations for weapons acquisition and to promote regional confidence-building steps.

In Korea, our goal remains a non-nuclear peninsula. We will make every effort to secure North Korea's full compliance with its nonproliferation commitments and effective implementation of the North-South denuclearization agreement.

In parallel with our efforts to obtain a secure, just, and lasting peace in the Middle East, we will promote dialogue and confidence-building steps to create the basis for a Middle East free of weapons of mass destruction. In the Persian Gulf, we will work with other suppliers to contain Iran's nuclear, missile, and CBW ambitions, while preventing reconstruction of Iraq's activities in these areas. In South Asia, we will encourage India and Pakistan to proceed with multilateral discussions of nonproliferation and security issues, with the goal of capping and eventually rolling back their nuclear and missile capabilities.

In developing our overall approach to Latin America and South Africa, we

will take account of the significant nonproliferation progress made in these regions in recent years. We will intensify efforts to ensure that the former Soviet Union, Eastern Europe and China do not contribute to the spread of weapons of mass destruction and missiles.

#### Military Planning and Doctrine

We will give proliferation a higher profile in our intelligence collection and analysis and defense planning, and ensure that our own force structure and military planning address the potential threat from weapons of mass destruction and missile around the world.

#### Conventional Arms Transfers

We will actively seek greater transparency in the area of conventional arms transfers and promote regional confidence-building measures to encourage restraint on such transfers to regions of instability. The U.S. will undertake a comprehensive review of conventional arms transfer policy, taking into account national security, arms control, trade, budgetary and economic competitiveness consideration.

#### Appendix B: Preapproval Copy EA Comment Summaries and Responses

A Preapproval Copy of this document was distributed to representatives of the affected states and Native American Tribes, and other groups and individuals, in April of 1995, for review and comment. This appendix contains a list of the commentators, a summary of their comments, and DOE's responses to these comments. Based on these comments, a number of changes have been made throughout the document to improve its clarity, completeness, and accuracy. Appendix B also explains the modifications made to this EA in response to these comments.

Comments were received from the following parties: Ms. Amy Fitzgerald,

Ph.D., Executive Director, Oak Ridge Reservation Local Oversight Committee (ORR LOC); Mr. Earl C. Leming, Director, Tennessee Department of Environment and Conservation, DOE Oversight Division (TN DEC); Mr. Elgan H. Usrey, Assistant Director, Tennessee Emergency Management Agency (TEMA); Mr. Harry H. Kelso, Director, Enforcement and Policy, Virginia Department of Environmental Quality (VA DEQ); Mr. Ralph Hutchison, Coordinator, Oak Ridge Environmental Peace Alliance (Oak Ridge Env. Peace Alliance); Mr. Gregory A. Richardson, Executive Director, North Carolina Commission of Indian Affairs, North Carolina Department of Administration; Mr. Bill Flournoy, State of North Carolina, Department of Environment, Health and Natural Resources (NC DEHNR); Mr. Larry Sams, Assistant to the State Highway Administrator State of North Carolina, Department of Transportation; Ms. Chrys Baggett, Director, North Carolina State Clearinghouse, Department of Administration; and Mr. James A. Whitaker, Mayor, the City of Lynchburg, Virginia.

In addition, correspondence was received from Mr. Don Hancock, Southwest Research and Information Center (SW Research and Information Center).

1. The public was not given enough time to properly review and comment on the EA in accordance with NEPA guidelines. In addition, members of the public were not provided with early notice of preparation of this EA. DOE also needs to solicit comments from a much larger group of stakeholders than just the affected states and Native American groups, to be consistent with the Secretary of Energy's NEPA policy and CEQ regulations.

No. of Comments 6 Document(s) ORR LOC; TN DEC; TEMA; NC DEHNR ;SW Research and Information Center; Oak Ridge Env. Peace Alliance

Response: Based on concerns raised by several reviewers, the review

period was extended from April 26, 1995, to May 5, 1995, for a total of 24 days. The original review period was established based on the discretion given to DOE in 10 CFR 1021.301(d) of 14 to 30 days for affected state and tribe review. Since the Preapproval Copy EA was brief, consisting of 26 pages of text plus the appendices, the review period with the extension is considered to be appropriate by DOE. The Preapproval Copy review distribution included the potentially affected states and tribes, and local government officials. In addition, several communications addressed DOE's plan to prepare the EA. These included letters to the affected states, Native American tribes, letters to individuals, and the NOI (60 CFR 17344) for the Disposition of Surplus HEU EIS. Although not required by NEPA, DOE or CEQ regulations, the Preapproval EA was distributed to local oversight organizations, and copies were made available to other interested individuals and groups, upon timely request, consistent with the Secretary's 1994 Policy on the National Environmental Policy Act for enhanced public involvement when possible and the CEQ regulations concerning public involvement. The final EA will be made available upon request.

2. The Department should have made available for public review all documents upon which the EA was based. Release of those documents would have helped members of the public evaluate assertions made in the EA. The principal documents of concern should have included all reference documents containing cost/benefit analysis of downblending prepared by either DOE or its contractors and any classified or previously classified documents containing information on costs associated with the acquisition of the Kazakhstan-origin HEU. The price paid to Kazakhstan and the cost of preparation and transportation of the Kazakhstan-origin materials are two examples of cost information that should have been released.

No. of Comments 2 Document(s) TN DEC; Oak Ridge Env. Peace Alliance

Response: All of the documents listed in Section 5 of the EA are currently available for public review, and copies of specific referenced documents were provided upon request. The purchase agreement for the United States acquisition of the Kazakhstan-origin HEU, is classified, was not used in preparing this EA, and does not address blending of the material in the United States. A cost/benefit analysis is not required for an EA. However, the eventual sale of the blended material would help to offset the costs associated with the purchase and blending of the Kazakhstan-origin HEU. The Proposed Action would also avoid additional cost associated with the continued storage of the material at the Y-12 Plant. Section 1.1 of the EA has been expanded to include an explanation of why a detailed cost/benefit analysis was not prepared for the EA.

3. Declassified versions of the EA (DOE/EA-1006) and FONSI issued last Fall concerning the transportation of Project Sapphire HEU from the Republic of Kazakhstan to Oak Ridge should have been made available.

No. of Comments 3 Document(s) ORR LOC; TEMA; Oak Ridge Env. Peace Alliance

Response: The classified EA was not listed or used as a reference for the preparation of this EA. However, unclassified versions of the EA and FONSI have now been provided to the Oak Ridge and other public reading rooms, and copies have been provided to individuals upon request. While the declassification of the EA was completed on March 6, 1995, administrative and other reviews were not completed and the document was not released until approximately April 17, 1995. Any delay in release of the documents was not related to the release of this EA for review and was not intended to withhold any information from the reviewers. DOE regrets any inconvenience that this may have caused the public in reviewing DOE NEPA documents.

4. The EA should have included a list of the agencies and persons consulted in preparation of the EA as directed under 40 CFR 1508.9(b).

No. of Comments 1 Document(s) TN DEC

Response: A list has been included in Section 6 of the EA.

5. The Proposed Action concerning the Kazakhstan-origin HEU should be connected with the environmental impact statement (EIS) for the proposed disposition of the United States-origin stockpiles of surplus weapons usable HEU. DOE must adopt a "cradle to grave" approach for considering the disposition of surplus HEU.

No. of Comments 2 Document(s) Oak Ridge Env. Peace Alliance; NC DEHNR

Response: As discussed in Section 1.1 of the EA, the Kazakhstan-origin HEU was purchased in accordance with the President's Nonproliferation and Export Control Policy. As discussed in Section 1.4 of the EA, the HEU considered in the EA is separate from the United States' stockpiles of HEU because, among other things, it is of foreign origin and is a small quantity. The purchase and conversion of the Kazakhstan-origin HEU is a high priority action, separate from the conversion of HEU material in the United States' stockpiles due to the small quantities involved and the need to proceed in a timely fashion in order to demonstrate to the international community our commitment to the nonproliferation objectives underlying the acquisition of the HEU from Kazakhstan. Section 1.4 of the EA has been clarified in response to these comments. Issues related to the nuclear fuel cycle, spent fuel disposition, and waste disposal are also addressed in comment responses 9 and 17.

6. Why is it necessary for DOE to begin blending the Kazakhstan-origin

HEU within six to nine months? This deadline has been used as a justification for accelerating the preparation of the EA and ultimately shortening the comment period for public review.

No. of Comments 2 Document(s) Oak Ridge Env. Peace Alliance; NC DEHNR  
Response: A discussion of the reasons for the expeditious timing surrounding the blending of the Kazakhstan-origin HEU has been expanded in Section 1.4 of the EA. On November 29, 1994, the White House issued a press release regarding the transfer, safe storage, and conversion of the Kazakhstan-origin HEU in the United States. The press release also contained a general schedule for the disposition of the Kazakhstan-origin material. As discussed in Section 1.1, Section 2, and Appendix E of the EA, the White House press release announced that consistent with the President's Nonproliferation Policy, it was planned that within six to nine months of receipt of the HEU into safe secure storage in the United States, the Kazakhstan-origin HEU would be transferred to a commercial facility where downblending would occur. The safe conversion of this material to a form that cannot readily be used for nuclear weapons should proceed as expeditiously as possible in order to strengthen the United States' commitment to help build a more secure international environment.

7. The EA did not adequately address environmental justice issues associated with the Proposed Action. The discussion of these issues did not describe potential routes for material other than HEU or attempt to evaluate the potential impact upon any population group living along those transportation routes. In addition, there is no indication if an analysis of representative routes was performed. If no such analysis was done, then an explanation as to why should be included in the EA.

No. of Comments 1 Document(s) NC DEHNR

Response: Section 4.7 has been modified to explain that representative routes were used for the HEU transportation analysis. Environmental justice is discussed in Sections 1.2 and 4.7 of the EA. As described in Section 4.7 of the EA, the potential impacts associated with the transportation, storage, and blending of the Kazakhstan-origin HEU are small. As a result, no high and adverse impacts are expected for the surrounding population. No disproportionately high and adverse impacts are expected for any segment of the population, particularly minorities and low-income residents.

8. The HEU material should be further characterized prior to any off site shipment. The EA fails to identify and evaluate the materials the EA purports to assess. Most of the material is something other than HEU. What is the other material and how shall its potential impacts be assessed?

No. of Comments 2 Document(s) ORR LOC; Oak Ridge Env. Peace Alliance

Response: The Kazakhstan-origin HEU is already in safe secure storage at the Y-12 Plant. Storage conditions for the HEU material at the Y-12 Plant are discussed in Section 4.6 of the EA. Analysis of the HEU samples was conducted in Kazakhstan in early April 1994 and subsequently at the Y-12 Plant in accordance with a sampling program, the objective of which was to characterize the Kazakhstan-origin material prior to shipment to the Y-12 Plant (DOE, 1995b). Representative sampling and analysis, including complete chemical and isotope analysis of samples at the Y-12 Plant was completed before shipment in accordance with the plan, and the results are summarized in Appendix C of the EA. The Kazakhstan-origin material contained HEU metal, uranium oxides, uranium-beryllium alloy rods, uranium-beryllium alloy scrap, HEU containing graphite, uranium-236, uranium-232, and plutonium. The HEU is currently packaged in 1,299 stainless steel cans, as described in Appendix C, each individually numbered with a mylar seal. These cans are packaged in

NRC-approved shipping containers which are also sealed with tamper-proof devices. Any additional characterization at the interim storage location at the Y-12 Plant would require breaking the integrity of this sealed system. The Y-12 Plant is only a temporary trans-shipment point, and it was not considered prudent to break the sealed system until the material was received at the blending facility. No additional characterization is anticipated prior to offsite shipment.

9. The EA provided an inadequate discussion of the consequences of the Proposed Action. DOE failed to consider impacts associated with the creation and disposal of spent nuclear fuel. In addition, the EA did not provide an explanation of the alternatives it evaluated and why some of those alternatives were discarded. For example, the EA ignored a less than four percent blending option, such as a one percent enrichment or blending to some enrichment level between four percent and 20 percent.

No. of Comments 2 Document(s) Oak Ridge Env. Peace Alliance; NC  
DEHNR

Response: As explained in Section 1.2 of the EA, potential indirect impacts associated with either further processing of the uranyl nitrate into commercial reactor fuel or its use as a fuel to furnish electrical power are discussed but are not analyzed in detail in this EA. DOE is currently characterizing and will prepare an EIS for the disposal of all spent nuclear fuel, including any spent nuclear fuel that may be indirectly associated with the commercial reactor fuel derived from the uranyl nitrate that would result from the Proposed Action. Section 1.1 has been expanded to provide an explanation for blending the material for use in commercial nuclear reactor fuel rather than blending to some other enrichment level between greater than four percent and less than 20 percent, or less than one percent enrichment. The commercial

reactors that would potentially use the fuel derived from the Kazakhstan-origin material would not experience modifications to their current operations or increased spent fuel generation because this LEU would be used in place of new LEU. An option to blend the material to less than four percent (e.g., less than one percent) enrichment was not analyzed in detail because this option would fail to meet the Purpose and Need described in Section 2 of the EA. Specifically, this option would fail to convert the HEU to peaceful use as commercial reactor fuel.

10. The EA did not provide any rationale for the shipment of uranyl nitrate to USEC Portsmouth. If the uranyl nitrate is destined for fabrication into fuel rods, wouldn't the preferred action be to leave the material at the blending site or ship it to the fabrication site in order to minimize transportation risks?

No. of Comments 1 Document(s) Oak Ridge Env. Peace Alliance

Response: USEC has storage capacity for the uranyl nitrate (solid form) in the X330 facility at Portsmouth. As explained in Section 1.2 of the EA, the exact allocation and site specific location and timing of the eventual fuel fabrication is not known at this time, has not been specifically proposed and would be contingent upon the needs and specifications of potential customers. However, if USEC selects one or more fuel fabrication facilities prior to completion of the Proposed Action, DOE may consider transporting uranyl nitrate directly to that facility. As discussed in Section 4.5 of the EA, transportation of the uranyl nitrate from the blending site to USEC Portsmouth was considered as a representative transportation activity for the material. The risk of transporting the uranyl nitrate is very low, and the material will be transported by commercial carrier as is routinely done. In addition, USEC Portsmouth would be required to maintain appropriate safeguards and security and certifications in order to receive the uranyl nitrate

shipment. As explained in Section 4.5 of the EA, if the uranyl nitrate were shipped to a domestic destination other than USEC Portsmouth the transportation impacts would differ slightly but are not expected to differ substantially.

11. The EA should have provided discussions of the security measures designed for the weapons-usable HEU at all times and locations.

No. of Comments: 1 Document(s) Oak Ridge Env. Peace Alliance

Response: Under the Proposed Action, there are only four locations where the HEU material would be located: the Y-12 Plant, NFS and B&W

blending facilities, and an SST. The Y-12 Plant complies with DOE safeguards and security. Both B&W and NFS are NRC licensed and are required to have the appropriate safeguards and security to receive shipments of HEU. SSTs are designed as safe secure packaging for the materials contained therein even in the event of a serious accident.

12. The EA did not provide any information concerning radiation levels associated with the handling and transport of the Kazakhstan material. Specific gamma and neutron radiation exposure rate information for various parts of the process should have been included. In addition, there was no clear summary of health effects from the total operation for all handling, transfer, storage, and blending of the entire stock of Kazakhstan-origin HEU. As a result, the summary of impacts discussion should have been expanded to include a discussion of both the overall and individual risks associated with each component of the Proposed Action.

No. of Comments 1 Document(s) NC DEHNR

Response: Section 4.3 of the EA provided a discussion of impacts associated with the Proposed Action. Radiological exposures associated with routine operations for processing HEU at the B&W and NFS blending facilities has been added to Sections 4.3.4.1 and 4.3.4.2, respectively. As discussed in those sections, the cumulative dose for the maximally exposed individual during normal operations at B&W and NFS is estimated as 0.05 mrem/year and 2.3 mrem/year respectively. The cumulative dose to the surrounding population living within an 80 km (50 mile) radius of the plant site is estimated at less than one person-rem/year for B&W and 14.6 mrem/year for NFS during normal operations. For normal operations at the GE Wilmington facility, the cumulative dose to the maximally exposed individual is estimated to be 0.13 mrem/year, and the cumulative dose to residents within 80 km (50 mile) is estimated as 0.15 person-rem/year. Radiological exposures associated with each step in the transportation of the Kazakhstan-origin HEU are presented in Tables 4.3.1-1, 4.3.2-1, 4.3.2-2, and 4.3.3-1. Section 4.3 includes discussion of not only the incremental risks but also the overall risks associated with the Proposed Action. Section 4.7 of the EA summarizes the transportation impacts associated with the Proposed Action, and Section 4.8 describes the cumulative impacts of the Proposed Action.

13. The EA states that 600 kg of HEU represents approximately 0.4 percent of the total quantity of HEU at the Y-12 Plant. Providing information on any incremental increases to criticality issues from the addition of 600 kg of HEU would be more meaningful because increased radioactivity is a more significant issue than quantity in this case. Because beryllium is an effective neutron reflector, extensive criticality analysis would be needed.

No. of Comments 2 Document(s) TN DEC; TEMA

Response: DOE has evaluated the environmental impacts, including criticality issues, from storing HEU at the Y-12 Plant in the

predecisional September 1994 Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee. Section 4.6 of this EA references the Y-12 EA and discusses potential impacts from storing the HEU material at the Y-12 Plant. The Y-12 EA includes analysis of storage of up to 500 metric tons of HEU, of which up to five metric tons could be from foreign sources. Sections 4.3.4.1 and 4.3.4.2 discuss additional controls that would be implemented at the blending facilities to ensure that the beryllium does not cause any criticality concerns. Before the material was shipped to the Y-12 Plant, criticality safety evaluations for transportation of those HEU and beryllium materials took into account the (criticality) reactivity effects (moderation and reflection) when calculating the neutron multiplication factor for the various loading limits listed in 49 CFR 173.417. In all cases, the actual loadings were within these loading limits and are adequately subcritical in the handling can/storage container configurations. In addition, these calculations accounted for the neutron production from the uranium alpha-decay process in which alpha strikes a beryllium atom nucleus, causing one or more neutrons to be released.

14. The EA did not provide a clear explanation of how population estimates of 3 million people are derived for the bounding accident analysis (Section 4.3.2, Table 4.3.2-1). In addition, the EA should also provide an explanation of how "urban areas" are defined along transportation routes in the bounding accident analysis and whether current demographics were used. In the Affected Environment Appendix the NFS discussion used 1980 census data, which does not lend credence to the document.

No. of Comments 2 Document(s) ORR LOC; TEMA

Response: Sandia National Laboratories, Albuquerque, New Mexico, performed the transportation risk analysis using the RADTRAN 4 computer

code and HIGHWAY, a computer highway routing code. The population size is defined as the product of the number of people per square kilometer along the link with the highest population density, and the area covered by the plume at the maximum radius considered, 80 km (50 miles). This is a conservative method for determining population size due to variations in meteorological data for the areas considered (e.g., wind velocity and atmospheric turbulence data for arbitrary points along a route). Urban population areas are those in which the distance-averaged population density within 0.8 km of the center of the highway, calculated by the HIGHWAY code, exceeds 1,670 persons per square kilometer. The 1980 census data used was quoted by an NFS EA in 1991. According to the NFS EA, the 1980 census data represented the most current data available at the time. However, the most recent (1990 census), currently available urban, suburban, and rural population data was used as input for the HIGHWAY code and for the analyses included in the EA.

15. The Department appears to be de-emphasizing the potential risks associated with transporting these materials. Although the number of shipments is small, the content is extremely large compared to civilian shipments. Also, the postulated accident in RADTRAN Transportation Risk Analysis Methodology Appendix only addresses the dispersion of five percent of the load. A serious accident or terrorist bombing could disperse much more.

No. of Comments 1 Document(s) TEMA

Response: The analyses discussed in Section 4.2.1 and Appendices G and H of the EA are extremely conservative, and are based on earlier studies at one of the DOE facilities. These studies postulated the releases as a result of an energetic projectile on 1,000 kg of 93 percent enrichment HEU in an SST load, whereas each SST load for the Proposed Action would

transport only approximately 50 kg. Specific safeguards and security systems, including armed courier surveillance, are in place to protect SST shipments from sabotage, terrorism, and other threats; however, the majority of this information remains classified. SSTs are designed and rigorously tested to ensure that they provide safe secure protection for materials contained within, even in the event of a serious accident. In addition, the SSTs are seldom stationary, utilize secret routes, and are not visually distinguishable from other trucks. The possibility exists, however, that a terrorist bomb exploded alongside an SST could disperse more than five percent of the load, but current security procedures minimize the likelihood of such an event happening. The release of five percent of the 1,000 kg load used in this scenario would be equivalent to the release of an entire 50 kg load of Kazakhstan-origin material for the Proposed Action. (The enrichment level may be slightly higher or lower depending on the material.) This scenario would result in a maximum of two latent cancer fatalities, but it has an even lower probability of occurring than the bounding accident in an urban area analyzed for this EA and presented in Section 4.3.2 and Table 4.3.2-1. The probability of the bounding accident in an urban area analyzed in this EA is less than  $3.9 \times 10^{-12}$  (less than one chance in 200 billion), and the probability of a terrorist or other attack resulting in the dispersement of an entire 50 kg load of Kazakhstan-origin material for the Proposed Action is even lower.

16. The EA should address in more detail the total number of shipments for all materials and operations, the total number of miles, transportation routes, and local emergency capabilities along those routes. States and local communities should be notified of the transportation of all non-classified materials so they can be better prepared for potential accidents. In addition, the 12 shipments required for transportation of all the Kazakhstan-origin HEU constitute a shipping campaign and as such require prior notification under the DOE/TEMA/TDEC agreement.

No. of Comments 2 Document(s) TEMA; VA DEQ

Response: The total number of shipments for each material are indicated in Sections 4.3.1 (12 shipments of HEU to the blending site), 4.4.1 (three truckloads of UF6 blending stock to GE Wilmington), 4.4.3 (five truckloads of uranium oxide blending stock to the blending site), and 4.5 (14 truckloads of uranyl nitrate to USEC Portsmouth). As discussed in Section 4.7 of the EA, the transportation routes for the Kazakhstan-origin HEU are classified and cannot be openly identified and addressed. DOE and ORR will coordinate all shipments required under the Proposed Action with appropriate state and local officials. If requested, DOE will assist appropriate state and local officials with response plans and if necessary, with resources in accordance with guidelines established in DOE Order 5530.3. DOE has developed a Radiological Assistance Program (RAP), also outlined in DOE Order 5530.3, to provide assistance in all types of radiological accidents. Regional RAP plans include coverage of the states and provide for maintaining and executing response plans.

17. At present the B&W site has two VPDES permitted facilities in Virginia. Additional information should be incorporated to address which facility at B&W will receive the Kazakhstan-origin HEU for processing and whether permit modifications may be required as a result. Information on whether there should be any release of radioactive materials in effluent discharge from the site needs to be added. In addition, procedures for interacting with appropriate state departments, agencies, and emergency services to ensure safe shipping and compliance with state environmental and safety laws should be added.

No. of Comments 2 Document(s) VA DEQ; TEMA

Response: The Naval Nuclear Fuel Division (NNFD) facility, as described in Appendix F, Section F.2.1, is the B&W site that could receive the Kazakhstan-origin HEU for processing. Sections 4.3.4.1 and 4.3.4.2 of the EA, respectively, discuss modifications that may be required to B&W and NFS' environmental permits prior to the implementation of the Proposed Action. The EA addresses the types and quantities of wastes which would be released from the processing operation at B&W and NFS in these sections, and no mixed wastes would be generated from the processing operations. Any actions undertaken during implementation of the Proposed Action will be coordinated with the appropriate state and local authorities to ensure compliance with all applicable permits and regulations.

18. The EA does not provide a detailed analysis of potential impacts to biotic, cultural, geologic, and socioeconomic resources.

No. of Comments 1 Document(s) ORR LOC

Response: The rationale for not including detailed analysis in these areas is included in Section 1.2 of the EA. No construction activities are associated with the Proposed Action, so there would be minimal impacts to biotic, archaeological, geologic, or cultural resources. Essentially no changes in the number of workers or the regional population are projected, therefore impacts to socioeconomic resources would also be minimal. Only minor modifications or upgrades to the processing systems would be required (i.e., HEPA filters and demisters), as described in Sections 4.3.4.1, 4.3.4.2, and 4.4.2 of the EA.

19. In the Affected Environment Appendix, the area surrounding ORR should not be characterized as predominantly rural given that almost 1 million people reside within an 80 km (50 mile) radius of ORR.

No. of Comments 1 Document(s) ORR LOC

Response: The appendix has been reworded to indicate that the land area immediately surrounding ORR is sparsely populated and rural, while land area in surrounding counties is often densely populated and urban. The last sentence of the first paragraph of the ORR description in Appendix F has been reworded to indicate that ORR is approximately three miles from downtown Oak Ridge.

20. Section 4.6 of the EA referenced the predecisional September 1994 Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant, Oak Ridge, Tennessee. This document is not technically sound because the historical data presented does not adequately address issues such as whether proper maintenance of storage buildings has occurred, whether any risks from incremental increases of stored enriched uranium exist and whether there is actually enough capacity for storage.

No. of Comments 2 Document(s) TN DEC; Oak Ridge Env. Peace Alliance

Response: Under the no action alternative, the Kazakhstan-origin HEU would remain in safe secure storage at the Y-12 Plant. No blending, transportation, or waste-related impacts would result. The analysis of risks from incremental increases in the quantity of stored enriched uranium, actual storage capacity, and the proper maintenance of storage buildings are within the scope of the predecisional September 1994 Y-12 EA and were not addressed in this EA.

21. The Department announced that the Kazakhstan-origin HEU would be placed under the control of the International Atomic Energy Agency (IAEA). At this time, approximately six months later, the material has not been placed under IAEA control, and there are currently no

negotiations between DOE and IAEA concerning such action.

No. of Comments 1 Document(s) Oak Ridge Env. Peace Alliance

Response: IAEA control is not an environmental issue associated with the Proposed Action. However, the IAEA has been kept informed of the existence and location of the Kazakhstan-origin HEU. The IAEA met with representatives of the United States government in February 1995, and indicated their preference to wait until the material was received at the blending facility to initiate inspections. In early April 1995, the United States Mission in Vienna was again informed by the IAEA that inspections would not be initiated until the material was received at the selected blending facility. In the interim, the material has been maintained in safe secure storage at the Y-12 Plant and has remained in the sealed containment system applied in Kazakhstan (see comment response #8). The list of United States facilities eligible for IAEA safeguards includes all commercial nuclear power reactors.

22. The EA evaluated two commercial sites that have limited operational experience in processing uranium material with high concentrations of beryllium. The EA did not adequately discuss what additional training is needed for workers at either of the two sites under the Proposed Action. Given the lack of operational experience, the EA should have evaluated the option of keeping the HEU material onsite at Y-12 until either the commercial workers or Y-12 workers were properly trained to perform the necessary functions to blend the HEU.

No. of Comments 4 Document(s) ORR LOC; TN DEC; TEMA; Oak Ridge Env. Peace Alliance

Response: The EA discusses some additional measures that the B&W and NFS sites may have to implement under the Proposed Action. These measures are outlined in Sections 4.3.4.1 and 4.3.4.2 of the EA for the

B&W and NFS facilities, respectively. In addition, standard established industrial safety practices for the handling of beryllium would be implemented as required. Examples of additional measures include controls such as air samplers for detecting beryllium and training on the potential hazards associated with handling beryllium. There are only two DOE facilities, the Y-12 Plant and SRS, that could provide the blending services needed for the Proposed Action. The rationale for eliminating these sites from detailed evaluation is discussed in Section 1.1 of the EA.

23. The EA should address why there are different time estimates for processing operations at B&W and NFS (38 and 120 days, respectively).

No. of Comments 1 Document(s) ORR LOC

Response: Estimates of time duration were obtained from direct correspondence with personnel at the sites involved and are based on capacity and capability.

Appendix C: Constituents of Kazakhstan-origin HEU

There are 1,299 cans of Kazakhstan-origin HEU that would be transported to the blending site. Laboratory analyses were performed on a number of representative samples collected in March 1994 (DOE, 1995b). A brief description of the results of the analyses is presented below.

Additionally, laboratory analysis indicated that the samples contained some U-236 and U-232 and contain small but measurable quantities of plutonium. The net mass total of the Kazakhstan-origin material is approximately 2.4 metric tons.

The cans of HEU are currently packaged in a model 6M, Type B packaging,

which is designed to prevent the release of contents under all credible transportation accident conditions.

Table C-1.- Constituents of Kazakhstan-origin HEU

Form of Material	Number of Cans	Total U-235 (kg)
HEU metal consisting of small cylinders and pellets	15	168.7
Uranium oxides primarily as powders	14	29.7
Uranium beryllium alloy rods	315	148.6
Uranium oxide-beryllium oxide rods	35	1.6
Uranium-beryllium alloy scrap consisting of powder, rocks, and chunks	870	231.5
HEU containing graphite	48	0.7
Assay samples	2	0.2
Total	1,299	581.0

Appendix D: Regulatory Issues and Authorizing Agencies

Issue	Agency	Regulation
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Packaging     Nuclear Regulatory Commission (NRC)     10 CFR 71 establishes standards for packaging and transportation of licensed materials. It further provides procedures and standards for NRC approval of packaging and shipping fissile materials.

DOE     DOE Order 5480.3 outlines the safety requirements and procedures for the packaging and transportation of hazardous materials, hazardous substances, and hazardous waste including fissile materials.

DOE     DOE Order 1540.2 establishes administrative procedures for the certification and use of radioactive and other hazardous materials packaging.

Department of Transportation (DOT)     49 CFR 173 specifies packaging requirements for transportation of hazardous materials

Transportation     DOT     49 CFR provides strict regulations and procedures to ensure the safe shipment of radioactive materials. This includes restricting the quantity of radioactive material that can be shipped over roadways and further requires that carriers be permitted. DOT regulations also require the use of appropriate placards on packages and vehicles to

alert workers, officials, and the public to the hazardous characteristics of the material being shipped.

DOE DOE Order 1540.1A establishes policies and procedures for the management of materials transportation activities, including traffic management. The policies and procedures in this order include the management of radioactive materials transport.

DOE Order 5632.2A establishes baseline protection requirements for special nuclear materials in transit, providing appropriately graded levels of protection for each shipment.

DOE Order 5610.14 ensures that transportation safeguard system operations are accomplished in a manner commensurate with established practices and procedures for cargo safeguards, program continuity, and protection of national security, personnel, the public, and the environment.

Worker Health and Safety DOE DOE Order 5480.10 establishes procedures and requirements for industrial hygiene programs. DOE Order 5483.1A establishes procedures and requirements for industrial safety programs.

Occupational Safety and Health Administration (OSHA)	29 CFR 1910 Hazard Communication Standard requires that workers are informed and trained to handle hazards in the workplace. It also establishes permissible exposure limits for 8-hour exposures and short-term exposure limits for 30-minute exposures for workers handling hazardous materials.
Air Quality	Environmental Protection Agency (EPA)
	40 CFR 61 establishes National Emission Standards for Hazardous Air Pollutants (NESHAPS) which detail air quality standards and maximum exposure levels.

Appendix E: Transfer of Kazakhstan-origin HEU Press Release

This appendix contains a copy of the statement released by the White House on November 11, 1994 regarding the transfer of vulnerable nuclear materials (HEU) from Kazakhstan to safe storage in the United States. This statement describes the transfer of the HEU into the United States and establishes a general schedule for its disposition.

THE WHITE HOUSE

Office of the Press Secretary

For Immediate Release

November 29, 1994

The United States and Kazakhstan Announce the Transfer of  
Vulnerable Nuclear Materials to Safe Storage

In an historic step toward meeting the proliferation challenges of the post Cold War era, the United States and Kazakhstan today completed the successful transfer of vulnerable nuclear materials from Kazakhstan to safe storage in the United States. The weapons-grade materials remained in Kazakhstan following the break-up of the Soviet Union.

The government of Kazakhstan approached the United States early in 1994 concerning approximately six hundred kilograms of highly enriched uranium on its territory. Kazakhstan was concerned about the security of the material and asked for U.S. assistance in removing it to safe storage. As part of its commitment to the Nuclear Non-Proliferation Treaty, Kazakhstan has been taking careful measures to implement full-scope safeguards under the International Atomic Energy Agency. Kazakhstan wishes to see the material removed from its territory before the safeguards are put in place in December.

The United States and Kazakhstan worked closely together to achieve this important success in securing these vulnerable nuclear materials. President Clinton congratulates the U.S. and Kazakhstani teams, which safely carried out the mission, and warmly commends President Nursultan Nazarbayev for his international leadership in nuclear nonproliferation. The President looks forward to future cooperation with President Nazarbayev to achieve our mutual nonproliferation goals.

The President has identified nonproliferation as a key national security objective for his Administration. With the end of the Cold War, the risk of proliferation of weapons of mass destruction has increased. Ensuring the security of nuclear materials is one of the key components of the Administration's strategy. Through programs such as Nunn-Lugar and other denuclearization initiatives, important progress has been made to build a more secure international environment. Today's transfer of weapons-grade nuclear materials from Kazakhstan to a secure facility in the United States is another critical part of this effort.

The material that will be stored at Oak Ridge is not considered waste. It is special nuclear material which can be used in nuclear weapons and it will be placed under IAEA safeguards.

It is currently planned, consistent with the President's nonproliferation policy, that the material will be transferred to a commercial facility within six to nine months, where the material would be blended down for use in commercial nuclear reactors. The Department of Energy will issue a Request for Proposal for commercial firms interested in doing this work.

The Department of Energy has been in close communication with the Defense Nuclear Facilities Board, which has safety oversight responsibility, to ensure that storage of this material poses no risk to the health and safety of the local public. The Department has addressed all problems raised by the Board with respect to matters of health and safety.

#### Appendix F: Affected Environment

This section briefly describes the affected environment of each site involved in the Proposed Action.

##### F.1 HEU Interim Storage Site

###### F.1.1 Oak Ridge Reservation Y-12 Plant

The ORR is a DOE-owned complex that encompasses approximately 140 square km (54 square miles) in Anderson and Roane Counties in Eastern Tennessee. ORR is in the incorporated area of the City of Oak Ridge (Figures F.1.1-1 and F.1.1-2). Much of the land area immediately surrounding ORR is sparsely populated and rural, while other land in

surrounding counties is often densely populated and urban. Regional land uses include residential, commercial, recreational, and agricultural areas. The current estimated residential population within an 80 km (50 mile) radius of ORR is approximately 880,000 (DOE, 1994a). Knoxville, Tennessee, located 32 km (20 miles) to the east of ORR, is the largest urban area with a population of approximately 165,000. The City of Oak Ridge has a population of approximately 27,000, and ORR is located approximately 4.8 km (three miles) from downtown Oak Ridge (DOE, 1995a).

The climate is characterized by warm and humid summers and typically cool winters. Prevailing winds, which are controlled largely by rigid topography, are northeasterly or southwesterly in direction. ORR has a comprehensive air pollution control and monitoring system, ensuring the ambient air meets air quality standards.

The Clinch River, which is regulated by a series of dams, provides the regional control of both surface water and groundwater flow from ORR. Radiation levels in the region are similar to national average background doses, except in two stretches of bank along the Clinch River and Poplar Creek.

The ORR was placed on the National Priorities List (NPL) in December 1989, making the site subject to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

The Y-12 Plant is located on the eastern boundary of ORR (Figure F.1.1-2). Prior to 1992, the primary mission of the Y-12 Plant was to produce and manufacture nuclear weapons components. With the end of the Cold War, the mission of the Y-12 Plant has been modified to include storage of nuclear materials; dismantlement of nuclear weapons components; transfer of technology; decontamination and decommissioning of selected

facilities; and environmental restoration activities (DOE, 1995a).

In addition to the Y-12 Plant, other ORR primary facilities are the Oak Ridge National Laboratory (ORNL) and the K-25 Site. The basic mission of ORNL is to perform energy-related research.

Major programs have included fission and fusion energy research; materials research; biological and ecological effects of radiation; fuel cycle and isotopes research; isotope production; and chemical engineering. The K-25 Site, previously referred to as the Oak Ridge Gaseous Diffusion Plant, is involved in incineration of wastes that are under regulation by the Toxic Substances Control Act (TSCA); low-level radioactive waste management; and environmental restoration (DOE, 1995a).

## F.2 Blending Sites

### F.2.1 B&W Lynchburg

The B&W Lynchburg site is an operating company of McDermott, Inc., a subsidiary of McDermott International, Inc. It encompasses 2.1 square km (0.82 square miles) in the northeastern corner of Campbell County, Virginia, and is bordered by an oxbow of the James River on the northern, eastern, and western sides (Figures F.2.1-1 and F.2.1-2). This site is located in a generally rural area, consisting primarily of rolling hills with gentle slopes, farmland, and woodlands (B&W, 1991).

In this region, approximately 20 percent of the northern areas of Campbell County are located within the James River Watershed. The James River, which the U.S. Army Corps of Engineers estimates produces a discharge rate of 10,700 m<sup>3</sup>/s (378,000 ft<sup>3</sup>/s) at the site, is the major water resource.

Based on 1980 Census data, the estimated residential population within a 80 km (50 mile) radius of the B&W Lynchburg site is approximately 520,000. The City of Lynchburg, located approximately eight km (five miles) east of the B&W site, is the largest local population center with an estimated population of approximately 66,000 (B&W, 1991).

The B&W Lynchburg site has an unusual microclimate that does not mirror that of Lynchburg in terms of wind speeds, directions, or stabilities. The unusual temperature conditions and reduced air stability is a result of the river which bounds three sides of the site. The Virginia Central Valley Region, which includes the greater Lynchburg area and the facility site, meets or exceeds all national ambient air quality standards. External radiation levels in the Lynchburg area are mainly due to natural sources of cosmic and terrestrial origin.

Three facilities are located at the B&W Lynchburg site: the Naval Nuclear Fuel Division (NNFD); the NNFD Research Laboratory; and the B&W

Fuel Company (BWFC). The NNFD and the Research Laboratory support the U.S. Navy propulsion program. The basic mission is to fabricate highly enriched nuclear fuel elements and assemble these elements into complete reactor cores for the U.S. Navy. Additionally, NNFD activities include fabricating and manufacturing fuel elements for research and test activities, and recovering uranium from scrap materials and zero power fuel elements (B&W, 1991).

#### F.2.2 NFS Erwin

NFS Erwin, a privately-owned facility, is located on a 0.23 square km (0.09 square mile) site in Unicoi County, approximately 0.8 km (0.5 miles) southwest of the city limits of Erwin, Tennessee (Figures F.2.2-1 and F.2.2-2). The area adjacent to NFS Erwin consists primarily of

residential, industrial, and commercial areas. A small agricultural area is located northeast of the site. Three natural water resources exist in the vicinity of the NFS Erwin site: the Banner Spring Branch, Martin Creek, and the Nolichucky River.

Based on 1980 Census data, the estimated population within a 80 km (50 mile) radius of the site is approximately 921,000. The total population of Unicoi County is approximately 16,400 and the majority of these people (approximately 10,000) are located in the City of Erwin and surrounding communities. Johnson City, approximately 27.4 km (17 miles) north of the site, has a population of approximately 84,200 (NFS, 1991).

The NFS Erwin site is characterized by warm, humid summers and relatively mild winters. Winds in the vicinity of the site generally emanate from the south 60 percent of the time and from the north to north-northwest 20 percent of the time. Air quality in Unicoi County meets or exceeds the national and state standards for particulate matter, sulfur dioxide, and carbon monoxide but violates standards for ozone and nitrogen dioxide, as does air quality throughout Tennessee. External radiation levels in the vicinity of the NFS Erwin site are due mainly to natural sources of cosmic and terrestrial origin.

The primary mission of NFS Erwin is to convert HEU into a classified product used in the fabrication of nuclear fuel. Additionally, NFS Erwin is involved in research on and development of improved manufacturing techniques; recovery and purification of scrap uranium; removal and/or recovery of materials generated in manufacturing waste streams to prevent environmental degradation; and operation of a chemistry laboratory (NFS, 1991).

### F.3 Other Sites Involved in the Proposed action

#### F.3.1 USEC Sites

The Energy Policy Act of 1992, passed by Congress in November of that year, established the government-owned USEC to take responsibility for the uranium enrichment from DOE beginning July 1, 1993. USEC has responsibility for two gaseous diffusion uranium enrichment plants located in Portsmouth, Ohio, and Paducah, Kentucky. USEC leases equipment, supplies, materials, and facilities from DOE to enrich uranium. The NRC is scheduled to assume direct oversight of USEC operations in October 1995, through a unique certification and licensing arrangement. In the interim, and until certification is granted, DOE is providing oversight of activities, regulated by the NRC (DOE, 1994c).

#### F.3.1.1 USEC Paducah

The DOE activities at USEC Paducah are managed for DOE by Martin Marietta Energy Systems, Inc. It is located in southwestern Kentucky, approximately 64.4 km (40 miles) east of Cape Girardeau, Missouri, 177 km (110 miles) southwest of Evansville, Indiana, and 16 km (ten miles) west of Paducah, Kentucky, near the Ohio River (Figure F.3.1.1-1). The plant occupies three square km (1.2 square miles) located on a 13.7 square km (5.3 square mile) tract in McCracken County, which was previously part of the Kentucky Ordnance Works TNT Plant. The population of McCracken County is approximately 60,000. The current population within a 80 km (50 mile) radius of the site is approximately 300,500 (DOE 1994c).

The area surrounding USEC Paducah is mostly rural, with residents and farms located in all directions. The north, east, and west boundaries are defined by the West Kentucky Wildlife Management Area on land that is managed by the Kentucky Department of Fish and Wildlife Resources. Also adjoining the northern boundary is the Tennessee Valley Authority Shawnee Steam Plant (DOE, 1994c).

The site is characterized by warm summers and moderately cold winters. Wind in the vicinity of the site emanates from the south-southwest. USEC Paducah is situated in the western part of the Ohio River Basin, approximately 24 km (15 miles) from the confluence of the Ohio River with the Tennessee River upstream of the site, and approximately 56 km (35 miles) from the confluence of the Ohio River and the Mississippi River downstream of the site. The ambient air monitoring network at the site ensures that air quality meets or exceeds standards for pollutants, including radioactive particulates. The radiation dose levels are nominal compared to the DOE annual dose limit. The major contributors of radiation is external radiation from and ingestion of sediment in the vicinity of the site.

The site was proposed for listing on the NPL in the Federal Register on May 10, 1993. The site is subject to CERCLA requirements.

The primary mission at USEC Paducah is the separation of uranium isotopes through gaseous diffusion. The process produces enriched uranium, which is used for nuclear fuel in commercial power plants.

#### F.3.1.2 USEC Portsmouth

The USEC Portsmouth site is located less than eight km (five miles) outside Piketon, Ohio, in the Ohio River Valley along the Scioto River in Pike County, approximately 32 km (20 miles) north of Portsmouth and 113 km (70 miles) south of Columbus. The plant occupies approximately two square km (0.8 square miles) of the 15 square km (5.8 square mile) DOE-owned complex (Figure F.3.1.2-1). In addition to the Scioto River, other water resources include Big Beaver Creek, Little Beaver Creek, and Big Run Creek. Based on 1990 Census data, Pike County has approximately 24,000 residents and the total population within 80 km (50 miles) of USEC Portsmouth is approximately 900,000 (DOE, 1994d).

South-central Ohio lies in the Appalachian foothills. The terrain varies from steep to gently rolling hills. The steep hills characteristically are densely forested, while the rolling hills provide marginal farmland. The Scioto Valley is farmed extensively, particularly with grain crops.

The USEC Portsmouth ambient air monitoring network ensures that air quality meets or exceeds standards, including radioactive particulate standards, and any problems that may arise would be detected before the proliferation of pollution. The radiation dose levels at the USEC Portsmouth site are well below the limit set by the EPA and DOE. USEC Portsmouth is not on the NPL, and environmental remediation activities at the site are monitored under the provisions of the Resource Conservation and Recovery Act (RCRA).

USEC Portsmouth has been operating since 1955 and its primary mission is to enrich uranium for national defense and commercial nuclear reactors. The main process at USEC Portsmouth is the separation of uranium isotopes through gaseous diffusion. This process produces enriched uranium which is used for nuclear fuel in commercial power plants. Until 1992, the plant also produced HEU for U.S. Navy nuclear reactors (DOE, 1994d).

#### F.3.2 GE Wilmington

GE Wilmington, owned and operated by GE Nuclear Energy Production, is located 9.7 km (six miles) north of Wilmington, North Carolina, in the Carolina Coastal Plain along the Cape Fear River, approximately 242 km (150 miles) southeast of Raleigh, North Carolina, and 16.1 km (ten miles) west of the Atlantic Ocean. The plant occupies 1.4 square km (0.5 square miles) on a 6.7 square km (2.6 square mile) tract of land in

New Hanover County (Figure F.3.2-1). The population of New Hanover County is 135,000, with 62,000 residing within the Wilmington city limits. The current population within a 80 km (50mile) radius of the site is approximately 200,000 (GE, 1995).

The area surrounding GE Wilmington is mostly rural, with some farms and single-family residences located along U.S. Highway 117. The land is mostly level with some gently rolling hills and is crossed by many small streams and marshy areas. The southeast portion of the site contains 0.7 square km (0.3 square miles) of land classified as swamp forest. The site is surrounded by undeveloped forest lands except on the west and east, where it is bordered by the Cape Fear River and U.S. Highway 117, respectively (GE, 1995).

GE Wilmington is licensed by the NRC to convert UF6 to uranium oxides and has been performing that task for over 25 years. GE Wilmington also develops and fabricates nuclear reactor fuel, fuel elements, fuel assemblies, and performs various research and development activities (GE, 1995).

#### Appendix G: RADTRAN Transportation Risk Analysis Methodology

The transportation risk analysis for this EA was performed using the RADTRAN 4 computer code, developed by Sandia National Laboratories, Albuquerque, New Mexico. RADTRAN calculates the collective dose from a postulated accident to exposed population segments (workers and the public). It produces conservative estimates (those that tend to overstate impacts) of integrated population radiation dose rates in a way that can be supported by available data. RADTRAN combines user-determined meteorological, demographic, transportation, packaging, and material factors with health physics data to calculate the expected radiological consequences for incident-free transportation and accidents involving radioactive material. User-assigned parameters are defined by

individual route segment links in conjunction with HIGHWAY, a highway routing data base (computerized road atlas), that currently describes over 386,400 km (240,000 miles) of major U.S. highways, including interstates. Environmental parameters that are quantified using values specific to each transportation link include transport distance, accident rates, and population density. Traffic densities are assessed at the recommended RADTRAN values.

The accident model in RADTRAN assigns accident probabilities to a set of accident categories from the lowest to the highest severity. The lowest severity category represents low magnitudes of crush force, accident impact velocities, fire duration, and puncture impact speed. The highest severity category represents a large crush force, high impact velocities, a 962 C (1800 F) fire lasting 1.5 hours, and a high-puncture-impact speed collision into the side of the vehicle to produce a hypothetical release of radioactive material. For conservatively assessing the risk, the bounding accident is the highest severity category accident used in the analysis and is associated with a probability of occurrence for each population density area (urban, suburban, and rural).

The Department has operated SSTs to transport radioactive materials for more than 119 million km (74 million miles) without an accident that resulted in a release of radioactive material. Accident probabilities for SST operations are lower than for commercial truck operations. However, to conservatively assess the probability of postulated accidents by SST, accident data from the DOT for the entire commercial shipping industry (i.e., accidents on interstate highways involving at least one commercial tractor-trailer, regardless of contents) were used.

Appendix H: Assessment for Transport by SST

The safeguards and security systems for SST transportation are designed to protect against sabotage, terrorism, and other adversarial actions. Since the RADTRAN model does not address terrorist attack scenarios, the Explosive Release Atmospheric Dispersal (ERAD) computer model was used by the Transportation Safeguards Division to analyze consequences due to attacks. The most immediate and severe threat to workers and members of the public from a terrorist attack by military-equipped forces is death or injury from weapons fire. It is quite likely that one or more DOE transportation workers (couriers), who are trained and responsible for protecting the shipments, would suffer fatalities during an attack. Depending on the proximity of members of the public to the shipment at the time the attack occurs, civilian casualties also may be expected from the weapons fire.

While the radiological hazard associated with weapons fire is substantially less than the physical hazard, it is possible for an accurately aimed, energetic projectile fired at an SST to cause a dispersal of HEU into the atmosphere. The effects of such a dispersal can be bounded. Based on tests done for the Nuclear Emergency Search Team program, the fraction of material dispersed would be less than five percent for this type of event. The bounding conditions for the postulated accident were as follows: the accident occurs in an urban area; there is maximum loading of the SST (equivalent to 1,000 kg of 93 percent enriched uranium); and, quiet nighttime meteorological conditions prevail, resulting in low dispersion of radioactive materials. Under these conditions, the area contaminated would be three square km (1.16 square miles), and the maximum individual dose would not be expected to exceed 30 mrem. The upper bound for the collective dose would be approximately 4,000 person-rem, possibly resulting in two excess latent cancer fatalities. The anticipated impacts due to weapons fire would be lower than the bounding case, resulting in a contaminated area of 1.5 square km (0.58 square miles), a maximum individual dose of five mrem, and either zero or one excess latent cancer fatality in the

collective population. The anticipated impacts are based on yearly average meteorological data. The threat analysis for SST shipments is discussed in more detail in the Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y-12 Plant (DOE, 1994a).

#### Appendix I: 6M, Type B Radioactive Materials Shipment Packaging Test Sequence

In addition to meeting standards demonstrating it can withstand normal conditions of transport without loss or dispersal of its radioactive contents, the model 6M, Type B packaging used for DOE shipments must survive certain severe hypothetical accident conditions that demonstrate resistance to impact, puncture, fire, and water submersion. Test conditions do not duplicate accident environments, but rather produce damage equivalent to extreme and unlikely accidents. The 6M, Type B packaging is judged as surviving extreme sequential testing if it retains all its contents except for minuscule allowable releases, and the dose rate outside the packaging does not exceed one rem/hr at a distance of one-m from the package surface. Drum sizes (outer package) can vary from 38 to 416 liters (ten to 110 gallons).

The complete sequence of tests is listed below:

\* Drop Test. A nine-m (30-ft) drop onto a flat, essentially unyielding, horizontal surface, striking the surface in a position for which maximum damage is expected.

\* Puncture Test. A one-m (40-in) drop onto the upper end of a 15-centimeter (cm) (six-in) diameter solid, vertical, cylindrical, mild steel bar mounted on an essentially unyielding, horizontal surface.

\* Thermal Test. An exposure for not less than 30 minutes to a heat flux not less than that of a radiation environment of 800 C (1475 F) with an emissivity coefficient of at least 0.9.

\* Water-Immersion Test. A subjection to water pressure equivalent to immersion under a head of water of at least 15-m (50-ft) for not less than eight hours.

The regulatory test conditions for the 6M, Type B packaging and other similar packagings are much more demanding than they might appear. For example, an impact on a very hard surface (desert caliche) at over 322 km (200 miles) per hour is not as likely to deform the packaging as would a drop of 9 m (30 ft) onto an unyielding target.

A typical 6M, Type B packaging approved for use by DOE is covered by Certificate of Compliance Number 9859, dated January 5, 1994.

The 6M, Type B packaging is made up of several component parts, each playing an integral engineered role in containment and confinement of the radioactive material being shipped. The applicable DOE Safety Analysis Report for Packaging provides additional detail that shows that the package provides a high level of public safety regardless of the accidental conditions it might encounter during transportation.

Although 6M, Type B packagings have been involved in severe accidents, the integrity of the packaging has never been compromised.

#### Appendix J: Graphics Depicting Transportation Packagings and Methods

The graphics included in this appendix depict some of the packagings and transportation methods that would be used to safely contain and transport the Kazakhstan-origin HEU and UF6 blending stock between the sites involved in the Proposed Action.

