Enclosure F

1 – NFS Wetland Area

2 – NFS Site

3 – Photos of Wetland A

4 – Photos of Wetland B

5 – Photos of Wetland A and Adjacent Area

6 – Photos of Wetland B and Adjacent Area

7 – Photos of Wetland A Soil

8 – Photos of Wetland B Soil

9 – Department of the Army Letter to B.M. Moore

Figure 1

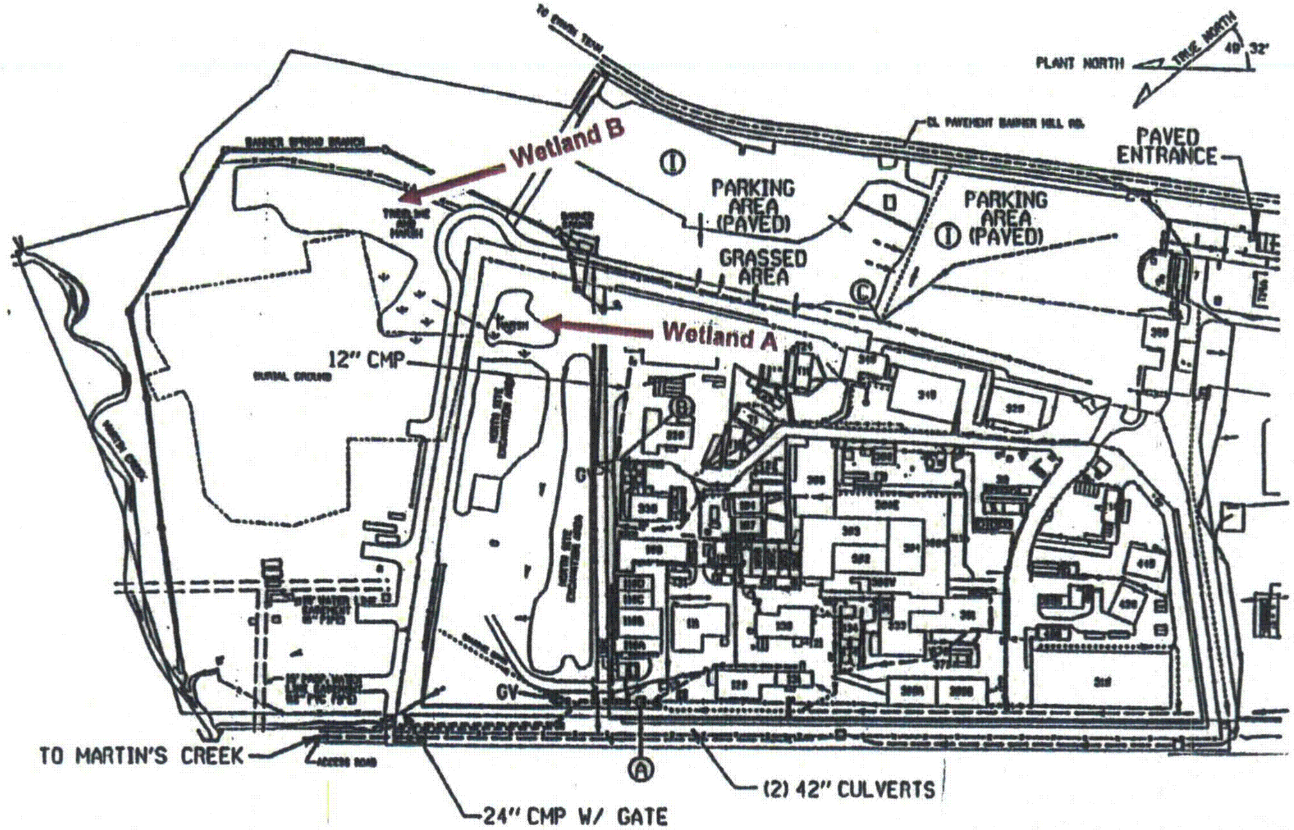
NFS Wetland Area

Note:

A=0.17 Acre

B=0.18 Acre

Figure 2
NFS Site



LEGEND

- UNDERGROUND
- OPEN TRENCH
- CORRUGATED METAL PIPE (CMP)-SLOTTED PIPE OR "ACO" CHANNEL
- SURFACE RUNOFF
- CORRUGATED PLASTIC ABOVE GROUND PIPE
- Ⓐ Ⓑ Ⓒ STORMWATER OUTFALLS
- Ⓘ IMPERVIOUS AREA: IMPERVIOUS AREAS ALSO INCLUDE ALL PAVED AREAS BETWEEN BUILDINGS (SOUTH OF BLDG. 410 AND IMPOUNDMENTS 1 & 2).
- GV GATE VALVE LOCATION

OFFICIAL USE ONLY

BY	DATE	REVISION	LET
		UPDATED FACILITY LAYOUT TO VERSION DATED 07-01-08	HH
	12-18-07	UPDATED FACILITY LAYOUT	GG
	03-07-07	UPDATED FACILITY LAYOUT	FF
	2-18-93	ORIGINAL ISSUE	—

NFS NUCLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

SURFACE DRAINAGE

SCALE 1"=200' DATE 07-09-08

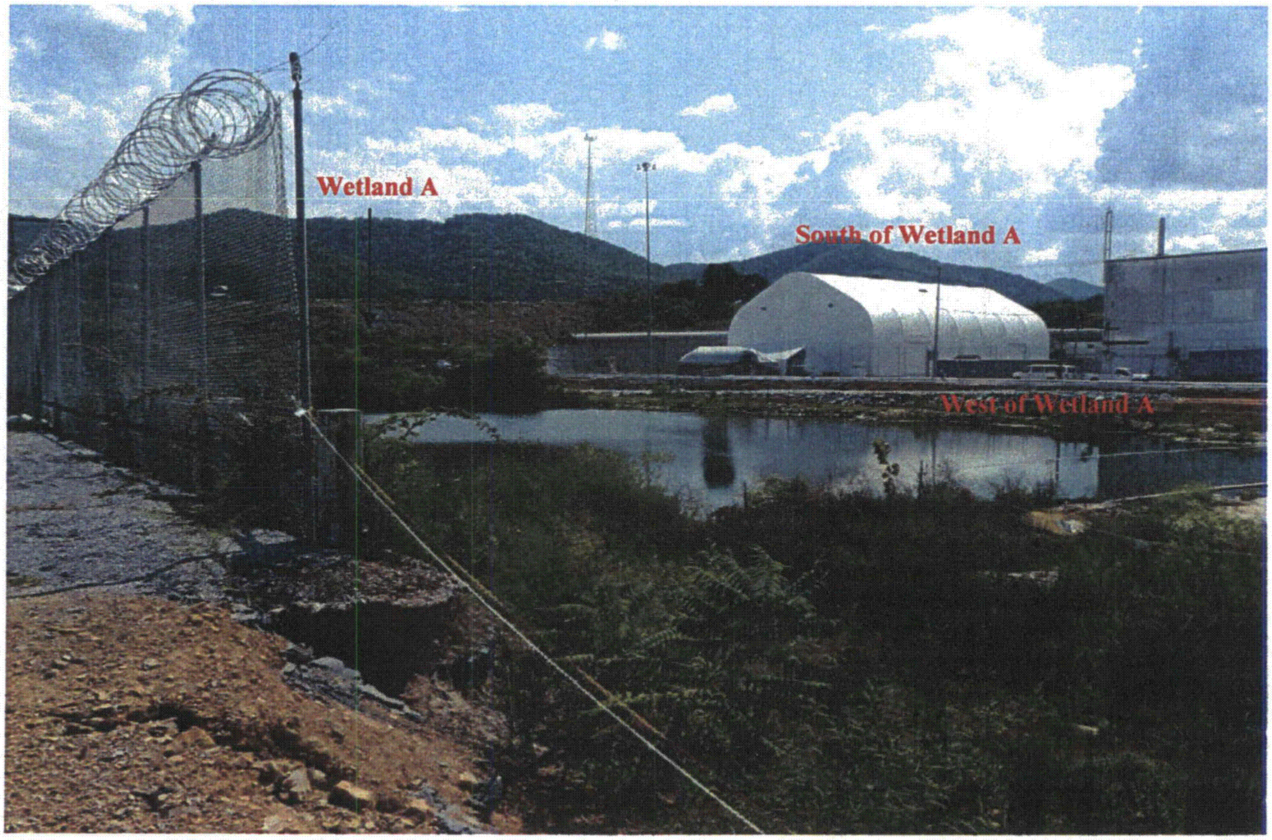
000-C0074-B

Photograph 1
Wetland A

4/29/09

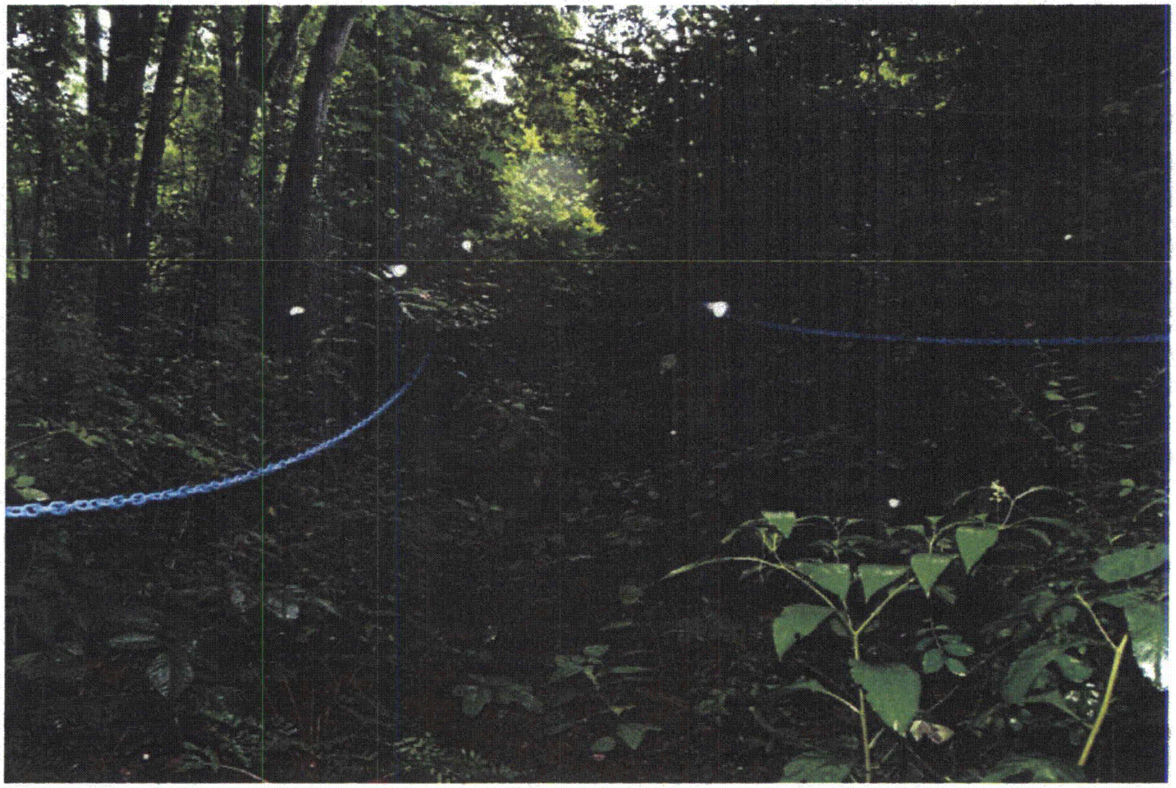
4/29/09

Photograph 2
Wetland A & Adjacent Area

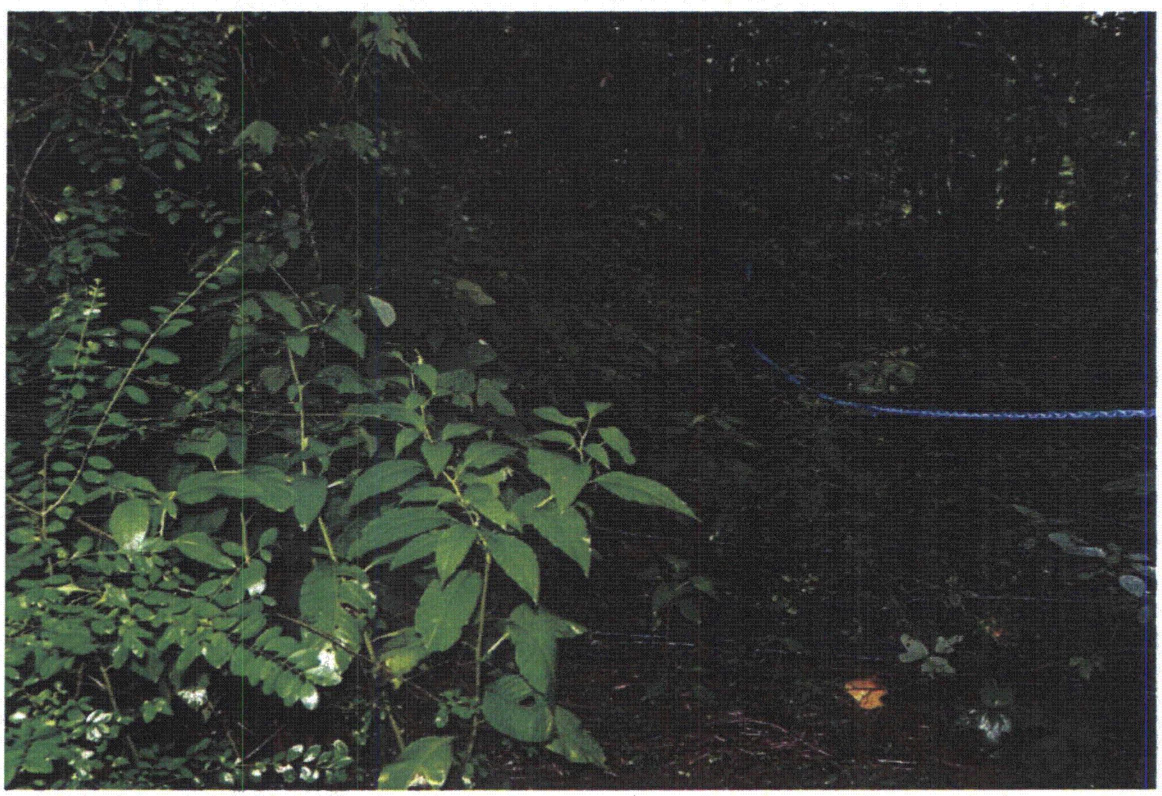


8/28/09

Photograph 3
Wetland B

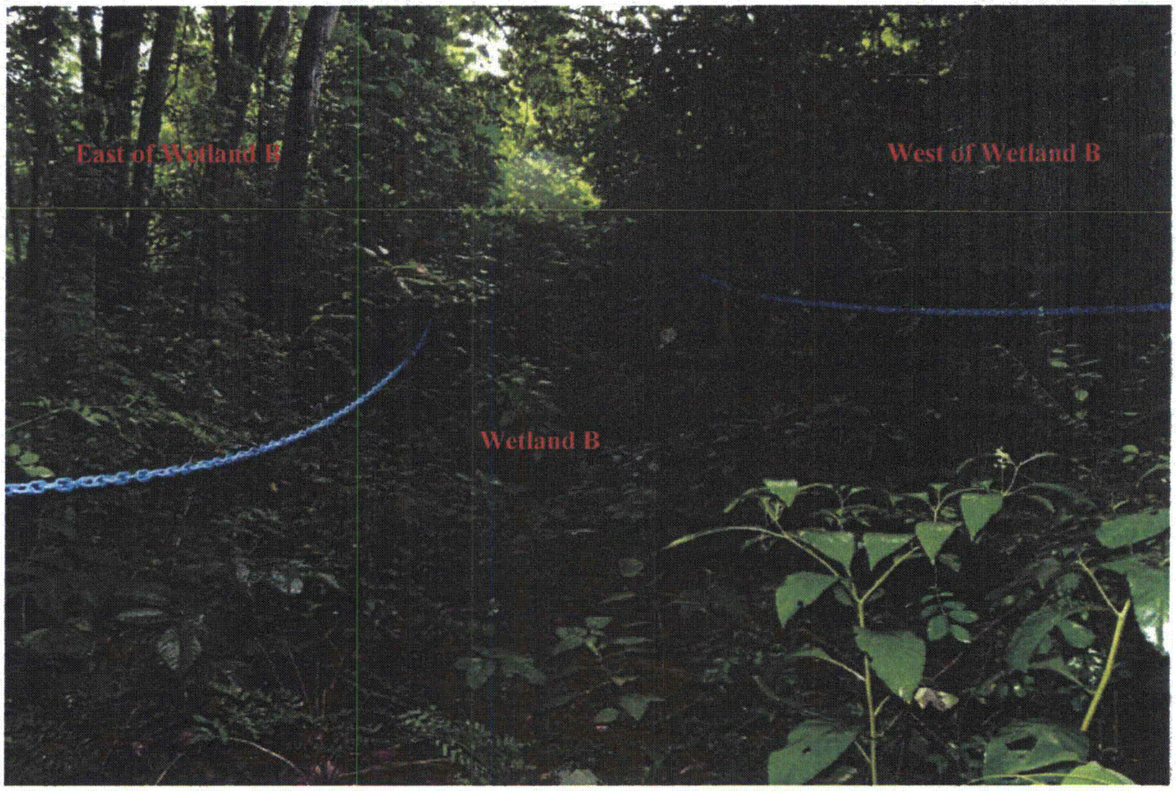


8/3/09

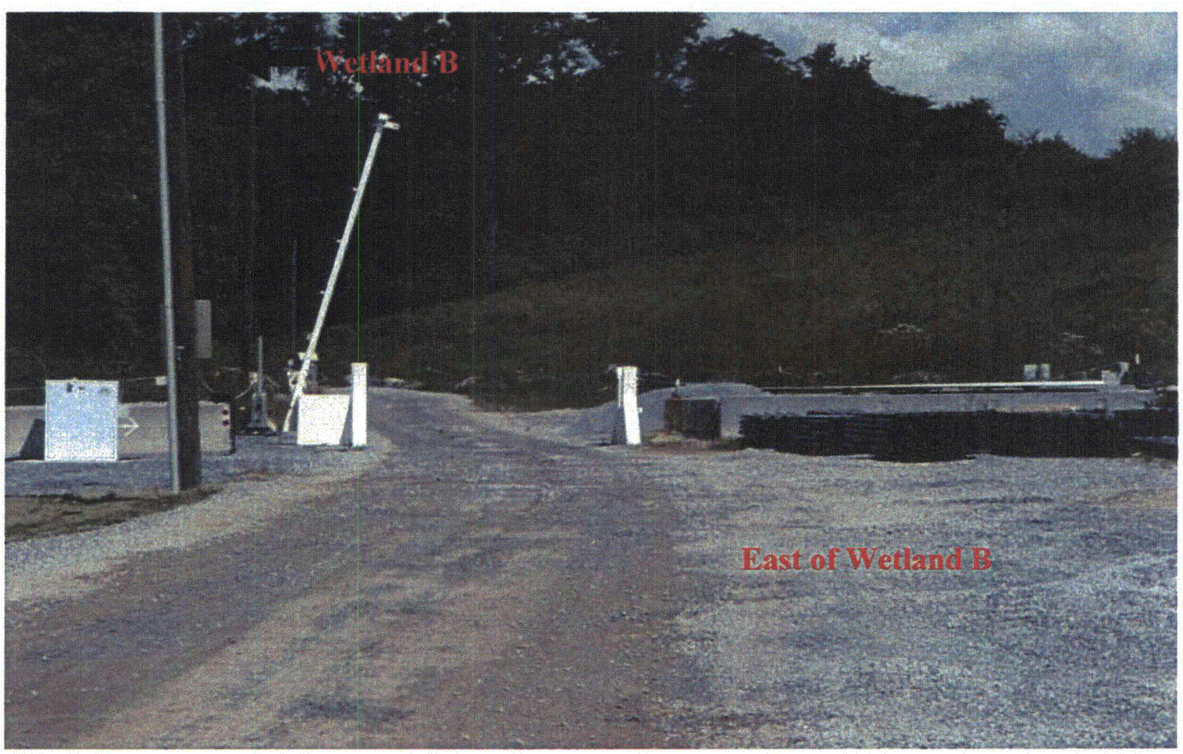


8/3/09

Photograph 4
Wetland B & Adjacent Areas



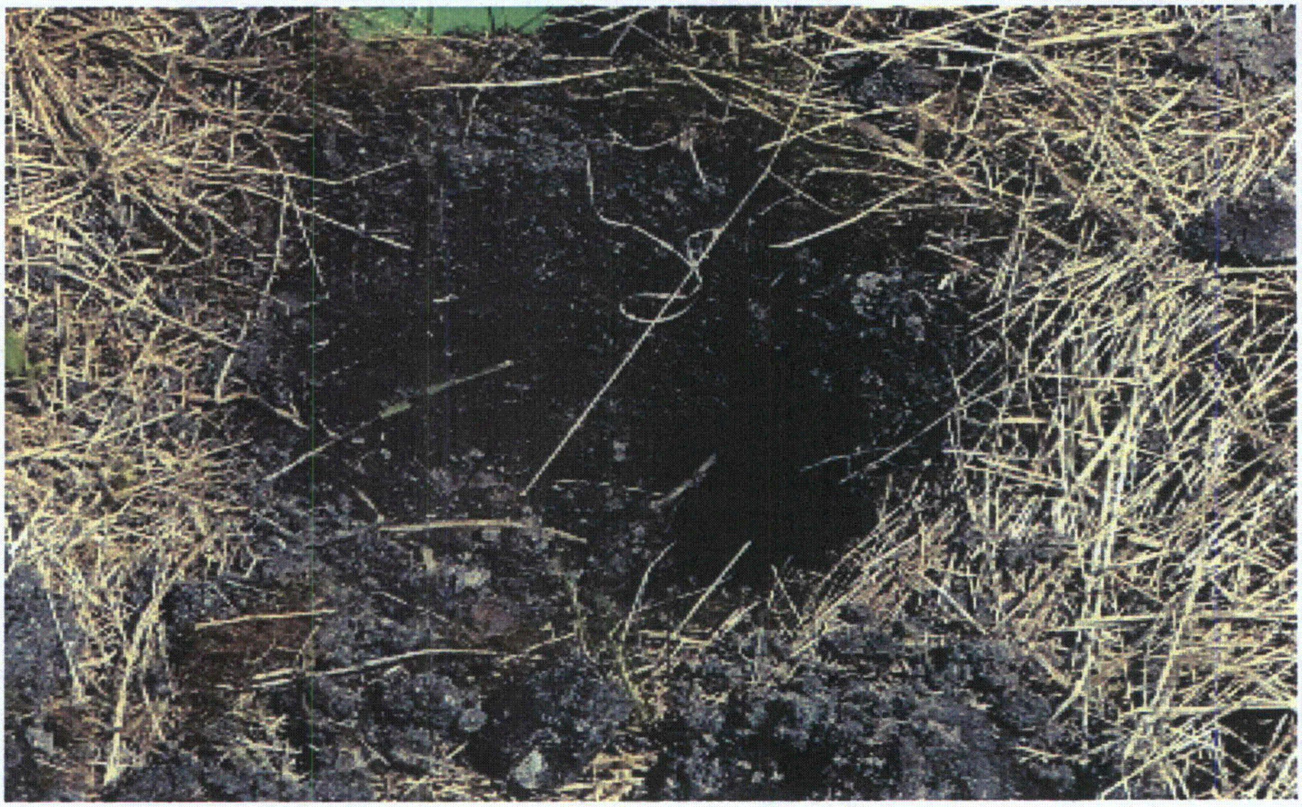
8/3/09



8/3/09

Picture 5
Wetland A Soil

4/29/09



4/29/09

Picture 6
Wetland B Soil

7/20/07

7/20/09

Department of Energy
Washington, DC 20585

June 1996

Dear Interested Party:

This Summary of the *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* is enclosed for your information. The entire document is available upon request and may be obtained by calling (202) 586-4513. This document has been prepared in accordance with the National Environmental Policy Act, and reflects comments received on an earlier draft released in October 1995 for review by the public. The document presents the analyses of the environmental impacts of alternatives for the disposition of weapons-usable highly enriched uranium (HEU) that has been declared surplus to national defense needs.

The Department proposes to eliminate the proliferation threat of surplus HEU by blending it down to low enriched uranium (LEU), which is not weapons-usable. The EIS assesses the disposition of a nominal 200 metric tons of surplus HEU. The Preferred Alternative is, where practical, to blend the material for sale as LEU and use over time, in commercial nuclear reactor fuel to recover its economic value. Material that cannot be economically recovered would be blended to LEU for disposal as low-level radioactive waste.

In addition to the "No Action" Alternative, the HEU EIS analyzes four alternatives that represent different proportions of the resulting LEU being used in commercial reactor fuel or disposed of as waste. It analyzes the blending of HEU using three different processes at four potential sites. The transportation of materials is also analyzed.

A public comment period for the HEU Draft EIS was held from October 27, 1995 to January 12, 1996. Comments were received by letter, fax, electronic mail, and telephone recording. In addition, public workshops on the EIS were held in Knoxville, Tennessee and Augusta, Georgia in November, 1995. All comments were considered by the Department in preparing the Final EIS and are presented along with responses in Volume II of the document. A Record of Decision on surplus HEU disposition will be issued no sooner than 30 days following publication of the Notice of Availability of the HEU Final EIS in the Federal Register.

The Department appreciates the participation of outside organizations and the general public in the review of this document.

Sincerely,

J. David Nulton

J. David Nulton, Director
Office of NEPA Compliance and Outreach
Office of Fissile Materials Disposition

Printed with soy ink on recycled paper

COVER SHEET

Lead Federal Agency: U.S. Department of Energy (DOE)
Cooperating Federal Agency: U.S. Environmental Protection Agency

TITLE:

Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement (DOE/EIS-0240)

CONTACTS:

For further information on this environmental impact statement (EIS), call (202) 586-4513 or fax (202) 586-4078 or contact:
Mr. J. David Nulton
Director
Office of NEPA Compliance and Outreach
Office of Fissile Materials Disposition
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585
(202) 586-4513

For further information on the U.S. Department of Energy/*National Environmental Policy Act* (NEPA) process, call (800) 472-2756 or contact:
Ms. Carol Borgstrom
Director
Office of NEPA Policy and Assistance (EH-42)
Office of Environment, Safety and Health
U.S. Department of Energy
1000 Independence Ave., SW
Washington, D.C. 20585
(202) 586-4600

ABSTRACT:

This document assesses the environmental impacts that may result from alternatives for the disposition of U.S.-origin weapons-usable highly enriched uranium (HEU) that has been or may be declared surplus to national defense or defense-related program needs. In addition to the No Action Alternative, it assesses four alternatives that would eliminate the weapons-usability of HEU by blending it with depleted uranium, natural uranium, or low-enriched uranium (LEU) to create LEU, either as commercial reactor fuel feedstock or as low-level radioactive waste. The potential blending sites are DOE's Y–12 Plant at the Oak Ridge Reservation in Oak Ridge, Tennessee; DOE's Savannah River Site in Aiken, South Carolina; the Babcock & Wilcox Naval Nuclear Fuel Division Facility in Lynchburg, Virginia; and the Nuclear Fuel Services Fuel Fabrication Plant in Erwin, Tennessee. Evaluations of impacts at the potential blending sites on site infrastructure, water resources, air quality and noise, socioeconomic resources, waste management, public and occupational health, and environmental justice are included in the assessment. The intersite transportation of nuclear and hazardous materials is also assessed. The Preferred Alternative is blending down as much of the surplus HEU to LEU as possible while gradually selling the commercially usable LEU for use as reactor fuel. DOE plans to continue this over an approximate 15- to 20-year period, with continued storage of the HEU until blend down is completed.

PUBLIC INVOLVEMENT:

The Department of Energy issued a HEU Draft EIS on October 27, 1996, and held a formal public comment period on the HEU Draft EIS through January 12, 1996. In preparing the HEU Final EIS, DOE considered comments received via mail, fax, electronic bulletin board (Internet), and transcribed from messages recorded by telephone. In addition, comments and concerns were recorded by notetakers during interactive public hearings held in Knoxville, Tennessee, on November 14, 1995, and Augusta, Georgia, on November 16, 1995. These comments were also considered during preparation of the HEU Final EIS. Comments received and DOE's responses to those comments are found in Volume II of the EIS.

DOE/EIS-0240-S

Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement

Summary

United States Department of Energy
Office of Fissile Materials Disposition

June 1996

Department of the Army Letter to B.M. Moore

dated March 24, 2009

15N100071
GOV010201
2010-00144
BANNER SPRING
WETLANDS
ACTION/RESPONSE: CSM
BY: 6/18/10
DIST: DBA, MPE, BMM
RPD, CSM, RGH
JMG, DMG, JEG
GLD, WRH, RAB

RECEIVED
MAR 26 2010
REGULATORY CONTROL

DEPARTMENT OF THE ARMY
NASHVILLE DISTRICT, CORPS OF ENGINEERS
Regulatory Branch
3701 Bell RD
Nashville, TN 37214

March 24, 2009

Regulatory Branch

SUBJECT: File No. 2010-00144; Proposed Excavation/Filling of Two Wetland Areas Adjacent to Banner Spring Branch (Nolichucky River Tributary at Mile 94.9R), in Erwin, Unicoi County, Tennessee

Ms. B. Marie Moore
Safety and Regulatory
Nuclear Fuel Services, Inc.
1205 Banner Hill Road
Erwin, Tennessee 37650

Dear Ms. Moore:

This is in response to your January 28, 2010, application for a Department of the Army (DA) permit to excavate and fill two wetlands, A (0.17 acres) and B (0.18 acres), at the subject location. You have indicated that you will mitigate for the 0.35 acres of permanent wetland impacts by purchasing 0.70 acres (2:1 ratio) of available credits at the Shady Valley Wetland Mitigation Bank. Your application has been assigned File No. 2010-00144, which should be referred to in all future correspondence with this office.

In accordance with your request, this is to inform you that the proposed activity is authorized by existing Nationwide Permit (NWP) 38 [March 12, 2007, Federal Register, Reissuance of Nationwide Permits; Notice (72 FR 11092)].

For the above authorization to be valid, the proposed work must be accomplished in accordance with the enclosed plans (Exhibits A - D), NWP Conditions (Exhibit E), and Activity-Specific Conditions (Exhibit F). If you fail to comply with any of the permit's terms and conditions, this authorization may be modified, suspended, or revoked and an individual permit may be required pursuant to 33 CFR 330.5.

In addition to the enclosed general and activity-specific conditions, the following special condition must also be met:

• Prior to impacting the wetlands, or no later than 90 days from the date of this permit verification (whichever comes first), you must furnish this office written evidence of your purchase of credits at the Shady Valley Wetland Mitigation Bank.

This verification will be valid until March 18, 2012, unless the NWP authorization is modified, suspended, or revoked. If the work has not been completed by that time, you should contact this office to obtain verification that the permit is still valid.

As soon as the authorized work has been completed **and** all the permit conditions have been met (including any required mitigation), you must sign the enclosed "Compliance Certification" and send it back to the Corps office checked on the form (Exhibit G).

You are responsible for obtaining any other federal, state, and/or local approvals that may be required for the activity. We understand that the Tennessee Department of Environment and Conservation, Division of Water Pollution Control, issued you a water quality certification for this action on February 24, 2010. Consequently, the proposed work must be constructed in accordance with all the conditions of the state certification. In addition, you must comply with any applicable state or local FEMA-approved floodplain management requirements.

If changes in the location or plans of the proposed work are necessary, revised plans should be submitted promptly to this office. No deviation should be made in the approved plans without first obtaining approval from this office.

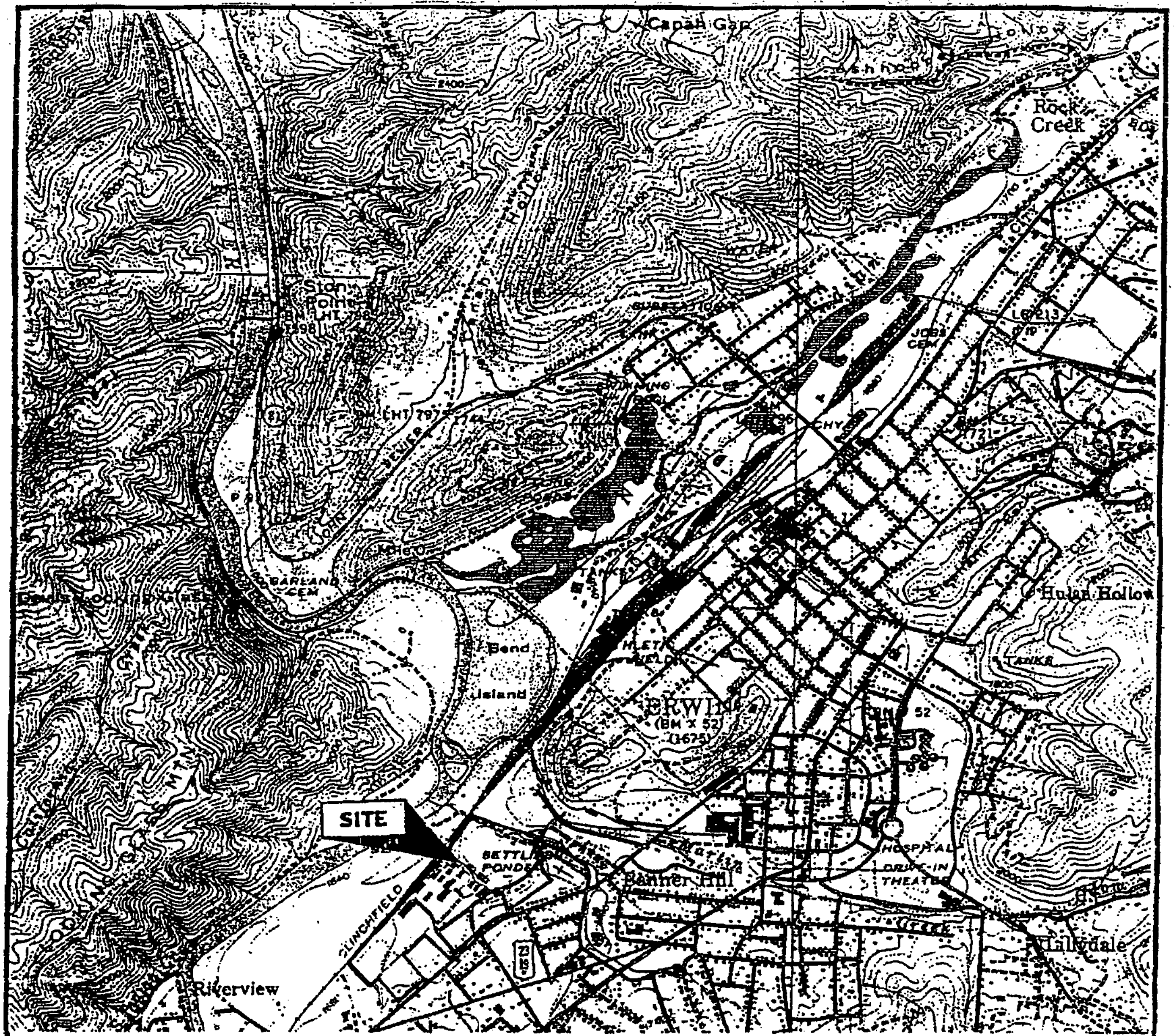
Sincerely,

J. Ruben Hernandez
Project Manager
Operations Division

Enclosures

Figure 1

USGS Topographical Map of NFS North Site



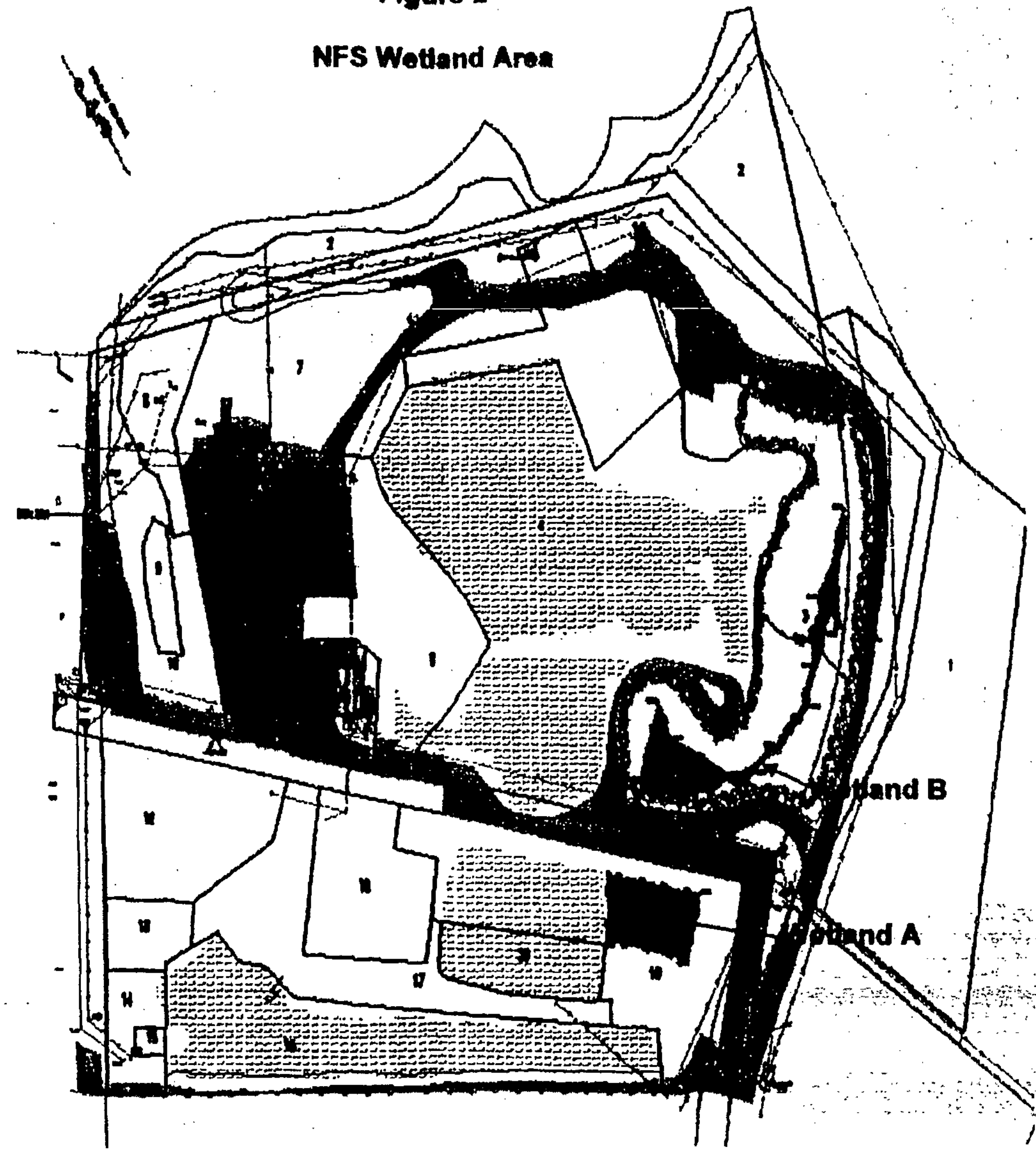
Property: **Nuclear Fuel Services, Inc.**
1205 Banner Hill Road, Erwin, Tennessee 37650
Map: USGS Quard: Erwin, Tennessee (199 NW)
Map Scale: 1= 2000

EXHIBIT A
FILE 2010-00144
24 MAR 10

EXHIBIT B
FILE 2010-00144
24MAR10

Figure 2

NFS Wetland Area



Note:

A=0.17 Acre

B=0.18 Acre

FIGURE 3
NFS SITE

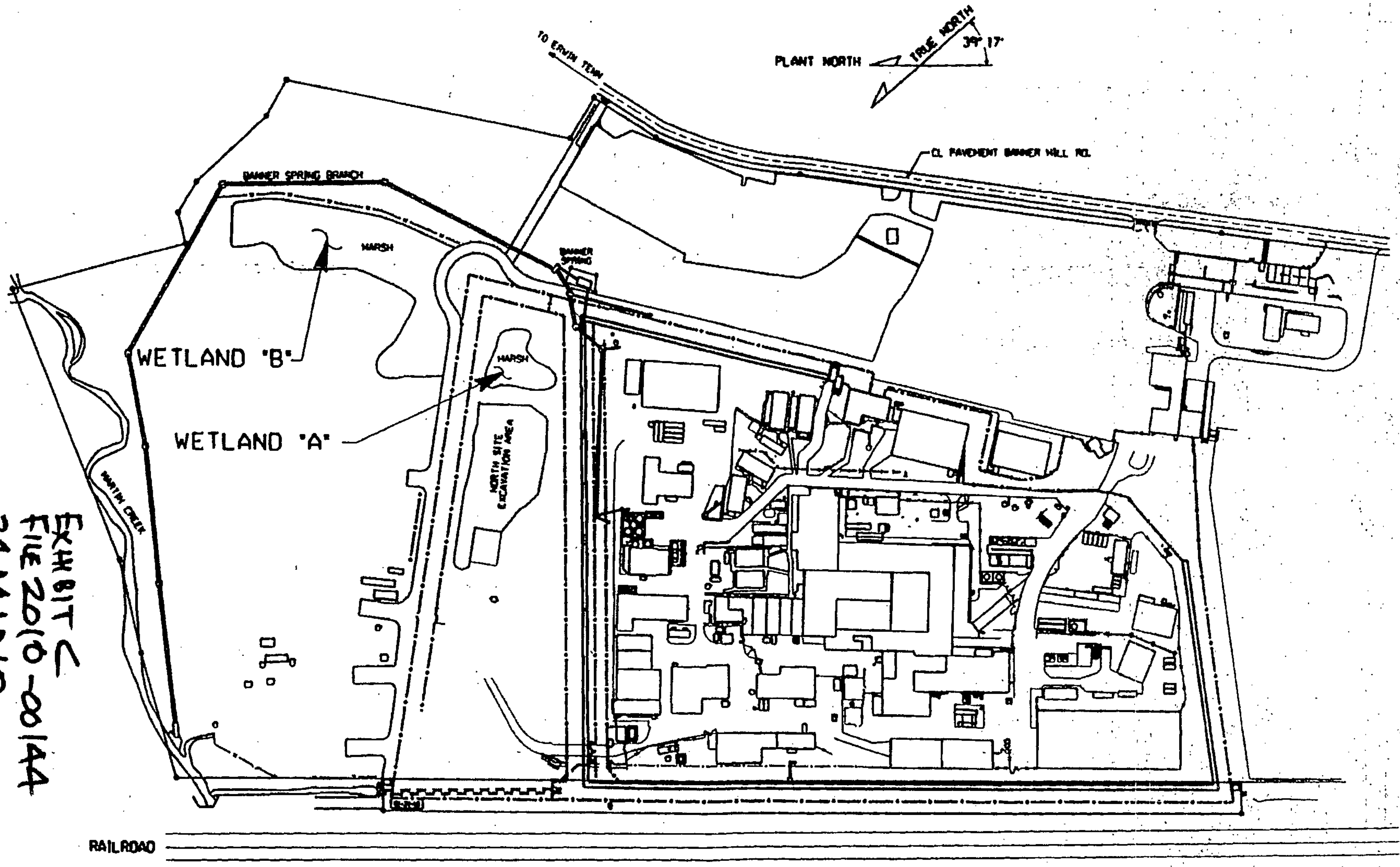


EXHIBIT C
FILE 2010-00144
24 MAR 10

COPIED FROM 880-C0040-0

Figure 4
NFS North Site

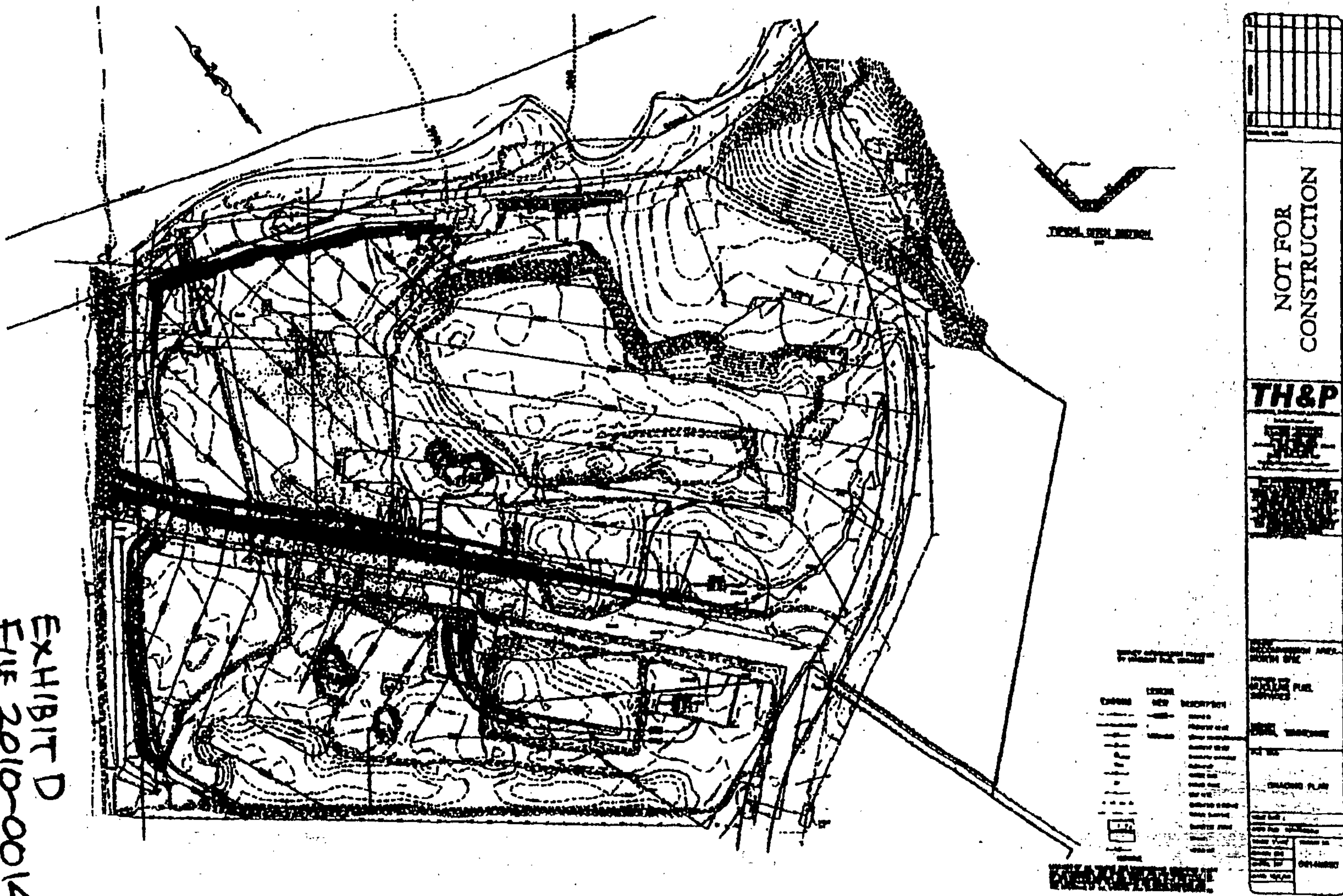


EXHIBIT D
FILE 2010-00144
24 MAR 10

EXHIBIT E
FILE 2010-00144
24MAR10

US Army Corps of Engineers
Nashville District

Nationwide Permit Conditions

2007

The following General Conditions must be followed in order for any authorization by NWP to be valid:

1. Navigation. (a) No activity may cause more than a minimal adverse effect on navigation. (b) Any safety lights and signals prescribed by the US Coast Guard, through regulations or otherwise, must be installed and maintained at the permittee's expense on authorized facilities in navigable waters of the US. (c) The permittee understands and agrees that, if future operations by the US require the removal, relocation, or other alteration, of the structure or work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, the permittee will be required, upon due notice from the Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the US. No claim shall be made against the US on account of any such removal or alteration.

2. Aquatic Life Movements. No activity may substantially disrupt the necessary life cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

3. Spawning Areas. Activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., through excavation, fill, or downstream smothering by substantial turbidity) of an important spawning area are not authorized.

4. Migratory Bird Breeding Areas. Activities in waters of the US that serve as breeding areas for migratory birds must be avoided to the maximum extent practicable.

5. Shellfish Beds. No activity may occur in areas of concentrated shellfish populations, unless the activity is related to a shellfish harvesting activity authorized by NWP 4 and 48.

6. Suitable Material. No activity may use unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.). Material used for construction or discharged must be free from toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act).

7. Water Supply Intakes. No activity may occur in the proximity of a public water supply intake, except where the activity is for the repair or improvement of public water supply intake structures or adjacent bank stabilization.

8. Adverse Effects from Impoundments. If the activity creates an impoundment of water, adverse effects to the aquatic system due to accelerating the passage of water, and/or restricting its flow must be minimized to the maximum extent practicable.

9. Management of Water Flows. To the maximum extent practicable, the preconstruction course, condition, capacity, and location of open waters must be maintained for each activity, including stream channelization and storm water management activities, except as provided below. The activity must be constructed to withstand expected high flows. The activity must not restrict or impede the passage of normal or high flows, unless the primary purpose of the activity is to impound water or manage high flows. The activity may alter the preconstruction course; condition, capacity, and location of open waters if it benefits the aquatic environment (e.g. stream restoration or relocation activities).

10. Fills Within 100-Year Floodplains. The activity must comply with applicable FEMA-approved state or local floodplain management requirements.

11. Equipment. Heavy equipment working in wetlands or mudflats must be placed on mats, or other measures must be taken to minimize soil disturbance.

12. Soil Erosion and Sediment Controls. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the US during periods of low-flow or no-flow.

13. Removal of Temporary Fills. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations and revegetated, as appropriate.

14. Proper Maintenance. Any authorized structure or fill shall be properly maintained, including maintenance to ensure public safety.

15. Wild and Scenic Rivers. No activity may occur in a component of the National Wild and Scenic River System, or in a river officially designated by Congress as a "study river" for possible inclusion in the system while the river is in an official study status, unless the appropriate Federal agency with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, US Forest Service, US Fish and Wildlife Service).

16. Tribal Rights. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

17. Endangered Species. (a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or is located in the designated critical habitat and shall not begin work on the activity until notified by the District Engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that may affect Federally-listed species or designated critical habitat, the notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. As a result of formal or informal consultation with the FWS, the District Engineer may add species-specific regional endangered species conditions to the NWP.

(b) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the USFWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the USFWS and NMFS or their World Wide Webpages at http://www.fws.gov/ and http://www.noaa.gov/fisheries.htmlrespectively.

18. Historic Properties. No activity which may affect historic properties listed or eligible for listing, in the National Register of Historic Places is authorized, until the District Engineer has complied with the provisions of 33 CFR Part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office Officer or Tribal Historic Preservation Officer, as appropriate, and the National Register of Historic Places (see 33 CFR 330.4(g)). For activities that may affect historic properties listed in, or eligible for listing in, the National Register of Historic Places, the notification must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property. Prospective permittees should be aware that section 110k of the NHPA (16 USC 470h–2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur.

19. Designated Critical Resource Waters. Critical resource waters including state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the district engineer after notice and opportunity for public comment. The district engineer may also designate additional critical resource waters after notice and opportunity for comment. (a) Discharges of dredged or fill material into waters of the US are not authorized by NWP 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, 44, 49, and 50 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters. (b) For NWP 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with general condition 27, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The district engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

20. Mitigation. The activity must be constructed to avoid and minimize adverse effects, both temporary and permanent, to waters of the US to the maximum extent practicable at the project site (i.e. on site). Mitigation in all its forms (avoiding, minimizing, rectifying, reducing, or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

21. Water Quality. The activity must comply with case specific conditions added by the Corps or by the state, Indian Tribe, or USEPA in its section 401 Water Quality Certification. Where States and authorized Tribes, or EPA where applicable, have not previously certified compliance of an NWP with CWA Section 401, individual 401 Water Quality Certification must be obtained or waived (see 33 CFR 330.4(c)). The district engineer or State or Tribe may require additional water quality management measures to ensure that the authorized activity does not result in more than minimal degradation of water quality.

22. Coastal Zone Management. (Not applicable in Nashville District.)

23. Regional and Case-By-Case Conditions. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state, Indian Tribe, or U.S. EPA in its section 401 Water Quality Certification.

24. Use of Multiple Nationwide Permits. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the US authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit. For example, if a road crossing over tidal water is constructed under NWP14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the US for the total project cannot exceed 1 3-acre.

25. Transfer of Nationwide Permit Verifications. If the permittee sells the property associated with NWP verification, the permittee may transfer the NWP verification to the new owner by submitting a letter to the appropriate Corps district office to validate the transfer. A copy of the NWP verification must be attached to the letter, and the letter must contain the following statement: When the structures or work authorized by this NWP are still in existence at the time the property is transferred, the terms and conditions of this NWP, including any special conditions, will continue to be binding on the new owner(s) of the property. To validate the transfer and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below:

____________________________ ______________________

Transferee Date

26. Compliance Certification. Every permittee who has received a Nationwide permit verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification form is included with this verification.

27. Pre-Construction Notification. N/A as a permit condition for this verification letter. (For full text of this condition, refer to page 11194 of the *Federal Register*, Vol. 72, No. 47, Monday, March 12, 2007 at http://www.usace.army.mil/inet/functions/cw/cecwo/reg/.

28. Single and Complete Project. The activity must be a single and complete project. The same NWP cannot be used more than once for the same single and complete project.

Further Information:

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.
2. NWPs do not obviate the need to obtain other Federal, state, or local permits, approvals, or authorizations required by law.
3. NWPs do not grant any property rights or exclusive privileges.
4. NWPs do not authorize any injury to the property or rights of others.
5. NWPs do not authorize interference with any existing or proposed Federal project.

US Army Corps of Engineers.
Nashville District

Nationwide Permit

38. Cleanup of Hazardous and Toxic Waste.

Specific activities required to effect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority. Court ordered remedial action plans or related settlements are also authorized by this NWP. This NWP does not authorize the establishment of new disposal sites or the expansion of existing sites used for the disposal of hazardous or toxic waste. (Sections 10 and 404)

Note: *Activities undertaken entirely on a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under section 404 of the Clean Water Act or section 10 of the Rivers and Harbors Act.*

EXHIBIT F
FILE 2010-00144
24 MAR 10

ATTENTION

YOU ARE REQUIRED TO SUBMIT THIS SIGNED CERTIFICATION REGARDING THE COMPLETED ACTIVITY AND ANY REQUIRED MITIGATION.

I hereby certify that the work authorized by Permit No. 2010-00144, including any required mitigation, general and/or special conditions, was completed in accordance with the Corps authorization.

X ______________________
Permittee Signature

Date X ______________

Submit this signed certification to the office checked below:

- [x] U.S. Army Corps of Engineers
Regulatory Branch
3710 Bell Road
Nashville, TN 37214-2660

- [ ] Eastern Regulatory Field Office
P.O. Box 465
Lenoir City, TN 37771

- [ ] Western Regulatory Field Office
2042 Beltline Road, Southwest
Building C, Suite 415
Decatur, AL 35601

JRH
Project Mgr.

EXHIBIT G
FILE 2010-00144
24 MAR 10

Enclosure G

1 – Wetland A Data Form

2 – Wetland B Data Form

Figure 4
Wetland A Data Form
Routine Wetland Determination
(1987 COE Wetlands Delineation Manual)

Site Name/Project No.: Nuclear Fuel Services, Inc./Wetland A **Applicant/Owner:** Nuclear Fuel Services, Inc. **Investigator:** Joyce Griffith	**Date:** 4/29/09 **County:** Unicoi **State:** TN
Do Normal Circumstances exist on the site? Yes [No] Is the site significantly disturbed (Atypical Situation)? [Yes] No Is the area a potential Problem Area? Yes No	**Community ID:** PFO1B **Transect ID:** ____ **Plot ID:** Wetland A

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer negundo*	T	FACW	9. *Juglans nigra*	T	FACW
2. *Acer rubrum*	T	FACW	10. *Myrica gale*	H	OBL
3. *Asclepias incarnta*	H	OBL	11. *Rubus spp.*	S	FAC
4. *Carex stricta*	G	OBL	12. *Salix discolor*	T	FACW
5. *Cephalanthus occidentalis*	S	OBL	13. *Salix spp*	T	OBL
6. *Dryoteris carthusian*	G	FACW	14. *Lobelia cardinalis L.*	H	FACW+
7. *Erigeron philadelphicus*	H	FACW	15. *Vernonia gigantean*	H	FAC+
8. *Euthamia remota*	H	FACW	16. *Eupatorium purpureum L.*	H	FAC

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): __100%__________ **FAC Neutral Test:** ______68%______

Remarks:
This site satisfies the hydrophytic vegetation criteria.

Hydrology

____ **Recorded Data (Describe in Remarks):**
____________ Stream, Lake, or Tide Gauge
____________ Aerial Photograph
____________ Other

__X__ **No Recorded Data Available**

Wetland Hydrology Indicators:

Primary Indicators:
_____ Inundated (see Remarks)
__X___ Saturated in Upper 12 Inches (see Remarks)
_____ Water Marks
_____ Drift Lines
_____ Sediment Deposits
_____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
_____ Oxidized Root Channels in Upper 12 inches
_____ Water Stained Leaves
__X___ FAC-Neutral Test
_____ Other (Explain in Remarks)

Field Observations:

Depth of Surface Water: ___0______ (in)

Depth of Free Water in Pit: ____6_____ (in)

Depth to Saturated Soil: _____0_____ (in)

Remarks:
This site satisfies the wetland hydrology criteria

Soils

Map Unit Name
(Series and Phase): Buncombe Loamy Sand (Bu) **Drainage Class:** Excessively Drained
Field Observations
Taxonomy (Suggroup): ______ **Confirm Mapped Type?** Yes [No]

Profile Description:

Depth (inches	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture Concretions, Structure, etc.
0-6	A	2.5Y 2.5/1	Black	Light Gray	Loam
7-16	B	2.5Y 5/2	Gray to Brown	Brown	Loam

Hydric Soil Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regine
_____ Reducing Conditions
__X__ Gleyed or Low-Chroma Color
_____ Concretions
__X__ High Organic Content in Surface Layer
_____ Organic Streaking in Sandy Soil
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks:
This site satisfies hydric soil criteria

Wetland Determination

Hydrophytic Vegetation Present?	[Yes]	No	(Circle)
Wetland Hydrology Present?	[Yes]	No	
Hydric Soils Present?	[Yes]	No	

(Circle)
Is the Sampling Point Within a Wetland? [Yes] No

Remarks:
All three criteria necessary to quality as a jurisdictional wetland based on the 1987 Corps. of Engineers Wetlands Delineation Manual have been met.

Figure 5
Wetland B Data Form
Routine Wetland Determination
(1987 COE Wetlands Delineation Manual)

Site Name/Project No.: Nuclear Fuel Services, Inc./Wetland B **Applicant/Owner:** Nuclear Fuel Services, Inc. **Investigator:** E. Schmidt	**Date:** 07/20/07 **County:** Unicoi **State:** TN
Do Normal Circumstances exist on the site? **[Yes]** No Is the site significantly disturbed (Atypical Situation)? Yes **[No]** Is the area a potential Problem Area? Yes **[No]**	**Community ID:** PFO1B **Transect ID:** - **Plot ID:** Wetland B

Vegetation

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1. *Acer rubrum*	1	FAC			
2. *Alnus serrulata*	1	FACW+			
3. *Fraximus pennsylvsnica*	1	FACW			
4. *Diospyros virginiana*	1	FAC			

Percent of Dominant Species that are OBL, FACW, or FAC (excluding FAC-): 100%

FAC Neutral Test: 100%

Remarks:
This site satisfies the hydrophytic vegetation Criteria. Several mosses were also present and although not dominant, *Sagittarria sp.*(typically OBL) was observed.

Hydrology

___ **Recorded Data (Describe in Remarks):**
- ______ Stream, Lake, or Tide Gauge
- ______ Aerial Photograph
- ______ Other

_X_ **No Recorded Data Available**

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated (see Remarks)
- _X_ Saturated in Upper 12 Inches (see Remarks)
- _X_ Water Marks
- _X_ Drift Lines
- ____ Sediment Deposits
- _X_ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 inches
- ____ Water Stained Leaves
- _X_ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Field Observations:

Depth of Surface Water: 0 (in)

Depth of Free Water in Pit: 12 (in)

Depth to Saturated Soil: 8 (in)

Remarks: This site satisfies the wetland hydrology criteria	

Soils

Map Unit Name
(Series and Phase): Buncombe Loamy Sand (Bu) **Drainage Class:** Excessively Drained
Field Observations
Taxonomy (Suggroup): ____________ **Confirm Mapped Type?** Yes [No]

Profile Description:

Depth (inches	Horizon	Matrix Color (Munsell Moist)	Mottle Color (Munsell Moist)	Mottle Abundance/Contrast	Texture Concretions, Structure, etc.
0-6	A	10YR 2/1	Black	Dark Gray	Loam
6-16	B	10YR 3/1	Dark Gray	Brown	Loam

Hydric Soil Indicators:

_____ Histosol
_____ Histic Epipedon
_____ Sulfidic Odor
_____ Aquic Moisture Regine
_____ Reducing Conditions
__X__ Gleyed or Low-Chroma Color
_____ Concretions
_____ High Organic Content in Surface Layer
_____ Organic Streaking in Sandy Soil
_____ Listed on Local Hydric Soils List
_____ Listed on National Hydric Soils List
_____ Other (Explain in Remarks)

Remarks:
This site satisfies the hydric soil criteria

Wetland Determination

Hydrophytic Vegetation Present? [Yes] No (Circle) Wetland Hydrology Present? [Yes] No Hydric Soils Present? [Yes] No	(Circle) Is the Sampling Point Within a Wetland? [Yes] No

Remarks:
This data satifies all three criteria necessary to quality as a jurisdictional wetland based on the 1987 Corps. of Engineers Wetlands Delineation Manual have been met.

Enclosure H

1 – NFS Air Permits

2 – NFS Permitted and Actual Emissions

Table 3
NFS Air Permits

Operation	Permit Number	State of TN Emission Source Reference No.
Building 234/ Decommissioning	017604P	86-0002-06
Building 300 Complex & Building 333	955420P	86-0002-08
Waste Water Treatment Facility	954441P	86-0002-12
Research & Development Laboratory & Soil Treatment Pilot Plant	051893P	86-0002-21
250 HP & 150 HP Steam Boilers	050434F	86-0002-24
Ground Water Treatment Process	051889P	86-0002-27
Blended Low Enriched Uranium (BLEU) Complex	955540P	86-0002-28

Note: Current as of 5/10/2010.

Table 22

NFS Permitted and Actual Emissions

Pollutant	*Emission Limitations (tons/yr)*	
	Actual	*Allowable By Permit*
Particulate *	0.5	38
Sulfur dioxide *	0.05	31
Carbon monoxide *	4.5	6.3
Volatile organic compounds *	1.3	4.7
Nitrogen oxides *	19	57
Hydrogen fluoride **	0.08	0.3
Hydrogen chloride **	0.63	0.9
Vinyl chloride **	0.0001	0.01
Tetrachloroethylene **	0.009	0.21
Trichloroethylene **	0.0006	0.06
Bis-2-ethylhexylphthalate **	0.0007	0.01
Mercury **	0.0006	0.01
Ammonia	24	114
Hydrogen	56	92
Nitric Acid	0.05	0.42
Hydrogen Sulfide	0.01	0.02
Silicon tetrafluoride	0.01	0.07

[a] *Information summarized from NFS air permits in effect as of 5/5/2010.*
* *Criteria Pollutant*
** *Hazardous Air Pollutant (HAP)*

Enclosure I

Air Inspection Report, April 2010

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
TENNESSEE DIVISION OF AIR POLLUTION CONTROL
ANNUAL INSPECTION

Reference No.: 86-0002-G3
State Class: CM
Pollutant(s): NOx

Environmental Specialist: GKT
Route To: ~~RBW~~ ~~VTD~~ CMW File

Date Inspected: April 13, 2010

Company: Nuclear Fuel Services (NFS)
Location address: 1205 Banner Hill Road
City/State/Zip: Erwin, TN 37650

Company Contact/Title: Becky Webb, Environmental Scientist
Phone: (423) 735-5415

Does Company impact an additional control area? YES/NO : No

Does Company have: NSPS (Part 60)? Yes (D) PSD? No
NESHAPS (Part 61)? No MACT (Part 63)? No
Sources: Point 28, BLEU Complex

Date of the last annual inspection: July 16, 2009
Time period covered by this inspection, from: July 1, 2009 to March 31, 2010
Is inspection partial or comprehensive? Comprehensive

Total time required for this inspection (hours): 7
Was company in compliance during entire inspection time period? Yes

If CM source: Date annual report received in EFO: Not Required
Date annual report review complete/acknowledged by EFO:
Did annual report have deviations from permit conditions (Y/N)?

EXECUTIVE SUMMARY:

On April 13, 2010, Air Pollution Control inspector Greg Tester met with Becky Webb, environmental scientist, for the purpose of conducting a comprehensive annual compliance inspection.

NFS currently has four (4) operating permits and three (3) construction permits. The 2007-2008 annual inspection was conducted on July 18, 2008 and found NFS to be in compliance. The 2008-2009 annual inspection was conducted on July 16, 2009 and found NFS to be in compliance. This inspection did include a site visit.

The following is a summary of my findings listed by permits and conditions. Conditions with no compliance specification have been omitted.

Operating Permit 017604P: Point 06, B-234

Condition 1: In compliance. This condition states the company is to operate within applicable visible emission limits as stated in the air pollution regulations. There were no visible emissions as the source was not in operation and is in the process of decommissioning.

Construction Permit 955420P: Point 08, Enriched Uranium Processing

The inspector did not have the proper security clearance to enter this area.

Condition 1: In compliance. B. Marie Moore is still the responsible party.

Condition 15: In compliance. This condition requires the company to maintain air pollution control equipment. Ms. Webb stated the air pollution control equipment is in good working condition and regularly maintained. Maintenance records were checked, dated, and initialed. See Condition 16.

Condition 16: In compliance. This condition requires maintenance logs be kept. Maintenance logs for July 2009 through April 2010 were reviewed, dated and initialed.

Condition 18: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 21: In compliance. This condition states the permittee must apply for an operating permit within 30 days of start-up. The start-up date was September 8, 2004 and the operating permit was applied for September 30, 2004.

Condition 22: In compliance. This condition specifies start-up date certification dates. The start-up notification shows September 8, 2004. Start-up certification was sent September 15, 2004.

Construction Permit 954441P: Point 12, Wastewater Plant

Condition 1: In compliance. B. Marie Moore is still the responsible party.

Condition 2: In compliance. This condition limits maximum wastewater/chemical input rate to 4,967 lbs/hr per forty-eight (48) hour period (batch time). Operational flexibility was granted on June 10, 2005 raising the limit to 14,914.94 lbs/hr by letter from David Carson. According to the wastewater input logs, the highest input rate was 3,907 lbs/hr for the 48 hour time period of 3/17/10-3/19/10.

Condition 4: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 6: In compliance. This condition requires logs that readily show compliance with Condition 2 of this permit. Logs for July 2009 through March 2010 were reviewed, initialed and dated.

Condition 9: In compliance. This condition specifies start-up certification deadlines. Start-up date was July 1, 2004. A timely start-up certification was applied for on July 12, 2004. An operating permit was applied for July 27, 2004.

Operating Permit 051893P: Point 21, Research and Development Laboratory and Soil Treatment Pilot Plant with Wet Scrubber Control.

Condition 1: In compliance. This condition lists Andrew Maxin as the responsible party. A letter dated January 31, 2000 changed the responsible party to B. Marie Moore. Ms. Moore is still the responsible party.

Condition 2: In compliance. This condition limits the maximum process material input rate to 540 pounds per hour in the soil treatment pilot plant. The soil treatment pilot plant has not operated in more than 10 years. The research and development laboratory is still in operation and Ms. Webb applied for an exemption on 5/28/2008.

Condition 6: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 8: In compliance. This condition states that permit renewal must be applied for no less than sixty (60) days prior to expiration. The permit expires November 1, 2008. According to an online delivery- tracking invoice, a timely permit renewal was sent on May 28, 2008 and signed for by T. Phipps on May 29, 2008.

Operating Permit 050434F, Point 24, 250 HP and 150 HP Steam Boilers:

Condition 1: In compliance. This condition lists Andrew Maxin as the responsible party. A letter dated January 31, 2000 changed the responsible party to B. Marie Moore. Ms. Moore is still the responsible party.

Condition 4: In compliance. This condition limits fuel to natural gas or #2 fuel oil. Only natural gas is used at this source.

Condition 7: In compliance. This condition states that both boilers may not operate simultaneously. At the time of this inspection, only the 250 HP boiler was operating.

Condition 8: In compliance. This condition requires a fuel sampling and analysis for #2 fuel oil. No fuel oil has been used since 1993.

Condition 9: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 10: In compliance. This condition states that permit renewal must be applied for sixty (60) days prior to expiration. Permit expires November 1, 2008. According to an online delivery- tracking invoice, a timely permit renewal was sent on July 11, 2008 and signed for by S. Bethea on June 14, 2008.

Operating Permit 051889P: Point 27, Groundwater Treatment Process

Condition 1: In compliance. This condition lists Andrew Maxin as the responsible party. A letter dated January 31, 2000 changed the responsible party to B. Marie Moore. Ms. Moore is still the responsible party.

Condition 2: In compliance. This condition limits volatile organic compounds (VOCs) emitted from this source to 0.6 pounds per hour. The highest reported VOC emission was in August 2009 at 0.000005 pounds per hour.

Condition 3: In compliance. This condition states that an activated carbon filter must be utilized any time vinyl chloride is detected by sampling of the incoming groundwater. Ms. Webb stated that the activated carbon filter is used at all times, even when no vinyl chloride is detected.

Condition 4: In compliance. This condition requires contaminated groundwater to be tested every month for toxics. This source began operation again after several years of being idle in January 2008. Monthly tests are conducted on-site for ammonia and nitrate. Other tests are sent to an independent laboratory. All results are placed in a log book. The results for July 2009 through February 2010 were initialed and dated.

Condition 5: In compliance. This condition states that based on certain test results, it is allowable to test every quarter, instead of monthly. Ms. Webb stated that this source will be tested monthly regardless of the test results.

Condition 6: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 7: In compliance. This condition states that permit renewal must be applied for sixty (60) days prior to expiration. According to an online delivery- tracking invoice, a timely permit renewal was sent on July 11, 2008 and signed for by S. Bethea on June 14, 2008.

Construction Permit 955540P: Point 28, Blended Low Enriched Uranium (BLEU) Complex

Condition 1: In compliance. B. Marie Moore is still the responsible party.

Condition 5: In compliance. This condition states only natural gas may be used for this facility. Ms. Webb stated that only natural gas is used.

Condition 6: In compliance. This condition limits the maximum throughput of Uranium Oxide Dissolution process to 60 tons/year on a twelve month moving average basis. Compliance with this condition is shown by logs required in Condition 7. This source only operates on an as-needed basis and has not operated since May 2009. Based on the 12-month rolling average, 5.8 tons is the highest 12-month average and as of May 1, 2010, will drop to 0.

Condition 7: In compliance. This condition requires an annual log of uranium oxide used at this source. Monthly logs were reviewed, dated, and initialed.

Condition 15: In compliance. This condition requires maintenance logs be kept for the wet scrubber. Maintenance logs for July 2009 through March 2010 were reviewed, dated, and initialed.

Condition 17: In compliance. This condition states that no parts of this source shall operate without the associated pollution control equipment. Ms. Webb stated that this source will not operate without the control devices. If the scrubber shuts down, sensors shut down the entire system.

Condition 21: In compliance. This condition limits visible emissions to 20% opacity per EPA Method 9. No visible emissions were observed.

Condition 23: In compliance. This condition states that the operating permit must be applied for within ninety (90) days of start-up. Start-up date was September 12, 2004. Operating permit applied for December 9, 2004.

Condition 24: In compliance. This condition states the start-up notification must be submitted within thirty (30) days of start-up. Source started on September 12, 2004, and the notification was sent on September 30, 2004.

Conclusion

Based on the information reviewed and/or obtained during this inspection, I report NFS to be **IN COMPLIANCE** in that no compliance problems were found with any issue under the purview of this inspector.

Inspector's Name

VEE Certification Number: 2287
Certification Expiration Date: 9/22/10

I verify that the format and content of this report conforms to established TN Division of Air Pollution Control annual inspection standard operational procedures guidance and that the compliance determination made in this report is correct.

Vera T. Davis
Supervisor/Manager

4/14/10
Date

Enclosure J

1 – Attainment Status TN Counties

2 – Attainment Status VA Counties

Table 1							
40 CFR 81.343 Subpart C - Section 107 Attainment Status Designations **Eastern Tennessee-Southwestern Virginia Interstate Air Quality Control** **A=Attainment NA = Non Attainment**							
TN County	**Particulate Matter$_{10}$ (PM $_{10}$)**	**Sulfur Dioxide (SO_2)**	**Carbon Monoxide (CO)**	**Ozone (O_3) (1-Hour Standard)**	**Ozone (O_3) (8-Hour Standard)**	**Nitrogen Dioxide (NO_2)**	**Particulate Matter$_{2.5}$ ($PM_{2.5}$) (Annual NAAQS)**
Anderson	A	A	A	A	NA	A	NA
Blount	A	A	A	A	NA	A	NA
Bradley	A	A	A	A	A	A	A
Campbell	A	A	A	A	A	A	A
Carter	A	A	A	A	A	A	A
Claiborne	A	A	A	A	A	A	A
Cocke	A	A	A	A	NA	A	A
Grainger	A	A	A	A	A	A	A
Greene	A	A	A	A	A	A	A
Hamblen	A	A	A	A	A	A	A
Hancock	A	A	A	A	A	A	A
Hawkins	A	A	A	A	(2)A	A	A
Jefferson	A	A	A	A	NA	A	A
Johnson	A	A	A	A	A	A	A
Knox	A	A	A	A	NA	A	NA
Loudon	A	A	A	A	NA	A	NA
McMinn	A	A	A	A	A	A	A
Meigs	A	A	A	A	(2)A	A	A
Monroe	A	A	A	A	A	A	A
Polk	A	A	A	A	A	A	A
Rhea	A	A	A	A	A	A	A
Roane	A	A	A	A	A	A	NA
Sevier	A	A	A	A	NA	A	A
Sullivan	A	A	A	A	(2)A	A	A
Unicoi	A	A	A	A	A	A	A
Union	A	A	A	A	A	A	A
Washington	A	A	A	A	A	A	A

Notes:

(1) Carbon Monoxide designation date November 15, 1990.

(2) Ozone (1-Hour Standard) designation date October 18, 2000. The standard is revoked effective June 15, 2005.

(3) Ozone (8-Hour Standard) designation date June 15, 2004. (2) Attainment effective April 15, 2008.

(4) $PM_{2.5}$ designation date is 90 days after January 5, 2005.

(5) Lead - not designated.

Table 2							
VA County	**Particulate Matter$_{10}$ (PM $_{10}$)**	**Sulfur Dioxide (SO_2)**	**Carbon Monoxide (CO)**	**Ozone (O_3) (1-Hour Standard)**	**Ozone (O_3) (8-Hour Standard)**	**Nitrogen Dioxide (NO_2)**	**Particulate Matter$_{2.5}$ ($PM_{2.5}$) (Annual NAAQS)**
Bland	A	A	A	A	A	A	A
Buchanan	A	A	A	A	A	A	A
Carroll	A	A	A	A	A	A	A
Dickenson	A	A	A	A	A	A	A
Grayson	A	A	A	A	A	A	A
Lee	A	A	A	A	A	A	A
Russell	A	A	A	A	A	A	A
Scott	A	A	A	A	A	A	A
Smyth	A	A	A	A	A	A	A
Tazewell	A	A	A	A	A	A	A
Washington	A	A	A	A	A	A	A
Wise	A	A	A	A	A	A	A
Wythe	A	A	A	A	A	A	A
City of Bristol	A	A	A	A	A	A	A
City of Galax	A	A	A	A	A	A	A
City of Norton	A	A	A	A	A	A	A

Notes:

(1) Carbon Monoxide designation date November 15, 1990.

(2) Ozone (1-Hour Standard) designation date October 18, 2000. The standard is revoked effective June 15, 2005.

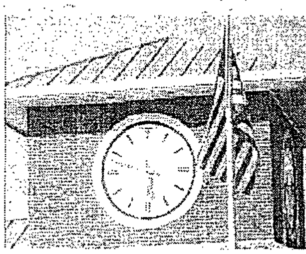
(3) Ozone (8-Hour Standard) designation date June 15, 2004.

(4) $PM_{2.5}$ designation date is 90 days after January 5, 2005.

(5) Lead - not designated.

Enclosure K

Town of Erwin Code of Ordinances



TOWN OF ERWIN
TENNESSEE

City Charter/Code of Ordinances

Get Adobe Reader

City Charter- Erwin City Charter

Code of Ordinances:

Erwin Town Hall
P.O. Box 59
211 North Main Avenue
(423) 743-6231 Fax (423) 743-3983

CHAPTER 3

OFFENSES AGAINST THE PEACE AND QUIET

11-301. Disturbing the peace. No person shall disturb, tend to disturb, or aid in disturbing the peace of others by violent, tumultuous, offensive, or obstreperous conduct, and no person shall knowingly permit such conduct upon any premises owned or possessed by him or under his control. (1976 Code, § 10-202)

11-302. Anti-noise regulations. Subject to the provisions of this section, the creating of any unreasonably loud, disturbing, and unnecessary noise is prohibited. Noise of such character, intensity, or duration as to be detrimental to the life or health of any individual, or in disturbance of the public peace and welfare is prohibited.

(1) Miscellaneous prohibited noises enumerated. The following acts, among others, are declared to be loud, disturbing, and unnecessary noises in violation of this section, but this enumeration shall not be deemed to be exclusive, namely:

(a) Blowing horns. The sounding of any horn or signal device on any automobile, motorcycle, bus, truck, or other vehicle while not in motion except as a danger signal if another vehicle is approaching, apparently out of control, or if in motion, only as a danger signal after or as brakes are being applied and deceleration of the vehicle is intended; the creation by means of any such signal device of any unreasonably loud or harsh sound; and the sounding of such device for an unnecessary and unreasonable period of time.

(b) Radios, phonographs, etc. The playing of any radio, phonograph, or any musical instrument or sound device, including but not limited to loudspeakers or other devices for reproduction or amplification of sound, either independently of or in connection with motion pictures, radio, or television, in such a manner or with such volume, particularly during the hours between 11:00 P.M. and 7:00 A.M., as to annoy or disturb the quiet, comfort, or repose of persons in any office or hospital, or in any dwelling, hotel, or other type of residence, or of any person in the vicinity.

(c) Yelling, shouting, etc. Yelling, shouting, whistling, or singing on the public streets, particularly between the hours of 11:00 P.M. and 7:00 A.M. or at any time or place so as to annoy or disturb the quiet, comfort, or repose of any persons in any hospital, dwelling, hotel, or other type of residence, or of any person in the vicinity.

(d) Pets. The keeping of any animal, bird, or fowl, which by causing frequent or long continued noise shall disturb the comfort or repose of any person in the vicinity.

(e) Use of vehicle. The use of any automobile, motorcycle, truck, or vehicle so out of repair, so loaded, or in such manner as to cause loud and unnecessary grating, grinding, rattling, or other noise.

(f) Blowing whistles. The blowing of any steam whistle attached to any stationary boiler, except to give notice of the time to begin or stop work or as a warning of fire or danger, or upon request of proper municipal authorities.

(g) Exhaust discharge. To discharge into the open air the exhaust of any steam engine, stationary internal combustion engine, motor vehicle, or boat engine, except through a muffler or other device which will effectively prevent loud or explosive noises therefrom.

(h) Building operations. The erection (including excavation), demolition, alteration, or repair of any building in any residential area or section or the construction or repair of streets and highways in any residential area or section, other than between the hours of 7:00 A.M. and 6:00 P.M. on week days, except in case of urgent necessity in the interest of public health and safety, and then only with a permit from the building inspector granted for a period while the emergency continues not to exceed thirty (30) days. If the building inspector should determine that the public health and safety will not be impaired by the erection, demolition, alteration, or repair of any building or the excavation of streets and highways between the hours of 6:00 P.M. and 7:00 A.M. and if he shall further determine that loss or inconvenience would result to any party in interest through delay, he may grant permission for such work to be done between the hours of 6:00 P.M. and 7:00 A.M. upon application being made at the time the permit for the work is awarded or during the process of the work.

(i) Noises near schools, hospitals, churches, etc. The creation of any excessive noise on any street adjacent to any hospital or adjacent to any school, institution of learning, church, or court while the same is in session.

(j) Loading and unloading operations. The creation of any loud and excessive noise in connection with the loading or unloading of any vehicle or the opening and destruction of bales, boxes, crates, and other containers.

(k) Noises to attract attention. The use of any drum, loudspeaker, or other instrument or device emitting noise for the purpose of attracting attention to any performance, show, or sale, or display of merchandise.

(1) Loudspeakers or amplifiers on vehicles. The use of mechanical loudspeakers or amplifiers on trucks or other moving or standing vehicles for advertising or other purposes.

(2) Exceptions. None of the terms or prohibitions hereof shall apply to or be enforced against:

(a) Municipal vehicles. Any vehicle of the town while engaged upon necessary public business.

(b) Repair of streets, etc. Excavations or repairs of bridges, streets, or highways at night, by or on behalf of the town, the county, or the state, when the public welfare and convenience renders it impracticable to perform such work during the day.

(c) Noncommercial and nonprofit use of loudspeakers or amplifiers. The reasonable use of amplifiers or loudspeakers in the course of public addresses which are noncommercial in character and in the course of advertising functions sponsored by nonprofit organizations. However, no such use shall be made until a permit therefor is secured from the recorder. Hours for the use of an amplifier or public address system will be designated in the permit so issued and the use of such systems shall be restricted to the hours so designated in the permit. (1976 Code, § 10-234)

Enclosure L

NFS Noise Level Survey

 ONLINE COPY

Attachment A

HEA-06-07-02
HS482
Rev. 4 (10/06)

Noise Level Survey

Location: Outside Perimeter Rad. Tech./ISS: RLH, HL, KG RS

Equipment: Quest Model 2900 Date: 3-23-10 Time: 0900

Calibration Check By & Date: KG 3/23/10 Calibration Check Results: 110.0

	Time	Reading H	Reading L			Time	Reading H	Reading L
Survey 1	0900	64.9	54.6		Survey 16	0920	60.0	54.3
Survey 2	0900	65.7	56.5		Survey 17			
Survey 3	0900	63.3	54.9		Survey 18			
Survey 4	0900	69.7	53.3		Survey 19			
Survey 5	0910	62.6	56.2		Survey 20			
Survey 6	0910	64.6	51.8		Survey 21			
Survey 7	0910	~~75.6~~ 58.0	~~58.5~~ 51.6		Survey 22			
Survey 8	0910	69.3	59.9		Survey 23			
Survey 9	0915	75.6	58.5		Survey 24			
Survey 10	0915	88.6	58.5		Survey 25			
Survey 11	0915	64.6	54.8		Survey 26			
Survey 12	0915	56.5	53.7		Survey 27			
Survey 13	0920	63.6	54.0		Survey 28			
Survey 14	0920	65.5	56.4		Survey 29			
Survey 15	0920	63.5	59.1		Survey 30			

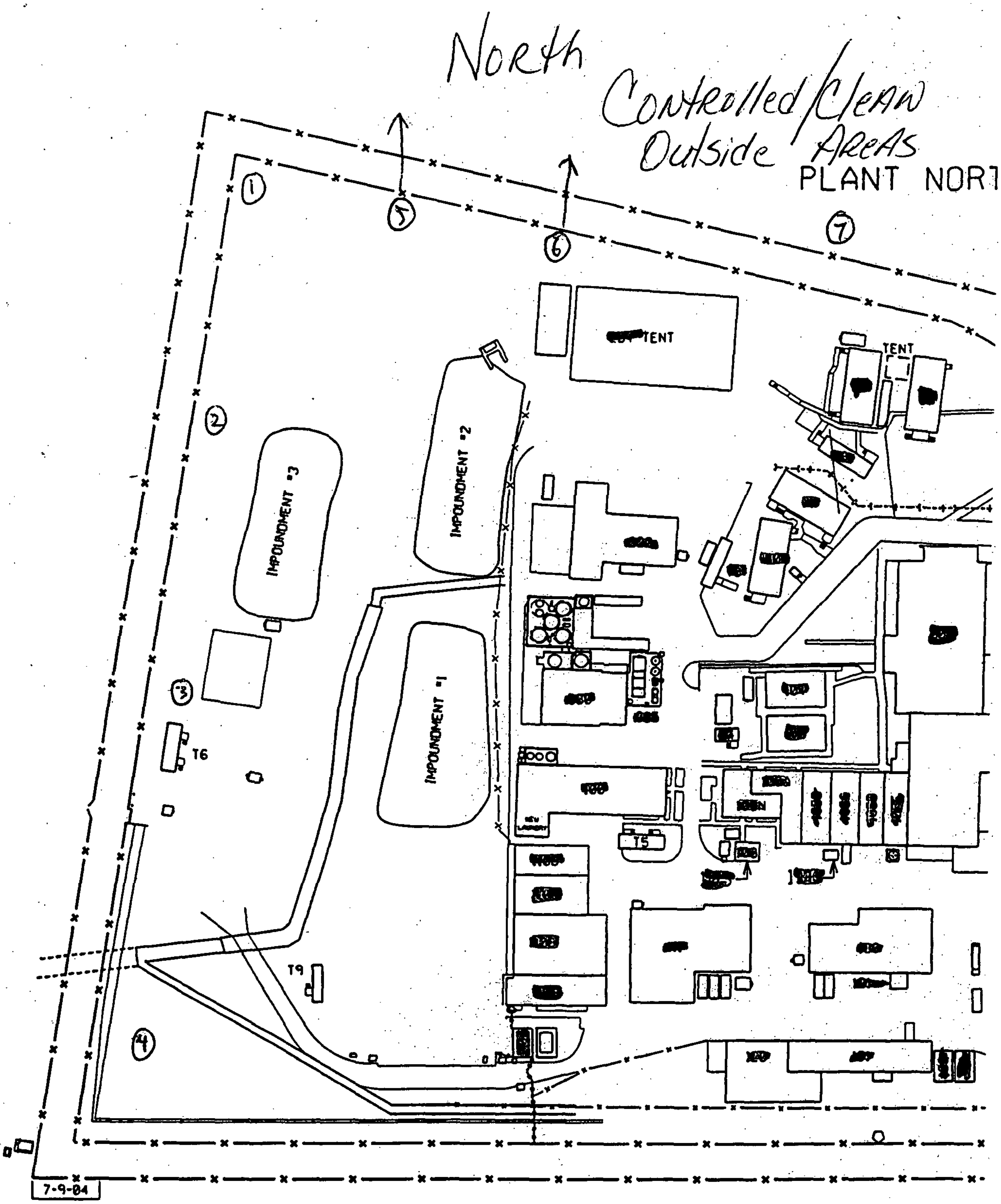
Comments: during "take cover" alarm
*Survey 10 was taken on the NW corner of 350 Bldg, an alarm speaker is located on that corner, thus the elevated reading. [signature] 3-30-10

Instructions: Indicate location of survey with sketch of area below:

See attached Drawing

ATTACHMENT REVISION APPROVED BY: ______________________

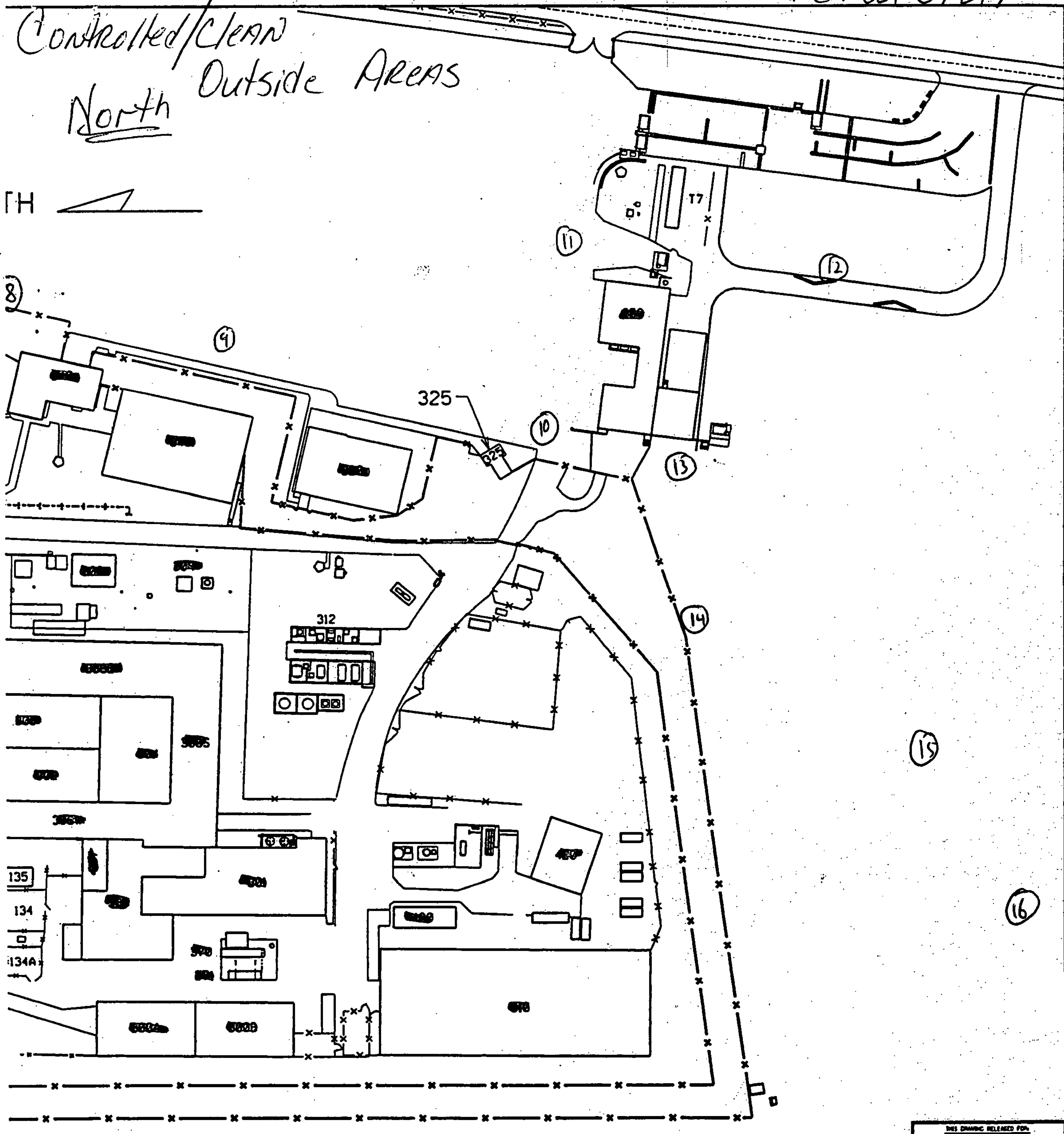
HCH 08-01-24


North
Controlled/Clean
Outside Areas
PLANT NORT
1
2
3
4
5
6
7
TENT
TENT
IMPOUNDMENT #3
IMPOUNDMENT #2
IMPOUNDMENT #1
T6
T5
T9
NEW LAUNDRY
7-9-04

HEH-02-01-24

Controlled/Clean Outside Areas

North



		ADDED ENTRY/EXIT TO ROADWAY	KK
WCH / RPC	3-24-04	ADDED VEHICLE BARRIERS	JJ
WCH / RPC	11-12-03	ADDED BLDG. T6	II
CADD	9-16-88	ORIGINAL ISSUE WAS RMG-9660	—
BY	DATE	REVISION	LET

TOLERANCE UNLESS SPECIFIED
FRACTIONAL ± 1/64"
ANGULAR ± 1/2°
DECIMAL .XX ± .01 .XXX ± .001

REVIEWED BY
PROPOSED COMPLETION DATE:
DRAFTER
PROPOSED APPROVALS
REQ.

THIS DRAWING, INCLUDING ALL INFORMATION CONTAINED HEREON, IS THE PROPERTY OF NUCLEAR FUEL SERVICES, INC. (NFS). THIS DRAWING IS LOANED SUBJECT TO RETURN ON DEMAND AND IS NOT TO BE COPIED, REPRODUCED, MADE AVAILABLE, OR DISCLOSED IN WHOLE OR PART TO THIRD PARTIES WITHOUT PRIOR WRITTEN CONSENT OF NFS.

NUCLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

GENERAL PLANT LAYOUT

DRAFTER WG HENSLEY
AS-BUILT APPROVALS
REQ.
OWNER

SCALE 1"=60'
DATE 4-21-04

DRAWING NO. 000-C0033-D

CONFIGURATION CONTROL YES ☐ NO ☒

THIS DRAWING RELEASED FOR: SIGNATURE/DATE
☐ CONSTRUCTION
☐ INFORMATION ONLY
☐ BID
☐ PURCHASE/FAB

FORWARD NEW REVISIONS TO THE EPC

Enclosure M

1 – ROI Population Growth

2 – School District Data

3 – ROI Education Attainment

4 – ROI Healthcare

5 – ROI Social Services

6 – Population Distribution and Percent Employment by NFS in Region of Interest

Table 1
ROI Population Growth

ROI	2000 Population	Estimated 2025 Population	Percent Change 2000-2025
Carter	56,742	58,263	2.7%
Sullivan	153,048	162,797	6.4%
Unicoi	17,667	19,195	8.6%
Washington	107,198	138,901	29.6%

Source:
Tennessee Department of Transportation, 2003, Twenty Five Year Transit Plan, Task 6, Factors Influencing Transit Demand in 2025, Brinckerhoff, Parsons, July

Table 2
School District Data

Item of Concern	Carter County	Sullivan County	Unicoi County	Washington County
Highest Grade Offered	12	12	12	12
Lowest Grade Offered	PK	PK	PK	PK
Number of Schools	17	28	6	14
Total Classroom Teachers	960	1816.7	248	1194.6
Total Students	6005	12159	2571	9206
English Language Learners	13	17	ND	26

Sources:
U.S. Department of Education, National Center for Education Statistics, The Common Core of Data, "Local Education Agency Universe Survey", 2007-2008, Version 1a.
Note:
ND: No Data

Table 3
ROI Educational Attainment

ROI	High School or Higher (%)	Bachelor's Degree or Higher (%)
Carter	76	15.4
Sullivan	81.9	19.8
Unicoi	67.7	10.6
Washington	83.4	27.2

Source:
U.S. Census Bureau, 2006-2008 (Carter, Sullivan, Washington)
U.S. Census Bureau, 2000 unicoi county (2006-2008 data not available)

Table 4
ROI Healthcare

Access to Healthcare	Carter County	Sullivan County	Unicoi County	Washington County
Medical Doctors per 1,000 (2007)	0.6	3.1	0.8	3.8
Hospital Beds per 1,000 Pop. (2006)	2.0	7.6	2.7	6.2
Nursing Home Beds per 1,000 Pop. 65 & Older	61.9	12.3	132	9.9
Hospitals	1	4	1	5

Source:
tennessee.gov/tacir/County_Profile/carter_profile.htm
tennessee.gov/tacir/County_Profile/sullivan_profile.htm
tennessee.gov/tacir/County_Profile/unicoi_profile.htm
tennessee.gov/tacir/County_Profile/washington_profile.htm
tnhospitalsinform.com/tn-hospitals.asp

Table 5
ROI Social Services

ROI	Law Enforcement County /City	Fire Dept.County/ Volunteer	Ambulance Services
Carter	1	6	1
Sullivan	1	10	1
Unicoi	1	4	1
Washington	1	5	1+ Wings

Sources:
usacops;com/tn/s37650
health.state.tn.us/ems/ambulanceservicelicensure.htm
maps.google.com/maps?h1=en&q=volunteer%20fire%20department%20address%20

Table 14
Population Distribution and Percent Employment by NFS in Region of Interest

County	2007 Pop.	2007 Percent Pop. Employed by NFS
Carter	59,492	0.15
Sullivan	153,900	0.02
Unicoi	17,718	1.07
Washington	118,639	0.23
Total in ROI	**349,749**	**1.47**

Source:
fedstats.gov/qf/states/47.html
NFS Employee data

Enclosure N

Summary of Environmental Dosimeter Data

Summary of Environmental Dosimeter Data
Offsite Deep-Dose Equivalents[a]
Annual Net in mrem

YEAR	2005		2006		2007		2008		2009	
	Occupancy Adjusted[b]	Total DDE[c]	Occupancy Adjusted[b]	Total DDE[c]	Occupancy Adjusted[b]	Total DDE[c]	Occupancy Adjusted[b]	Total DDE[c]	Occupancy Adjusted[b]	Total DDE[c]
Offsite Dosimeters										
D001 - Background along Asheville Hwy	50	50	53	53	53	53	53	53	40	40
D003 - Little Mountain	0	0	0	0	0	0	0	0	0	0
Site Boundary Dosimeters										
D002 - East property boundary	0	0	0	0	0	0	0	0	0	0
D005 - North property boundary	0	0	0	0	1.4	22	0	0	0	0
D013 - West property boundary	0.2	3	0	0	0	0	0	0	0	0
D015 - West property boundary	0	0	0	0	0	0	0	0	0	0
D016 - West property boundary	2.2	35	1.6	25	0.9	15	0	0	0	0
D018 - East property boundary	2.0	2	0	0	0	0	0	0	0	0
D019 - North property boundary	0	0	0	0	0	0	0	0	0	0
D020 - North property boundary	0.1	1	0	0	0	0	0	0	0	0
D021 - North property boundary	0	0	0	0	0	0	0	0	0	0
D022 - South property boundary	1.2	19	0.3	4	0.8	12	0.4	7	0.8	13
D029 - West property boundary	0.8	13	0.1	1	0	0	0.1	2	0.6	9
D030 - South property boundary	0.7	11	0.1	2	0.3	5	0.8	13	1.0	16
D031 - West property boundary	0.1	1	0	0	0	0	0	0	0	0
D032 - West property boundary	0.4	7	0.1	2	0.4	6	0	0	0	0
D033 - Northeast property boundary	0.3	4	0	0	0.3	5	0	0	0.1	1
D034 - West property boundary	N/A	N/A	N/A	N/A	0.5	8	0.1	1	0.3	4

[a] Deep-Dose Equivalents as measured at the property boundary
[b]Occupancy factors as defined in NCRP Report No. 49
[c]Deep-Dose Equivalent (DDE) using an occupancy factor of one (1)
Source: NFS 2005-2009

Enclosure O

Bulk Chemical Management Control Measures

Table 1
Bulk Chemical Management Control Measures

Chemical	Quantity (gal)	Management Control Measures
Ammonia Hydroxide	1-1,611 1-700	Concrete dike capacity 1,500 gals, Daily Inspections (M-F), Administrative Quantity Control, Deadman valve (Locked)
Uranyl Nitrate Tanker	3,700	Concrete loading pad with 500 gal. sump. Tanker has the following safeguards: hose fitting and coupling catch basin on top of tanker, level switch, mass flow meter, inspection prior to filling, and personal attendant during filling. Tanker storage on the UNH loading pad or temporarily on plant site.
Nitric Acid	2-4,656	Concrete dike capacity 4,656 gal, Engineered high level interlock, Daily inspection (M-F)
Sodium Hydroxide	4,971	Concrete dike capacity 4,971 gal, Engineered high level interlock, Daily inspection (M-F), Gate valve

Enclosure P

1 – Environmental Indicator Evaluation Memorandum

2 –1996 DOE Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement

15N040248
GOV05
EL MEMO

Distribution
NJN, AMW, BMM, RPD,
JEG, KDS, DBF

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Solid Waste Management
Fifth Floor, L & C Tower
401 Church Street
Nashville, Tennessee 37243 – 1535

RECEIVED
DEC 3 2004
REGULATORY CONTROL

7003 1680 0005 5753 4235
RETURN RECEIPT REQUESTED

November 19, 2004

Nuclear Fuel Services, Inc.
1205 Branner Hill Road
Erwin, TN 37650

Attention: B. Marie Moore
Vice President Safety & Regulatory

Re: Environmental Indicator Evaluation Memorandum (EI Memo)
Dated September 17, 2004
TND 00 309 5635

Dear Ms. Moore:

The purpose of this letter is to formally transmit to your facility a copy of the EI Memo, which the Division of Solid Waste Management (Division) prepared for your facility. The EI Memo is designed to determine if human exposures to toxins are controlled at your facility; and if groundwater releases are controlled at your facility, based on the latest information available to the Division. The EI Memo lists the documents upon which the Division relied in reaching our conclusions. The most recent EI Memo for your facility is enclosed. It shows that your facility is currently meeting both Environmental Indicators. Please review the Summary of Follow-Up Actions located in Section 6, page 4 of the EI Memo. The Follow-Up Actions will be discussion topics in future Facility Action Plan (FAP) meetings.

If you have any questions concerning the EI Memo, please contact me at 615.532.0864.

Sincerely,

Roger Donovan, P.G.
Corrective Action Section

Enclosure

cc: William Krispin, Manager, Permitting Section, DSWM
Charlie Burroughs, Manager, Corrective Action Section
Fred Willingham, Johnson City EAC
55

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Solid Waste Management
Fifth Floor, L & C Tower
401 Church Street
Nashville, Tennessee 37243 - 1535

ENVIRONMENTAL INDICATOR MEMORANDUM

DATE: September 17, 2004

SUBJ: Evaluation of Nuclear Fuel Services, Inc.'s (NFS status under the RCRA Info Corrective Action Environmental Indicator Event Code (CA750)
EPA I.D. Number: TND 00 309 5635

FROM: Roger Donovan 9/17/04
Environmental Specialist 4
Corrective Action Section
Division of Solid Waste Management
Tennessee Department of Environment and Conservation

THRU: Charles Burroughs CGB 9/17/04
Environmental Program Manager 1
Corrective Action Section
Division of Solid Waste Management
Tennessee Department of Environment and Conservation

TO: William E. Krispin WEK 9/17/04
Environmental Program Manager 2
Manager of Hazardous Waste Permitting Sections
Division of Solid Waste Management
Tennessee Department of Environment and Conservation

RCRA Info Status Code for this Memo: **CA725:** **YES**

CA750: **YES**

I. PURPOSE OF MEMO

This memo is written to formalize an evaluation of NFS's status in relation to the following RCRA Info corrective action code defined in the Resource Conservation and Recovery Information System (RCRA Info):

Migration of Contaminated Groundwater Under Control Determination (CA750)

Concurrence by the Manager of the Hazardous Waste Permitting Section is required prior to entering this event code into RCRA Info.

II. HISTORY OF ENVIRONMENTAL INDICATOR EVALUATIONS AT THE FACILITY AND REFERENCE DOCUMENTS

This particular evaluation is the third evaluation performed for the NFS facility. The evaluation, and associated interpretations and conclusions on contamination, exposures and contaminant migration at the facility are based on information obtained from the following documents:

1. *RCRA Facility Investigation Workplan for Nuclear Fuel Services, Inc., Erwin, Tennessee*, dated May 26, 1993, by Nuclear Fuel Services, Inc., and EcoTek, Inc.

2. *Revised Groundwater Flow and Solute-Transport Modeling report, Nuclear Fuel Services, Inc./Erwin, Tennessee* dated February 8, 1999, by ARCADIS Geraghty and Miller, Inc.

3. *Groundwater Risk Assessment at Nuclear Fuel Services, Inc. and Adjacent Industrial Park Site,* dated June 1997, by Nuclear Fuel Services, Inc.

4. *RCRA Facility Investigation Report for SWMU 1 and AOC 5 at Nuclear Fuel Services, Inc.*, dated October 17, 1994, by Advanced Recovery Systems, Inc.

5. *RCRA Facility Investigation Report for AOC 3* dated November 23, 1994, by Nuclear Fuel Services, Inc.

6. *RCRA Facility Investigation Report for SWMU 7 at Nuclear Fuel Services, Inc.*, dated March 1995, by Nuclear Fuel Services, Inc.

7. *RCRA Facility Investigation Report for SWMUs 9 and 10 at Nuclear Fuel Services, Inc.*, dated October 1995, by Nuclear Fuel Services, Inc.

8. *RCRA Facility Investigation Report for SWMU 3 at Nuclear Fuel Services, Inc.*, dated December 1995, by Nuclear Fuel Services, Inc.

9. *RCRA Facility Investigation Report for SWMUs 13 and 14 at Nuclear Fuel Services, Inc.*, dated December 1995, by Nuclear Fuel Services, Inc.

10. *RCRA Facility Investigation Report for SWMU 16 at Nuclear Fuel Services, Inc.*, dated February 1997, by Nuclear Fuel Services, Inc.

11. *RCRA Facility Investigation Report for AOCs 2 and 4 at Nuclear Fuel Services, Inc.*, dated June 1997, by Nuclear Fuel Services, Inc.

12. *RCRA Facility Investigation Report for SWMU 20 and Well 103A and Off-Site Groundwater at Nuclear Fuel Services, Inc.*, dated June 1997, by Nuclear Fuel Services, Inc.

13. *Report on the Investigation to Define the Vertical Extent of Groundwater Contamination at Nuclear Fuel Services, Inc.*, dated December 1998, by Nuclear Fuel Services, Inc.

14. Several Quarterly *RCRA Facility Investigation* and *Interim Measures Reports*, Dated 1994 through 2004, submitted by Nuclear Fuel Services, Inc.

15. *Facility Action Plan (FAP) Presentations*, dated march 25, 2004, presented by Nuclear Fuel Services, Inc.

16. *Site-Wide Groundwater Monitoring Data and Plume Maps First Quarter 2004*, dated June 1, 2004, submitted by Nuclear Fuel Services, Inc.

17. *Preliminary Analytical Data MW-122A*, email dated September 8, 2004, submitted by Nuclear Fuel Services, Inc.

Earlier environmental indicator evaluations and status codes are listed below:

First Evaluation (9/11/96):	CA725: <u>YE</u>	CA750: <u>NO</u>
Second Evaluation (9/29/99)	CA725: <u>YE</u>	CA750: <u>NO</u>

The Previous Environmental Indicator CA725: Human Exposures Controlled Determination – Yes—Coded CA725 YE; dated September 29, 1999, is enclosed as Attachment 1.

III. FACILITY DESCRIPTION:

The NFS facility is located in northeast Tennessee within the city limits of the town of Erwin in Unicoi County. NFS lies in an alluvial valley surrounded by rugged mountains. The site encompasses 57.8 acres of relatively level area some 50 to 100 feet above the normal elevation of the Nolichucky River to the northwest. The nearest prominent cities include Johnson City, TN to the north, Knoxville, TN to the southwest, and Asheville, NC to the south. It is located on the Erwin 71/2 Minute Quadrangle Map at latitude 82° 25' 58" and longitude 36° 07' 51".

NFS has provided an array of nuclear products and services since 1957. Its principal products and services include the manufacturing of fuel for the U.S. Navy. Uranium supplied by the U.S. Government is the principal raw material used for this purpose.

Solid waste generated at the NFS facility falls into four categories: radiological waste; hazardous waste; mixed (radioactive & hazardous) waste; and non-radiological, non-hazardous solid waste. Radiological and hazardous wastes are properly packaged and shipped to an off-site licensed commercial disposal facility. Non-radiological, non-hazardous solid waste is disposed of in a municipal landfill. Mixed waste is stored in an on-site permitted facility.

The NFS facility operates under the regulatory supervision of various agencies, including the Tennessee Department of Environment and Conservation (RCRA Hazardous Waste, Air Emissions and Radioactive Material Licenses), the City of Erwin (Sanitary Sewer Discharge Permit), the US Nuclear Regulatory Commission (Nuclear / Radioactive Material Licenses, Shipping Certificates), and the US Department of Transportation (Shipping Certificates).

CONCLUSION FOR CA 725:

CA 725 YE, Human Exposures remain under control as specified in previous evaluation.

V. CONCLUSION FOR CA 750:

CA 750 YE, Migration of contaminated groundwater is under control.

VI. SUMMARY OF FOLLOW-UP ACTIONS:

NFS is required to perform the following actions:

1. Continue current bioremediation program;
2. Remediate contaminated groundwater offsite where feasible;
3. Install warning signs in the backwater area of the Nolichucky River;
4. Perform additional surface water sampling of the backwater area;
5. Perform sediment sampling in the backwater area;
6. Perform surface water sampling of the Nolichucky River down gradient of the backwater area.

Attachments:

1. Previous Environmental Indicator for Human Exposures Controlled Determination –Yes— Coded CA725 YE; dated September 29, 1999
2. Environmental Indicator (EI) RCRA Info Code CA750 Migration of Contaminated Groundwater Under Control

ATTACHMENT 1

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action
Environmental Indicator (EI) RCRIS code (CA725)

Current Human Exposures Under Control

Facility Name:	**Nuclear Fuel Services, Inc.**
Facility Address:	**Erwin, TN**
Facility EPA ID #:	**TND 00 309 5635**

1999 EI

1. Has all available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been considered in this EI determination?

   __X__ If yes - check here and continue with #2 below,

   ____ If no - re-evaluate existing data, or

   ____ If data are not available skip to #6 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EI developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Current Human Exposures Under Control" EI

A positive "Current Human Exposures Under Control" EI determination ("YE" status code) indicates that there are no "unacceptable" human exposures to "contamination" (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all "contamination" subject to RCRA corrective action at or from the identified facility (i.e., site-wide)).

Relationship of EI to Final Remedies

While Final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, GPRA). The "Current Human Exposures Under Control" EI are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program's overall mission to protect human health and the environment requires that Final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRIS national database ONLY as long as they remain true (i.e., RCRIS status codes must be changed when the regulatory authorities become aware of contrary information).

2. Are groundwater, soil, surface water, sediments, or air media known or reasonably suspected to be "contaminated"[1] above appropriately protective risk-based "levels" (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			See rationale below.
Air (indoors)[2]		X		
Surface Soil (e.g., <2 ft)	X			See rationale below.
Surface Water	X			See rationale below.
Sediment	X			See rationale below.
Subsurface Soil (e.g., >2 ft)	X			See rationale below.
Air (outdoors)		X		

____ If no (for all media) - skip to #6, and enter "YE," status code after providing or citing appropriate levels," and referencing sufficient supporting documentation demonstrating that these "levels" are not exceeded.

__X__ If yes (for any media) - continue after identifying key contaminants in each "contaminated" medium, citing appropriate "levels" (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

____ If unknown (for any media) - skip to #6 and enter "IN" status code.

Rationale:

A groundwater contamination plume primarily associated with the SWMUs 1, 2, 4, 6, 9 and 20 is present at the facility, and has also migrated off-site, towards the Nolichucky River. This plume has approximate dimensions of 600 feet by 900 feet. The site-related chemicals listed on the following page have been detected at concentrations exceeding RCRA groundwater standards, i.e., MCLs or RCRA health-based action levels.

Soil and/or sediment contamination has been detected at the facility during the course of several investigations. The site-related chemicals listed on the following page have been detected at concentrations exceeding RCRA standards, i.e., Region 3 Risk-Based Concentrations for Soil.

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based "levels" (for the media, that identify risks within the acceptable risk range).

[2] Recent evidence (from the Colorado Dept. of Public Health and Environment, and others) suggests that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

Groundwater Constituents above Appropriate Action Levels

Key Contaminant in Groundwater	Appropriate Level in mg/l[1]
Tetrachloroethylene (PCE)	0.005
Fluoride	4.
Nitrates	10.
Vinyl chloride	0.002
1,2-Dichloroethylene	0.07
Trichloroethylene (TCE)	0.005
Bis(2-ethylhexyl)phthalate	0.006
1,2-Dichloroethane	0.005
Aroclor-1254	0.0005
Tributyl phosphate	0.2
Antimony	0.006
Lead	0.015
Mercury	0.002
Sulfates	500.

[1] Maximum Contaminant Level (MCL), unless otherwise noted.

Soil Constituents above Appropriate Action Levels

Key Contaminant in Soil	Appropriate Level in mg/kg[1]
Beryllium	160.
Chromium	230.
Mercury	22. [2]
Cadmium	3.9
Arsenic	0.43
Lead	400. [2]
Fluoride	3300. [2]
Zinc	23000.
Toluene	16000.
Ethylbenzene	7800.
Xylene	160000.

[1] EPA Region 3 4/12/99 Risk Based Concentration for Soil (Residential), unless otherwise noted.
[2] EPA Region 9 Preliminary Remedial Goal for Soil (Residential).

3. Are there **complete** pathways between "contamination" and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table Potential Human Receptors (Under Current Conditions)							
"Contaminated" Media	Residents	Workers	Day-Care	Construction	Trespassers	Recreation	Food[3]
Groundwater	No	No	No	No	No	No	No
Soil (surface, e.g., <2 ft)	No	No	No	No	No	No	No
Surface Water	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No
Soil (subsurface, e.g., >2 ft)	No	No	No	No	No	No	No

Instructions for Summary Exposure Pathway Evaluation Table:

1. For Media which are not "contaminated" as identified in #2 above, please strike-out specific Media, including Human Receptors= spaces, or enter "N/C" for not contaminated.

2. Enter "yes" or "no" for potential "completeness" under each "Contaminated" Media -- Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential "Contaminated" Media - Human Receptor combinations (Pathways) do not have assigned spaces in the above table. While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

_X_ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter "YE" status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

____ If yes (pathways are complete for any "Contaminated" Media - Human Receptor combination) - continue after providing supporting explanation.

____ If unknown (for any "Contaminated" Media - Human Receptor combination) - skip to #6 and enter "IN" status code

Rationale:

Soil at the facility is contaminated with constituent concentrations at or just above residential action levels. Although beryllium and arsenic concentrations are above action levels, they are not indicative of soil contamination since they are typical of background levels. Radionuclides of uranium and technetium-99 have also been detected at concentrations above the NRC Option 1 levels. Although "industrial land use" action levels may be appropriate and are being considered in the risk assessment

[3] Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

for this facility, the NRC Option 1 residential levels are frequently the primary regulatory driver for many soil cleanups.

Numerous source cleanups have been and are currently being conducted at SWMUs pursuant to the stabilization/interim measures provisions of the HSWA permit and the NRC decommissioning regulations. As a result, the potential for direct exposure to contaminants in the subsurface soils is expected to occur only through planned excavations or maintenance-related activities under a controlled setting.

Water service to the town and the adjacent industrial properties is supplied by Erwin (public) Utilities. There are no residences or water supply wells on the potentially affected off-site properties. The nearest water supply well (the Railroad Well) is located approximately 3,500 feet northeast and upgradient of NFS. Erwin Utilities owns and operates this well at an average pumping rate of 330 gpm. Recent capture zone analysis (groundwater modeling) indicated that the NFS contaminant plume is unaffected by the operation of the Railroad Well. Surface water is not used for drinking water in the Erwin area. The nearest public water supply on the Nolichucky River is the city of Jonesborough, TN, located eight miles downstream of Erwin, TN.

NFS owns and controls all property except that affected by the off-site groundwater plume (estimated to be 5-8 acres). High walled security fences surround all SWMUs and contaminant source areas within the plant. Appropriate for a high-security, nuclear fuel processing facility, these areas have also been instrumented with motion detectors and are patrolled by armed guards. NFS has notified the affected landowners of the possibility of groundwater contamination beneath their properties and has received permission to install Phase III RFI monitoring wells and sample additional surface waters. Earlier surface water sampling indicated slight traces of contamination but very much below any action levels. Thus, human exposure has been eliminated except for the on-site workers who only conduct sampling and remediation under approved NRC/EPA safety plans.

The EPA approved Phase III RFI Workplan also included conducting a risk assessment for both on-site and off-site human exposures. Region 4 guidance as well as the Superfund Risk Assessment Guidance (RAGS) will be used to develop appropriate groundwater cleanup levels which will be protective of human health and the environment at the immediate point of off-site exposure.

4 Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **"significant"**[4] (i.e., potentially "unacceptable" because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable "levels" (used to identify the "contamination"); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable "levels") could result in greater than acceptable risks)?

____ If no (exposures can not be reasonably expected to be significant (i.e., potentially "unacceptable") for any complete exposure pathway) - skip to #6 and enter "YE" status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If yes (exposures could be reasonably expected to be "significant" (i.e., potentially "unacceptable") for any complete exposure pathway) - continue after providing a description (of each potentially "unacceptable" exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to "contamination" (identified in #3) are not expected to be "significant."

____ If unknown (for any complete pathway) - skip to #6 and enter "IN" status code

Rationale and Reference(s): ____

____

[4] If there is any question on whether the identified exposures are "significant" (i.e., potentially "unacceptable") consult a human health Risk Assessment specialist with appropriate education, training and experience.

5 Can the "significant" **exposures** (identified in #4) be shown to be within **acceptable** limits?

_____ If yes (all "significant" exposures have been shown to be within acceptable limits) - continue and enter "YE" after summarizing and referencing documentation justifying why all "significant" exposures to "contamination" are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be "unacceptable")- continue and enter "NO" status code after providing a description of each potentially "unacceptable" exposure.

_____ If unknown (for any potentially "unacceptable" exposure) - continue and enter "IN" status code

Rationale and Reference(s): ____
____

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

X YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the Nuclear Fuel Services, Inc. facility, EPA ID TND 00 309 5635, located at Erwin, TN under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

____ NO - "Current Human Exposures" are NOT "Under Control."

____ IN - More information is needed to make a determination.

Completed by [signature] Date 10-1-99
Hernan R. Flores
Environmental Protection Specialist 3

Supervisor [signature] Date 10/1/99
William E. Krispin
Program Manager 1
Tennessee Department of Environment and Conservation

Concur ________ Date ________
Narindar Kumar
Chief, RCRA Programs Branch
Waste Management Division
EPA Region 4

Locations where References may be found:

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Division of Solid Waste Management
L & C Tower, 5th Floor
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Nashville, TN 37243-1535

Contact information:

Hernan R. Flores
(615) 532-0856
hflores@mail.state.tn.us

[5] FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENINNG OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSSMENTS OF RISK.

ATTACHMENT 2
RCRA Corrective Action
Environmental Indicator (EI) RCRA Info Code CA750
Migration of Contaminated Groundwater Under Control

Facility Name: **Nuclear Fuel Services, Inc.**
Facility Address: **Erwin, Tennessee**
Facility EPA ID No.: **TND 00 309 5635**

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, subject to RCRA Corrective Action (e.g., from Solid Waste Management Units (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

   __X__ If yes - check here and continue with #2 below,

   _____ If no - re-evaluate existing data, or

   _____ If data are not available, skip to #8 and enter "IN" (more information needed) status code.

BACKGROUND

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) to track changes in the quality of the environment. The two EIs developed to-date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of "Migration of Contaminated Groundwater Under Control" EI

A positive "Migration of Contaminated Groundwater Under Control" EI determination ("YE" status code) indicates that the migration of "contaminated" groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original "area of contaminated groundwater" (for all groundwater "contamination" subject to RCRA corrective action at or from the identified facility, i.e., site-wide).

Relationship of EI to Final Remedies

While final remedies remain the long-term objective of the RCRA Corrective Action program the EI are near-term objectives which are currently being used as Program measures for the Government Performance and Results Act of 1993, (GPRA). The "Migration of Contaminated Groundwater Under Control" EI pertains ONLY to the physical migration (i.e., further spread) of contaminated ground water and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

Duration / Applicability of EI Determinations

EI Determinations status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

2. Is **groundwater** known or reasonably suspected to be **"contaminated"**[1] above appropriately protective "levels" (i.e., applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action, anywhere at, or from, the facility?

_X_ If yes - continue after identifying key contaminants, citing appropriate "levels," and referencing supporting documentation.

____ If no - skip to #8 and enter "YE" status code, after citing appropriate "levels," and referencing supporting documentation to demonstrate that groundwater is not "contaminated."

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

A plume of contaminated groundwater primarily associated with SWMUs 1, 2, 4, 6, 9 and 20 is present at the NFS facility. The contaminants of concern in the groundwater at NFS include tetrachloroethylene (PCE), trichloroethene (TCE), cis-1,2 dichloroethylene (cis-1,2 DCE), vinyl chloride (VC), gross alpha and total uranium (U). NFS has installed 42 wells to monitor and treat groundwater at the facility. Twenty-one wells were installed on-site and twenty-two wells were installed off-site. Impact Plastics has collected groundwater samples from beneath their property located at 1070 Industrial Drive, which is approximately 0.1 miles northwest of NFS. Due to litigation between NFS and Impact Plastics there are no recent groundwater analytical results that would be relevant for this evaluation. Impact Plastics refuses to allow NFS to sample the wells. Impact Plastics also refuses to submit construction information pertaining to the wells on their property. However, NFS installed an additional monitoring well MW-122A directly across from Impact Plastics adjacent to the backwaters of the Nolichucky River. The monitoring well was installed August 25, 2004 and sampled August 31, 2004.

For the purpose of summarizing the condition of groundwater, the contaminant plume is divided into the source area, and the off-site plume.

Refer to Table 1 for the following discussion. Figure 1 depicts the monitoring well system at NFS. Figure 2 depicts the PCE plume. Figure 3 is the NFS site map. Monitoring well MW-122A is not depicted on the most recent facility maps. Due to the well just being installed the figures were not updated in time to include in this report. Please note that due to security considerations figures contained in this report do not show specific details about the plant site or contiguous properties. A topographic map showing the facility location is not included as part of this evaluation for the same reason.

There are twenty-one wells located in the source area. Sixteen wells contain PCE above the 0.005 milligrams per liter (mg/l) Maximum Contaminant Level (MCL). Six wells contain PCE at least one order of magnitude (>0.050 mg/l) above the MCL. MW-111A has the highest detection of PCE at 0.9 mg/l. Nine wells contain TCE above the 0.005 mg/l MCL. Two wells contain TCE at least one order of magnitude (>0.050 mg/l) above the MCL. IW-21 has the highest detection of TCE at 0.310 mg/l. Sixteen wells contain VC above the 0.002 mg/l MCL. Eight wells contain VC at least one order of magnitude (>0.020 mg/l) above the MCL. OW-1 has the highest detection of VC at 1.0 mg/l. Six wells contain DCE above the 0.070 mg/l MCL. Two wells contain cis-1,2 DCE at least one order of magnitude (>0.700 mg/l) above the MCL. MW-93 has the highest detection of cis-1,2 DCE at 1.1 mg/l. Four wells contain gross alpha above the 15 pCi/L MCL. Three wells contain gross alpha at least one order of magnitude (>150 pCi/l) above the 15 pCi/l MCL. MW-234-2 has the highest detection of gross alpha at 1338 pCi/l. Five wells contain U above the 0.030 mg/l MCL. IW-21 contains U at least one order of magnitude (>0.030 mg/l) above the MCL at 3.369 mg/l.

---

[1] "Contamination" and "contaminated" describes media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriate "levels" (appropriate for the protection of the groundwater resource and its beneficial uses).

There are twenty-two wells located off-site that define the contamination plume. Twelve wells contain PCE above the 0.005 mg/l MCL. Eight wells contain PCE at least one order of magnitude (>0.050 mg/l) above the MCL. MW-103A has the highest detection of PCE at 4.4 mg/l. Seven wells contain TCE above the 0.005 mg/l. Two wells contain TCE at least one order of magnitude (>0.050 mg/l) above the MCL. MW-103A has the highest detection of TCE at 0.40 mg/l. Seventeen wells contain VC above the 0.002 mg/l MCL. Five wells contain VC at least one order of magnitude (>0.020 mg/l) above the MCL. MW-103A has the highest detection of VC at 0.20 mg/l above the MCL. Two wells contain cis-1,2 DCE above the 0.070 mg/l above the MCL. MW103A has the highest detection at 0.640 mg/l.

The plume is approximately 1,400 feet by 1,000 feet or 1.4 million square feet (Figure 2).

References: 13, 14, 15, 16 and 17

3. Has the **migration** of contaminated groundwater **stabilized** such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"[2] as defined by the monitoring locations designated at the time of this determination?

__X__ If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"[7]).

____ If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"[2]) - skip to #8 and enter "NO" status code, after providing an explanation.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale:

Groundwater velocity of the plume is 13.08 feet/day. The plume travels approximately 700 feet from the plant boundary and emerges in backwater of the Nolichucky River. The Nolichucky is a receiving stream. Disposal of PCE at the NFS facility occurred between 1957 and 1965. Based on the velocity of the groundwater and the amount of time the disposal occurred at the plant site, it is apparent that contaminated groundwater has migrated beneath the Impact Plastics facility. Monitoring well MW-122A (installed August 24, 2004) installed adjacent to the backwater of the Nolichucky River contained PCE at 0.0037 mg/L. This is an indication that the plume is flowing to the Nolichucky. Low contaminant levels found in the backwaters adjacent to the Nolichucky River toward the northwest also indicates that the contamination moving in that direction has already reached the Nolichucky River. Remediation of the groundwater on the NFS property is addressing the source of contamination. Because NFS has begun source remediation and because contaminated groundwater is adjacent to or entering the Nolichucky River, no additional groundwater contamination beyond the present boundaries of contamination, is expected to occur.

Fractured, tilted beds of shale underlie the site. Any contamination moving vertically will move downward until competent bedrock is reached and will then be trapped. Attempts to drill deep wells at the NFS site proved problematic due to collapsing boreholes. Constituents of concern at depth are not expected to contaminate any additional groundwater at the site and is not a concern at this time.

---

2 "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated groundwater" remains within this area, and that the further migration of Acontaminated groundwater" is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

Reference(s): 13, 14, 15 and 17

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

_X_ If yes - continue after identifying potentially affected surface water bodies.

____ If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

____ If unknown - skip to #8 and enter "IN" status code.

Rationale: The Nolichucky River lies 700 feet from the source area at NFS. Groundwater flow from NFS is toward the Nolichucky River. Adjacent to the Nolichucky River is some impoundments caused by the rerouting of the Nolichucky during the building of Interstate I-26, called the backwaters in this report. Low levels of contamination have been detected in the backwaters. The contaminated groundwater is not expected to impact the Nolichucky River, only the backwaters.

Reference(s): 15

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be **"insignificant"** (i.e., the maximum concentration[3] of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature and number of discharging contaminants, or environmental setting) which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

_X_ If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration[7] of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) providing a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

____ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration[7] of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations[3] greater than 100 times their appropriate groundwater "levels," providing the estimated total amount (mass in kg/yr.) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identifying if there is evidence that the amount of discharging contaminants is increasing.

____ If unknown - enter "IN" status code in #8.

Rationale:

The Nolichucky backwater area and the Nolichucky River are the receiving surface waters. Groundwater from the NFS facility enters the waters through up flow. PCE was detected less than ten times the 0.005 mg/l MCL at 0.013 mg/l. in the backwaters. Monitoring well MW-122A installed adjacent to the backwater of the Nolichucky River contained PCE at 0.0037 mg/L. The Nolichucky River is not expected to be impacted by the contamination.

---

3 As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

Reference(s): 14, 15 and 17

6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be **"currently acceptable"** (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented[4])?

_____ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the sites surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment,[5] appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

_____ If no - (the discharge of "contaminated" groundwater can not be shown to be **"currently acceptable"**) - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

_____ If unknown - skip to 8 and enter "IN" status code.

Rationale:

Reference(s):

7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

__X__ If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

_____ If no - enter "NO" status code in #8.

---

4 Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

5 The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

____ If unknown - enter "IN" status code in #8.

Rationale:

NFS is performing on-going interim measures that require effectiveness monitoring. Additionally, during the upcoming October 21, 2004 Facility Action Plan Meeting, the Division will require continued surface water sampling of the Nolichucky backwater and further down stream on the Nolichucky River. The Division will require remediation of the backwater if deemed necessary to protect human health and the environment.

Reference(s): 14 and 15

8. Check the appropriate RCRA Info status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

 X YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at Nuclear Fuel Services, EPA ID No. TND 00 309 5635, located at Erwin, Tennessee. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater". This determination will be re-evaluated when the Agency/State become aware of significant changes at the facility.

____ NO – "Unacceptable Migration" of contaminated groundwater is observed or expected.

____ IN - More information is needed to make a determination.

Completed by ________________ Date: 9/17/04

Roger Donovan
Environmental Specialist 4

Supervisor ________________ Date: 9/17/04

Charles Burroughs
Environmental Program Manager I
Tennessee Division of Solid Waste Management

Location where References may be found:

Tennessee Department of Environment and Conservation
Division of Solid Waste Management
L & C Tower, 5th Floor
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Nashville, Tennessee 37243 - 1535

Contact telephone number and e-mail address:

Roger Donovan
(615) 532-0864
roger.donovan@state.tn.us

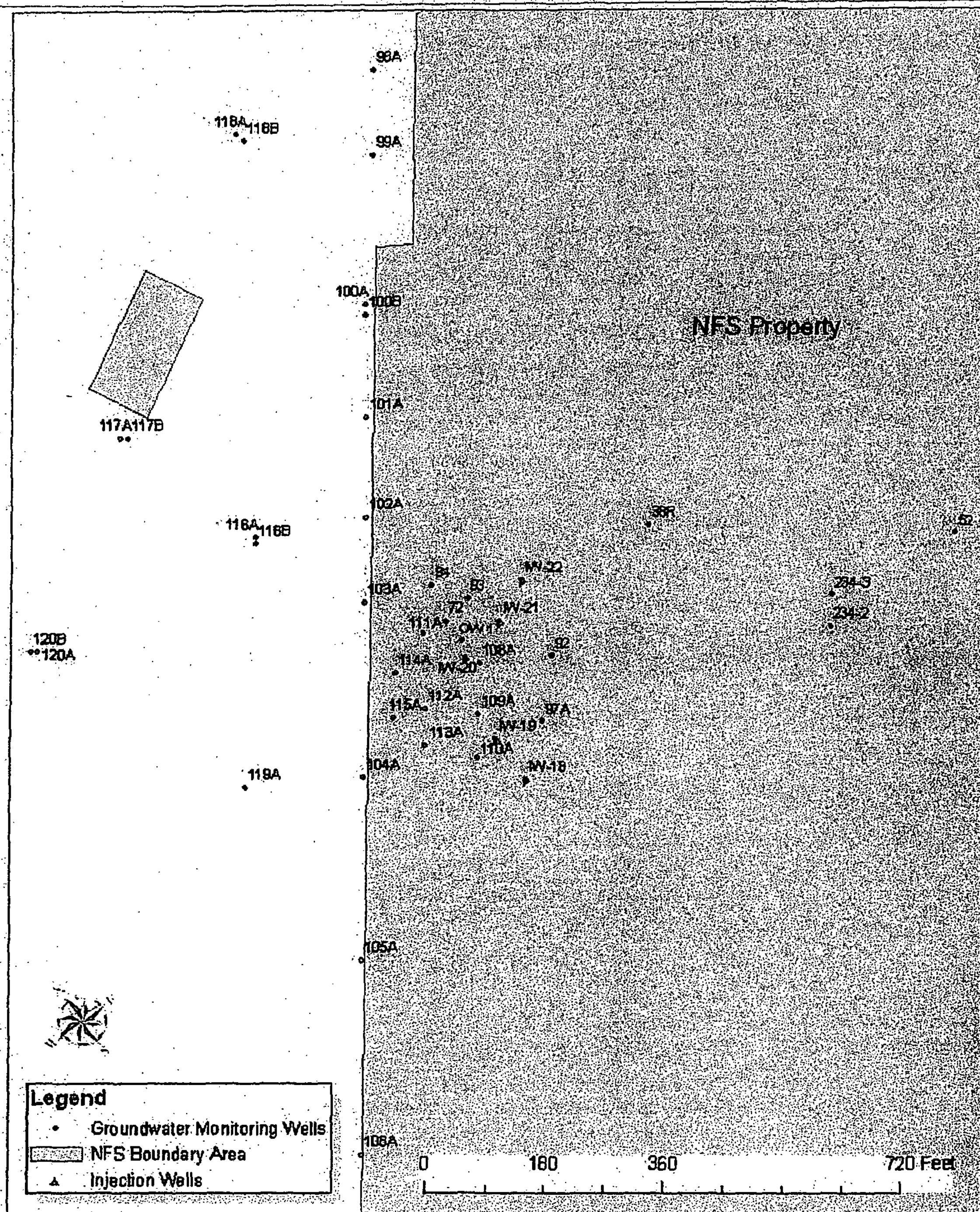
TABLE ONE

AREA	SOURCE AREA WELLS	OFF-SITE WELLS	SURFACE WATER LCOATIONS
NO. OF LOCATIONS WELLS	21	22	1
NO. OF LOCATIONS WITH PCE DETECTED	21	22	1
NO. LOCATIONS 0.005<PCE<0.050	10	4	1
NO. LOCATIONS PCE > 0.050	6	8	
HIGHEST RANGE PCE	0.0005-.900	0.0005-4.40	0.013
[illegible]	[illegible]	[illegible]	[illegible]
NO. OF LOCATIONS WITH TCE DETECTED	21	20	1
NO. LOCATIONS 0.005<TCE<0.050	7	5	
NO. LOCATIONS TCE > 0.050	2	2	
HIGHEST RANGE TCE	0.0005-0.310	0.0005-0.40	0.0025
[illegible]	[illegible]	[illegible]	[illegible]
NO. OF LOCATIONS WITH VINYL CHLORIDE (VC) DETECTED	21	21	0
NO. LOCATIONS 0.20<VC<2.00	8	12	
NO. LOCATIONS VC >2.00	8	5	
HIGHEST RANGE VC	0.001-1.0	0.001-0.20	
[illegible]	[illegible]	[illegible]	[illegible]
NO. OF LOCATIONS WITH Cis-1,2-DCE DETECTED	21	21	0
NO. LOCATIONS 0.070<Cis-1,2-DCE<0.1047	4	2	
NO. LOCATIONS Cis-1,2-DCE > 0.140	2	0	
HIGHEST RANGE Cis-1,2-DCE	0.00095-1.10	0.0005-0.640	
[illegible]	[illegible]	[illegible]	[illegible]
NO. LOCATIONS WITH GROSS ALPHA DETECTED	5	17	1
NO. LOCATIONS 15 pCi/l<GROSS ALPHA<150.00 pCi/l	1	0	
NO. LOCATIONS GROSS ALPHA > 150.00 pCi/l	3	0	
HIGHEST RANGE GROSS ALPHA (in pCi/l)	1.0-1338.0	0.59-8	0.59
[illegible]	[illegible]	[illegible]	[illegible]
NO. OF LOCATIONS WITH U DETECTED	17	12	1
NO. LOCATIONS 0.030 < U< 0.300	4	0	
NO. LOCATIONS U > 0.300	1	0	
HIGHEST RANGE U	0.0002-3.369	.00014-0.0163	0.327pCi/l
[illegible]	[illegible]	[illegible]	[illegible]

NOTES: ALL VALUES IN MG/L EXCEPT WHERE NOTED; PCE = TETRACHLOROETHYLENE, TCE = TRICHLOROETHENE, VC = VINYL CHLORIDE, Cis-1,2-DCE= Cis-1,2-DICHLOROETHENE, U = URANIUM

FIGURE 1

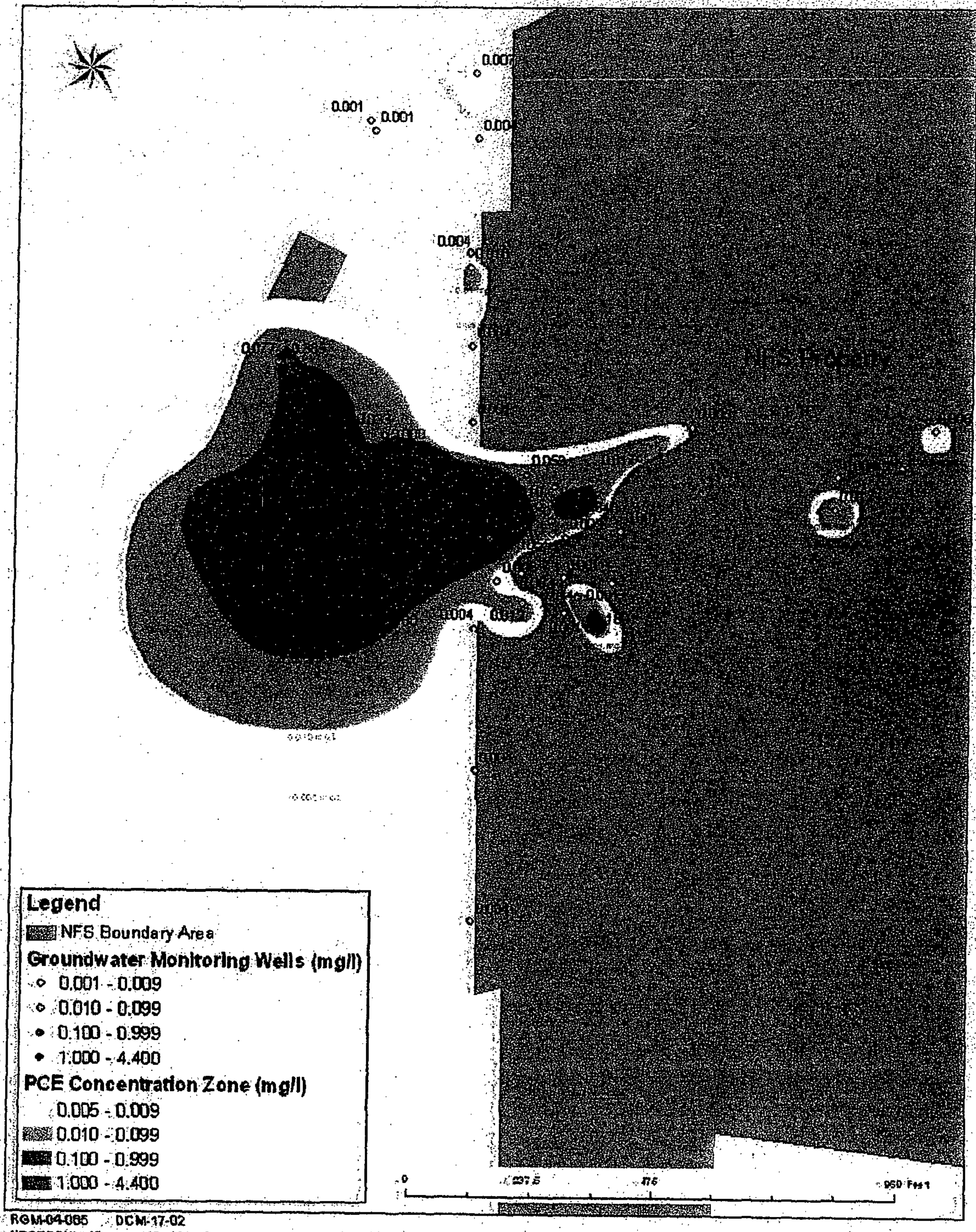
NFS Site Groundwater Monitoring Wells



RGM-04-058 Ntas11/Decomm/RobbiM/Data for GIS/Maps/2004ACFProject

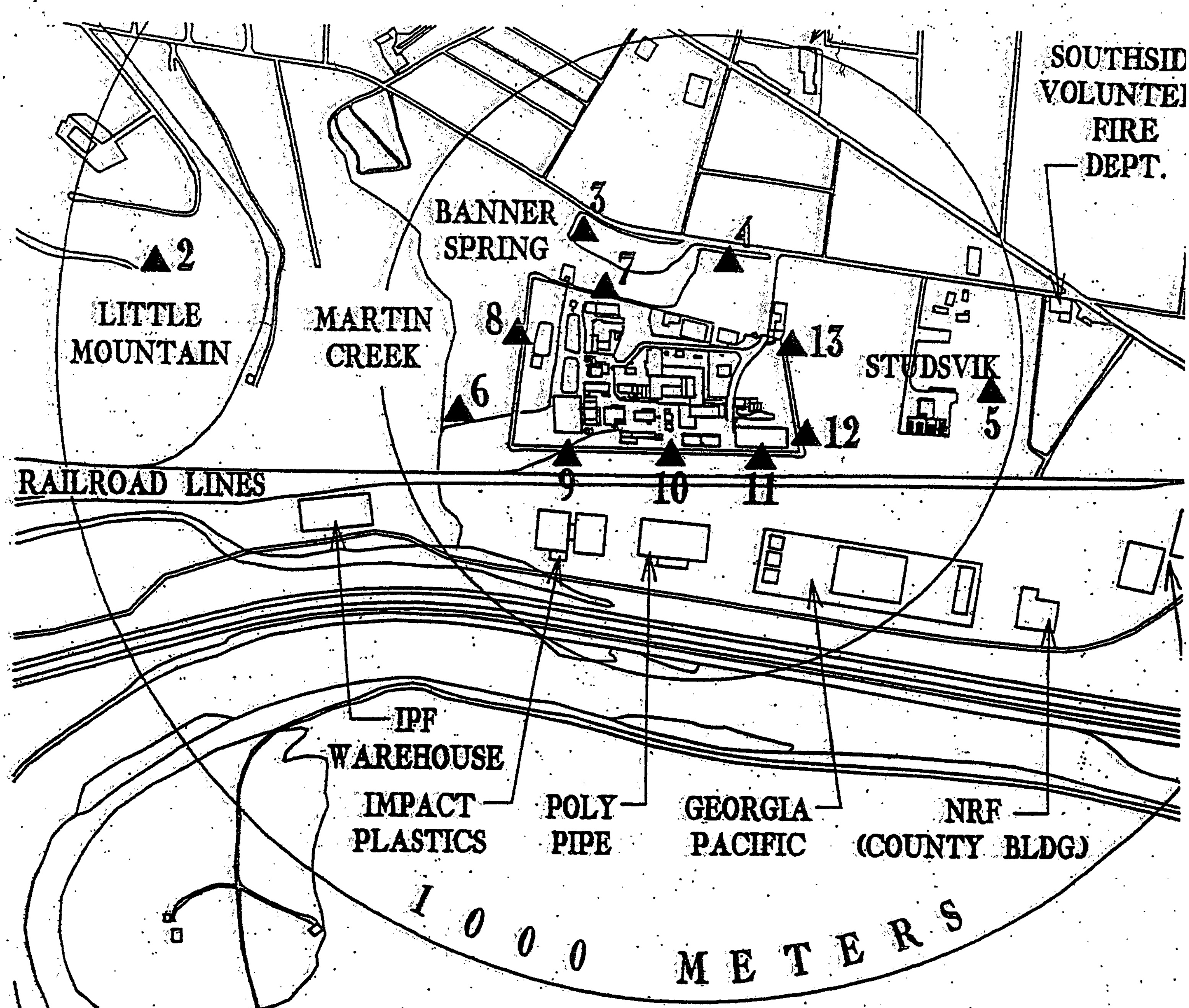
FIGURE 2

NFS Site PCE Plume Map – 1st Quarter (2004)



RGM-04-085 DCM-17-02

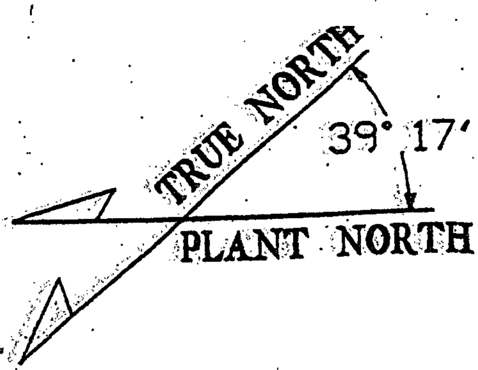
NFSPRRNtas\Decomm\Robb\MData for GIS\Maps\Groundwater\PCE\NFS Site 1st Qtr 2004 PCE Plume



LEGEND

▲ "SYMBOL" DOSIMETER LOCATIONS

1 ASHEVILLE HIGHWAY (ATTACHED TO AIR SAMPLER [illegible])
2 LITTLE MOUNTAIN (ATTACHED TO AIR SAMPLER [illegible])
3 CAROLINA AVENUE-1 (ATTACHED TO AIR SAMPLER [illegible])
4 CAROLINA AVENUE-2 (ATTACHED TO BOUNDARY FENCE FOR MAIN PARKING AREA - MIDWAY)
5 BERKSHIRE DRIVE (ATTACHED TO TELEPHONE POLE)
6 NORTH BOUNDARY FENCE (ATTACHED TO BOUNDARY FENCE NEAR CONFLUENCE OF MARTINS CREEK AND BANNER SPRING BRANCH)
7 EAST OF BLDG.[illegible] (ATTACHED TO OUTER PROTECTED AREA FENCE)
8 NORTH OF PONDS AREA (ATTACHED TO OUTER PROTECTED AREA FENCE)
9 WEST OF BLDG.[illegible] (ATTACHED TO OUTER PROTECTED AREA FENCE)
10 WEST OF BLDG.[illegible] (ATTACHED TO OUTER PROTECTED AREA FENCE)
11 WEST OF BLDG.[illegible] (ATTACHED TO OUTER PROTECTED AREA FENCE)
12 SOUTH OF BLDG.[illegible] (ATTACHED TO OUTER PROTECTED AREA FENCE)
13 SOUTH PERIMETER (ATTACHED TO OUTER PROTECTED AREA FENCE - NEAR BLDG.[illegible])



DOE/EIS-0240-S

Office of
Fissile Materials Disposition

United States Department of Energy

Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement

Summary

June 1996

For Further Information Contact:
U.S. Department of Energy
Office of Fissile Materials Disposition, 1000 Independence Ave., SW, Washington, D.C. 20585

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(423) 743-6995 Fax
John W. Nagy
Health Physicist

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing and Materials
B&W	Babcock & Wilcox
BTU	British thermal unit
CEQ	Council on Environmental Quality
CO	carbon monoxide
DOE	Department of Energy
DOT	Department of Transportation
DU	depleted uranium
EA	environmental assessment
EIS	environmental impact statement
ERDA	Energy Research and Development Administration
ha	hectare
HEU	highly enriched uranium
HEU EIS	*Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement*
HF	hydrogen fluoride
HLW	high-level waste
IAEA	International Atomic Energy Agency
kg	kilogram
km	kilometer
l	liter
lb	pound
LEU	low-enriched uranium
LLW	low-level waste
m^3	cubic meter
mi	mile
mrem	millirem (one thousandth of a rem)
MWe	megawatt electric
MWh	megawatt hour

NEPA	*National Environmental Policy Act* of 1969
NFS	Nuclear Fuel Services
NO_2	nitrogen oxide
NRC	Nuclear Regulatory Commission
NTS	Nevada Test Site
NU	natural uranium
ORR	Oak Ridge Reservation
Pb	lead
PEIS	programmatic environmental impact statement
PM_{10}	particulate matter (less than 10 microns)
Pu	plutonium
rem	roentgen equivalent man
ROD	Record of Decision
ROI	region of influence
SO_2	sulfur dioxide
SRS	Savannah River Site
t	metric ton
TSP	total suspended particulates
U	uranium
U-234	uranium-234
U-235	uranium-235
U-236	uranium-236
U-238	uranium-238
UF_6	uranium hexafluoride
UNH	uranyl nitrate hexahydrate
USEC	United States Enrichment Corporation
Y–12 EA	*Environmental Assessment for the Proposed Interim Storage of Enriched Uranium Above the Maximum Historical Storage Level at the Y–12 Plant, Oak Ridge, Tennessee*

METRIC CONVERSION CHART

To Convert Into Metric			To Convert Out of Metric		
If You Know	**Multiply By**	**To Get**	**If You Know**	**Multiply By**	**To Get**
Length					
inches	2.54	centimeters	centimeters	0.3937	inches
feet	30.48	centimeters	centimeters	0.0328	feet
feet	0.3048	meters	meters	3.281	feet
yards	0.9144	meters	meters	1.0936	yards
miles	1.60934	kilometers	kilometers	0.6214	miles
Area					
sq. inches	6.4516	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.092903	sq. meters	sq. meters	10.7639	sq. feet
sq. yards	0.8361	sq. meters	sq. meters	1.196	sq. yards
acres	0.40469	hectares	hectares	2.471	acres
sq. miles	2.58999	sq. kilometers	sq. kilometers	0.3861	sq. miles
Volume					
fluid ounces	29.574	milliliters	milliliters	0.0338	fluid ounces
gallons	3.7854	liters	liters	0.26417	gallons
cubic feet	0.028317	cubic meters	cubic meters	35.315	cubic feet
cubic yards	0.76455	cubic meters	cubic meters	1.308	cubic yards
Weight					
ounces	28.3495	grams	grams	0.03527	ounces
pounds	0.45360	kilograms	kilograms	2.2046	pounds
short tons	0.90718	metric tons	metric tons	1.1023	short tons
Force					
dynes	.00001	newtons	newtons	100,000	dynes
Temperature					
Fahrenheit	Subtract 32 then multiply by 5/9ths	Celsius	Celsius	Multiply by 9/5ths, then add 32	Fahrenheit

The numbers (estimated by models or calculated, not those obtained from references) in this document have been rounded using engineering judgment to facilitate reading and understanding of the document. Because numbers have been rounded, converting these numbers from metric to English using the conversion table above will give answers not consistent within the text.

METRIC PREFIXES

Prefix	Symbol	Multiplication Factor
exa-	E	1 000 000 000 000 000 000 = 10^{18}
peta-	P	1 000 000 000 000 000 = 10^{15}
tera-	T	1 000 000 000 000 = 10^{12}
giga-	G	1 000 000 000 = 10^{9}
mega-	M	1 000 000 = 10^{6}
kilo-	k	1 000 = 10^{3}
hecto-	h	100 = 10^{2}
deka-	da	10 = 10^{1}
deci-	d	0.1 = 10^{-1}
centi-	c	0.01 = 10^{-2}
milli-	m	0.001 = 10^{-3}
micro-	μ	0.000 001 = 10^{-6}
nano-	n	0.000 000 001 = 10^{-9}
pico-	p	0.000 000 000 001 = 10^{-12}
femto-	f	0.000 000 000 000 001 = 10^{-15}
atto-	a	0.000 000 000 000 000 001 = 10^{-18}

Summary

INTRODUCTION

The Department of Energy (DOE) is the Federal agency responsible for the management, storage, and disposition of weapons-usable fissile materials from United States nuclear weapons production and dismantlement activities. Highly enriched uranium (HEU) is a weapons-usable fissile material; in certain forms and concentrations, it can be used to make nuclear weapons.[1] In accordance with the *National Environmental Policy Act* of 1969 (NEPA), the Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and DOE's NEPA Implementation Procedures (10 CFR Part 1021), DOE has prepared this environmental impact statement (EIS) to evaluate alternatives for the disposition of U.S.-origin HEU that has been or may be declared surplus to national defense or national defense-related program needs by the President.

This *Disposition of Surplus Highly Enriched Uranium Final Environmental Impact Statement* (HEU EIS) consists of two volumes, plus this summary. Volume I contains the main text and the technical appendices that provide supporting details for the analyses contained in the main text. Volume II contains the comments received on the HEU Draft EIS during the public review period and the DOE responses to those comments. Major comments are summarized starting on page S–22. Changes to the HEU Draft EIS Summary are shown by sidebar notation (vertical lines adjacent to text) in this HEU Final EIS Summary for both the text and tables. Deletion of one or more sentences is indicated by the phrase "text deleted." Similarly, where a table or figure has been removed, the phrase "table deleted" or "figure deleted" is shown.

Uranium

The heaviest naturally occurring metallic element. It has three naturally occurring radioactive isotopes, uranium-234 (U-234) (<0.01 percent of natural uranium), U-235 (0.7 percent), and U-238 (99.3 percent). U-235 is most commonly used as a fuel for nuclear fission.

The end of the Cold War created a legacy of weapons-usable fissile materials both in the United States and the former Soviet Union. Further agreements on disarmament between the two nations may increase the surplus quantities of these materials. The global stockpiles of weapons-usable fissile materials pose a danger to national and international security in the form of potential proliferation of nuclear weapons and the potential for environmental, safety, and health consequences if the materials are not properly safeguarded and managed. To demonstrate the United States' commitment to reducing the threat of proliferation, President Clinton announced on March 1, 1995, that approximately 200 metric tons (t) of U.S.-origin fissile materials, of which 165 t is HEU, had been declared surplus to the United States' defense needs.[2]

THE PROPOSED ACTION

The Department of Energy proposes to blend down surplus HEU to low-enriched uranium (LEU), to eliminate the risk of diversion for nuclear

[1] Plutonium (Pu) is the other major weapons-usable fissile material. This document covers the disposition of surplus HEU. The storage of nonsurplus Pu and the storage and disposition of surplus Pu, as well as the storage of nonsurplus HEU and surplus HEU before disposition (or continued storage of surplus HEU if no action is selected in the Record of Decision [ROD] for this HEU EIS), are analyzed in the *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement*, which was issued (in draft form) in February 1996.

[2] The Secretary of Energy's *Openness Initiative* announcement of February 6, 1996, declared that the United States has about 213 t of surplus fissile materials, including the 200 t the President announced March 1995. Of the 213 t of surplus materials, the *Openness Initiative* indicated that about 174.3 t (hereafter referred to as approximately 175 t) are HEU, including 10 t previously placed under International Atomic Energy Agency (IAEA) safeguards in Oak Ridge, Tennessee. The HEU Draft EIS, which identified the current surplus as 165 t, did not include the IAEA safeguarded material.

proliferation purposes and, where practical, to reuse the resulting LEU in peaceful, beneficial ways that recover its commercial value.[3] Uranium enriched to 20 percent or more in the uranium-235 (U-235) isotope can be used for weapons. The isotope most abundant in nature is U-238. Therefore, the weapons-usability of HEU can be eliminated by blending it with material that is low in U-235 and high in U-238 to create LEU. This isotopic blending process can be performed by blending HEU with depleted uranium (DU), natural uranium (NU), or LEU blendstock. Once HEU is blended down to LEU, it is no more weapons-usable than existing, abundant supplies of LEU. It would need to be re-enriched to be useful in weapons, which is a costly, technically demanding, and time-consuming process. Therefore, blending to LEU is the most timely and effective method for eliminating the proliferation threat of surplus HEU.

Highly Enriched Uranium

Uranium enriched in the isotope U-235 to 20 percent or above, at which point it becomes suitable for use in nuclear weapons.

The Department of Energy's inventory of surplus HEU consists of a variety of chemical, isotopic, and physical forms. If blended down, much of the resulting LEU would be suitable for commercial use in the fabrication of fuel for nuclear power plants. Other portions of the resultant LEU would contain uranium isotopes, such as U-234 and U-236, that would make them less desirable for commercial use. To the extent that they could not be commercially used, these portions would need to be disposed of as radioactive low-level waste (LLW). Some of the material may or may not be directly suitable for commercial use because its isotopic composition would not meet current industry specifications for commercial nuclear reactor fuel. Nonetheless, it could be used as fuel under certain circumstances.

Because of the multiplicity of existing material forms and potential end products (commercial reactor fuel or LLW), disposition of the entire inventory of surplus HEU is likely to involve multiple processes, facilities, and business arrangements.

[Text deleted.]

[Figure deleted.]

Low-Enriched Uranium

Uranium with a content of the isotope U-235 greater than 0.7 percent and less than 20 percent.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to reduce the threat of nuclear weapons proliferation worldwide in an environmentally safe and timely manner by reducing stockpiles of weapons-usable fissile materials, setting a nonproliferation example for other nations, and allowing peaceful, beneficial reuse of the material to the extent practical.

Blending

Dilution of HEU (20 percent or greater U-235 content) with low-enriched (1- to 2-percent U-235), natural (0.7-percent U-235), or depleted (0.2 to 0.7-percent U-235) uranium by one of several available processes to produce LEU.

[3] Low-enriched uranium has commercial value because, at appropriate enrichment levels and in appropriate forms, it can be used as fuel for the generation of electricity in nuclear power plants.

Comprehensive disposition actions are needed to ensure that surplus HEU is converted to proliferation-resistant forms consistent with the objectives of the President's nonproliferation policy. These proposed actions would essentially eliminate the potential for reuse of the material in nuclear weapons, would demonstrate the United States' commitment to dispose of surplus HEU, and encourage other nations to take similar actions toward reducing stockpiles of surplus HEU. The proposed action would begin to reduce DOE's HEU inventory as well as costs associated with storage, accountability, and security, rather than indefinitely storing such material. Blending down surplus HEU to make non-weapons-usable LEU is the easiest and most rapid path for neutralizing its proliferation potential.

Scope of the Environmental Impact Statement

The HEU EIS assesses environmental impacts of reasonable alternatives for the disposition of surplus HEU. The HEU EIS assesses the disposition of a nominal 200 t of surplus HEU, encompassing HEU that has already been declared surplus as well as additional weapons-usable HEU (not yet identified) that may be declared surplus in the future. The material, which is in a variety of forms, is currently located at facilities throughout DOE's nuclear weapons complex, but the majority is stored at the Y–12 Plant in Oak Ridge, Tennessee, or is destined to be moved there for storage. As a result of the Secretary of Energy's *Openness Initiative* announcement of February 6, 1996, DOE is now able to provide additional unclassified details about the locations, forms, and quantities of surplus HEU, which are shown in Figure S–1. This EIS also addresses transfer of title to 7,000 t of NU now owned by DOE to the United States Enrichment Corporation (USEC). This material is part of a larger quantity that is in storage at DOE's Portsmouth and Paducah gaseous diffusion plants.

The HEU EIS assesses potential environmental impacts associated with the four sites where HEU conversion and blending could occur: DOE's Y–12 Plant at the Oak Ridge Reservation (ORR) in Oak Ridge, Tennessee; DOE's Savannah River Site (SRS) in Aiken, South Carolina; the Babcock & Wilcox Naval Nuclear Fuel Division facility (B&W) in Lynchburg, Virginia; and the Nuclear Fuel Services (NFS) facilities in Erwin, Tennessee. The blending processes evaluated are uranyl nitrate hexahydrate (UNH), metal, and uranium hexafluoride (UF_6). UF_6 blending capability does not currently exist at any of the candidate sites.

Uranyl nitrate hexahydrate blending could be used to produce either commercial reactor fuel or LLW, whereas UF_6 and metal blending would only be used to produce LEU for commercial reactor fuel or LLW, respectively. The HEU EIS also assesses the environmental impacts of transportation of these materials. Figure S–2 shows the location of sites that might be used for the HEU blending process(es).

The disposition of surplus HEU was originally considered within the scope of the *Storage and Disposition of Weapons-Usable Fissile Materials Programmatic Environmental Impact Statement* (Storage and Disposition PEIS), which also deals with plutonium (Pu). In the course of the Storage and Disposition PEIS public scoping process (August through October 1994), DOE realized that it might be more appropriate to analyze the impacts of surplus HEU disposition in a separate EIS. DOE held a public meeting on November 10, 1994, to obtain comments on this subject, and subsequently concluded that a separate EIS would be appropriate.

The decision to separate the analysis of surplus HEU disposition from the Storage and Disposition PEIS was made for a number of reasons, including the following: the disposition of surplus HEU could use existing technologies and facilities in the United States, in contrast to the disposition of surplus Pu; the disposition of surplus HEU would involve different timeframes, technologies, facilities, and personnel than those required for the disposition of surplus Pu; decisions on surplus HEU disposition are independently justified, would not impact, trigger, or preclude other decisions that may be made regarding the disposition of surplus Pu, and would not depend on actions taken or decisions made pursuant to the Storage and Disposition PEIS. In addition, a separate action is the most rapid path for neutralizing the proliferation threat of surplus HEU; is consistent with the President's nonproliferation policy; would demonstrate the United States' nonproliferation commitment to other nations; and is consistent with

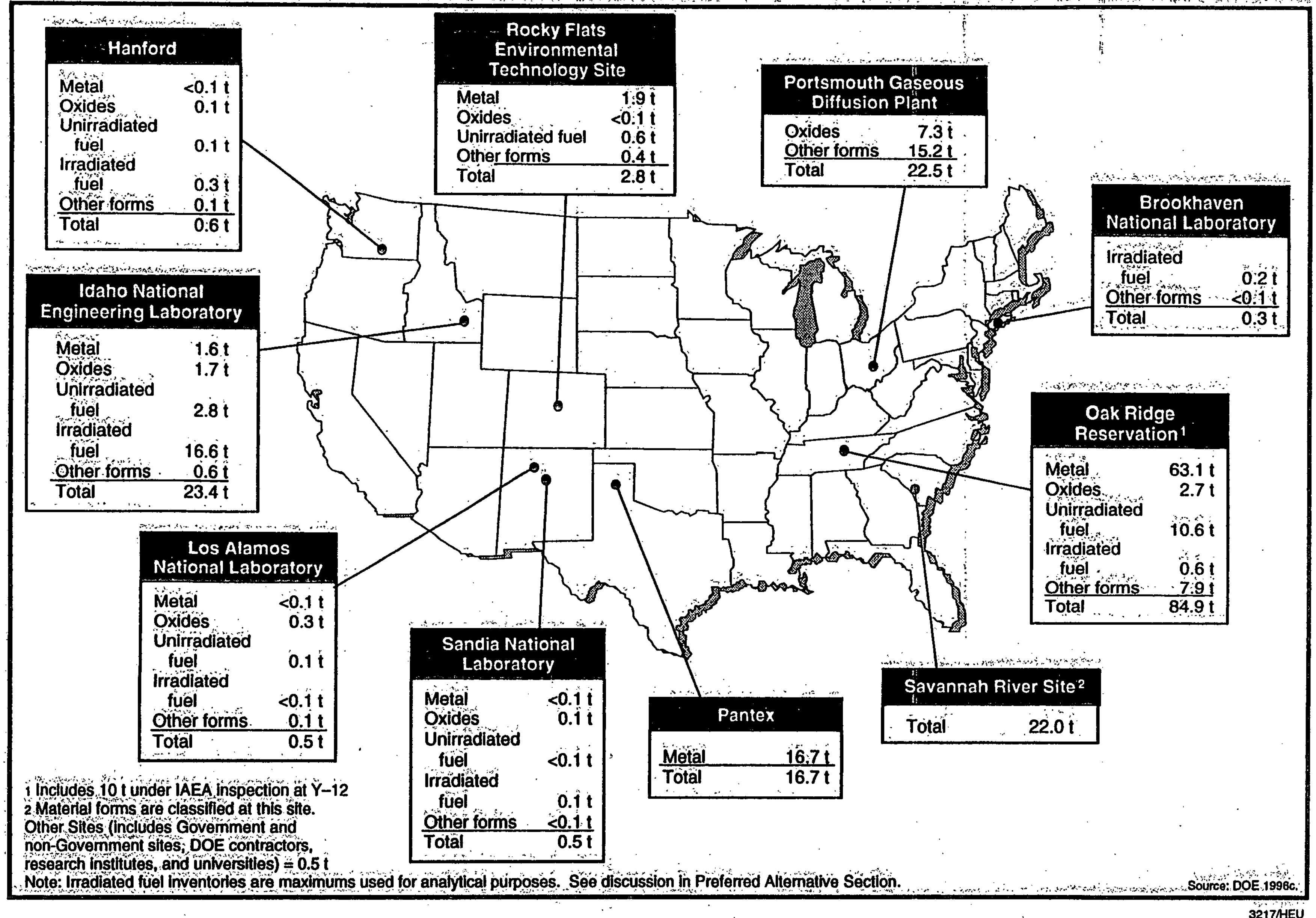

Figure S–1. Locations, Forms, and Amounts of Surplus Highly Enriched Uranium, as of February 6, 1996.

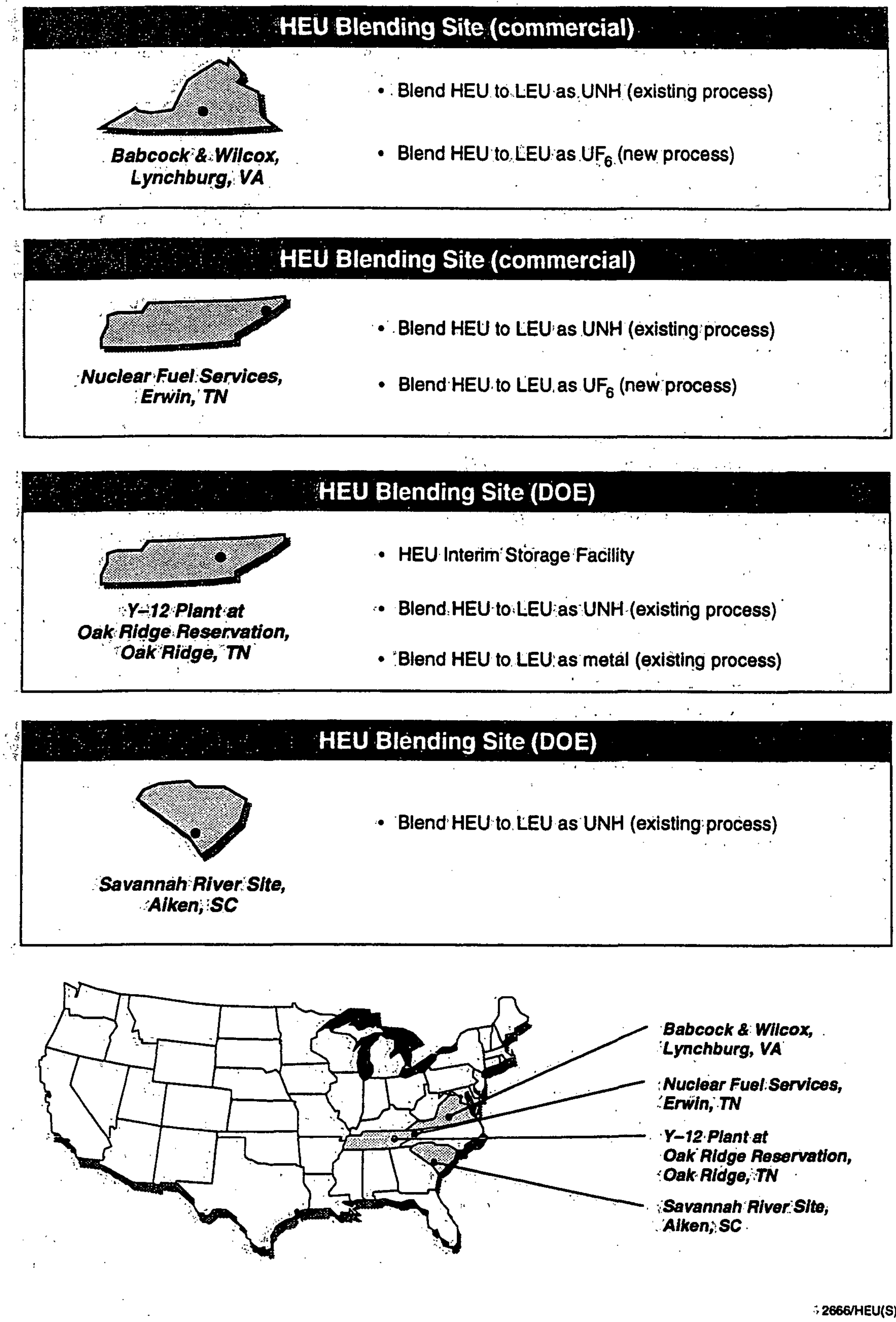

Figure S–2. Location of Sites That Would be Potentially Involved in the Proposed Highly Enriched Uranium Blending Processes.

the course of action now underway in Russia to reduce Russian HEU stockpiles.

Accordingly, DOE published a notice in the *Federal Register* (60 FR 17344) on April 5, 1995, to inform the public of the proposed plan to prepare a separate EIS for the disposition of surplus HEU. Four comments (one pro and three con) were received on the proposal. For the reasons explained above, DOE concluded that disposition of surplus HEU should be treated separately. The scope of the Storage and Disposition PEIS continues to include storage of surplus HEU beyond a 10-year (yr) period and storage of most nonsurplus HEU.

Until recently, DOE was authorized to market LEU, including LEU derived from HEU, only with USEC acting as its marketing agent.[4] On April 26, 1996, the President signed Public Law 104-134, the *Balanced Budget Down Payment Act*, which included provisions (in Sections 3101-3117, the *USEC Privatization Act*) providing for the privatization of USEC. This legislation provides that, once USEC is privatized, DOE is not required to sell through USEC, but places several conditions on the sale or transfer of DOE's uranium inventory (Public Law 104-134, Sections 3112(d) and 3116(a)(1)). Thus, once USEC is privatized, DOE will have numerous business options for selling LEU derived from surplus HEU and could pursue a number of different methods for undertaking or contracting blending services and LEU sales over time. The HEU EIS addresses the potential impacts associated with the various alternatives regardless of the commercial arrangements.

The exact quantity of future discrete "batches" of surplus HEU, and the exact time at which such batches would be subject to disposition, would depend on a number of factors, including the rate of weapons dismantlement; the rate at which the HEU is declared surplus; market conditions; work orders for commercial fuel feed; legislative restrictions on sales (see Public Law 104-134); and available throughput capacities and capabilities of the blending facilities. The HEU EIS analyzes the blending of surplus HEU at the facilities and using technologies that exist and are available today or that could be added without new construction. It analyzes the transportation of necessary materials from their likely places of origin to the potential blending sites, and from blending sites to the likely or representative destinations for nuclear fuel fabrication or waste disposal. Decisions about the timing and details of specific disposition actions (which facility or process to use) might be made in part by DOE, USEC, the private successor to USEC, or other private entities acting as marketing agents for DOE.

Enrichment

A process whereby the proportion of fissile U-235 in uranium is increased above its naturally occurring value of 0.7 percent. Enrichment to approximately 3 to 5 percent is typical of fuel for nuclear power reactors and to 90 percent or more is typical for weapons.

PREFERRED ALTERNATIVE

Several representative, reasonable alternatives are described and assessed in Chapters 2 and 4 of the HEU EIS, and summarized in Tables S–1 through S–3 of this Summary. In addition to the No Action Alternative, there are four alternatives that represent different ratios of blending to commercial use versus blending to waste, different combinations of blending sites, and different combinations of blending technologies. DOE has identified a preferred alternative that satisfies the purpose and need described previously. The Preferred Alternative is identified as Alternative 5, Variation c (the variation using all four sites), in the HEU EIS. Under this alternative, the commercial use of surplus HEU would be maximized, and the blending would most likely be done at some combination of commercial and DOE sites. The Preferred Alternative is as follows:

[4] The *Energy Policy Act* of 1992, Public Law 102-486, created USEC as a wholly Government-owned corporation to take over uranium enrichment functions from DOE. The legislation made USEC the Government's exclusive marketing agent for enriched uranium (42 U.S.C. 2297c(a)).

Table S–1. Alternatives for Disposition of Surplus Highly Enriched Uranium

Alternatives	Site Variations	Components	DOE Sites: Y–12 and SRS			Commercial Sites: B&W and NFS		
			Amount	Process	Duration[a]	Amount	Process	Duration[a]
1. No Action			200 t (Primarily Y–12)	storage	10 yrs			
2. No Commercial Use 100-percent waste	All four sites	200 t blended to waste	50 t/site	UNH metal[b]	24 yrs 16 yrs	50 t/site	UNH	24 yrs
3. Limited Commercial Use 25-percent fuel/ 75-percent waste	All four sites (except for 50 t of USEC material)	50 t fuel[c]				25 t/site	UF_6 UNH	6 yrs 6 yrs
		150 t waste	37.5 t/site	UNH metal[b]	18 yrs 12 yrs	37.5 t/site	UNH	18 yrs
4. Substantial Commercial Use 65-percent fuel/ 35-percent waste	a) DOE sites only	130 t fuel[c]	65 t/site	UNH	16 yrs			
		70 t waste	35 t/site	UNH metal[b]	17 yrs 11 yrs			
	b) Commercial sites only	130 t fuel[c]				65 t/site	UF_6 UNH	16 yrs 16 yrs
		70 t waste				35 t/site	UNH	17 yrs
	c) All four sites	130 t fuel[c]	32.5 t/site	UNH	16 yrs	32.5 t/site	UF_6 UNH	16 yrs 16 yrs
		70 t waste	17.5 t/site	UNH metal[b]	8 yrs 6 yrs	17.5 t/site	UNH	8 yrs

Table S–1. Alternatives for Disposition of Surplus Highly Enriched Uranium—Continued

Alternatives	Site Variations	Components	DOE Sites: Y–12 and SRS			Commercial Sites: B&W and NFS		
			Amount	Process	Duration[a]	Amount	Process	Duration[a]
	d) Single site	130 t fuel[c]	130 t/site	UNH	16 yrs	130 t/site	UF_6 UNH	16 yrs 16 yrs
		70 t waste	70 t/site	UNH metal[b]	33 yrs 23 yrs	70 t/site	UNH	33 yrs
5. Maximum Commercial Use 85-percent fuel/ 15-percent waste	a) DOE sites only	170 t fuel[c]	85 t/site	UNH	21 yrs			
		30 t waste	15 t/site	UNH metal[b]	7 yrs 5 yrs			
	b) Commercial sites only	170 t fuel[c]				85 t/site	UF_6 UNH	21 yrs 21 yrs
		30 t waste				15 t/site	UNH	7 yrs
	c) All four sites	170 t fuel[c]	42.5 t/site	UNH	21 yrs	42.5 t/site	UF_6 UNH	21 yrs 21 yrs
		30 t waste	7.5 t/site	UNH metal[b]	4 yrs 2 yrs	7.5 t/site	UNH	4 yrs
	d) Single site	170 t fuel[c]	170 t/site	UNH	21 yrs	170 t/site	UF_6 UNH	21 yrs 21 yrs
		30 t waste	30 t/site	UNH metal[b]	14 yrs 10 yrs	30 t/site	UNH	14 yrs

[a] Some indicated durations are revised substantially from those in the Draft EIS, in response to comments received. Whereas the Draft EIS based its projections of commercial blending durations on maximum possible blending capabilities of the facilities (up to 40 t/yr total in the four-sites variations), the durations indicated here (based on a total of 8 t/yr for commercial material) reflect more realistic assumptions concerning DOE's ability to make material available, market conditions, and legislative requirements to avoid adverse material impacts on the domestic uranium industry. Waste blending is based on processing rates of 3.1 t/yr for metal blending at Y–12 and 2.1 t/yr for UNH blending at other sites (about 9 t/yr for all four sites together).

[b] The Y–12 Plant only.

[c] The proposal to transfer 50 t of HEU to USEC is a component of each of the commercial use Alternatives (3, 4, and 5). Included within this proposal, and as part of Alternatives 3, 4, and 5, is the proposed transfer to USEC of title to 7,000 t of NU.

- To gradually blend down surplus HEU and sell as much as possible (up to 85 percent) of the resulting commercially usable LEU (including as much off-spec[5] LEU as practical) for use as reactor fuel, (including 50 t of HEU that are proposed to be transferred to USEC over a 6-year period[6]), using a combination of four sites (Y–12, SRS, B&W, and NFS) and two possible blending technologies (blending as UF_6 and UNH) that best serves programmatic, economic, and environmental needs, following the ROD and continuing over an approximate 15- to 20-year period, with continued storage of the HEU until blend down.

- To eventually blend down surplus HEU that has no commercial value, using a combination of four sites (Y–12, SRS, B&W, and NFS) and two blending technologies (blending as UNH and metal) that best serves programmatic, economic, and environmental needs, to dispose of the resulting LEU as LLW, and to continue to store the surplus HEU until blend down occurs.

Because a portion of the surplus HEU is in forms, such as residues and weapons components, that would require considerable time to make available for blending, it is anticipated that no more than 70 percent of the surplus HEU could be blended down and commercialized over the next 10- to 15-year period.

A portion of the surplus HEU is in the form of irradiated fuel (the total quantity of which remains classified). The irradiated fuel is not directly weapons-usable, is under safeguards and security, and poses no proliferation threat. Therefore, DOE is not proposing to process the irradiated fuel to separate the HEU for down blending as part of any of the alternatives in the HEU EIS. There are no current or anticipated DOE plans to process irradiated fuel solely for the purposes of extracting HEU. However, activities associated with the irradiated fuel for the purposes of stabilization, facility cleanup, treatment, waste management, safe disposal, or environment, safety, and health reasons could result in the separation of HEU in weapons-usable form that could pose a proliferation threat and thus be within the scope of the HEU EIS. Under the Preferred Alternative, DOE would recycle any such recovered HEU and blend it to LEU pursuant to the HEU EIS.[7] (If the No Action Alternative were selected in the ROD for this EIS, such "recovered" HEU would continue to be stored pursuant to the Storage and Disposition PEIS or other appropriate NEPA analyses.) To provide a conservative analysis presenting maximum potential impacts, the HEU EIS includes such HEU (currently in the form of irradiated

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[5] Off-spec material is material that, when blended to LEU, would not meet industry standard (American Society for Testing Materials) specifications for isotopic content of commercial nuclear reactor fuel. The ultimate disposition of the off-spec material will depend on the ability and willingness of nuclear fuel fabricators and nuclear utilities to use and the Nuclear Regulatory Commission to license the use of off-spec fuel. (For instance, fuel with a higher than usual proportion of the isotope U-236, which inhibits the fission process that is needed for reactors to produce heat and electricity, can still be used in nuclear fuel if the fuel is at a somewhat higher enrichment level. High levels of U-234 can have implications for worker radiation exposures during fuel fabrication.) Utilities have expressed some interest in the use of such material, but the practical extent of that interest is not yet determined.

[6] The proposal to transfer 50 t of HEU and 7,000 t of NU to USEC is specifically authorized by Section 3112(c) of Public Law 104-134. Those proposed transfers are components of each of the commercial use alternatives (3, 4, and 5). The delivery to commercial end users of the surplus uranium transferred to USEC could not begin before 1998 pursuant to the statute. Because the proposed transfer of 7,000 t of NU from DOE to USEC is part of the same proposed transaction as the transfer of 50 t of HEU, the environmental impacts of that transfer are assessed in Section 4.9 of the HEU EIS and in this Summary. DOE may propose to sell additional remaining inventories of NU and those decisions will be considered in separate NEPA reviews, if necessary.

[7] For example, weapons-usable HEU is anticipated to be recovered from dissolving and stabilizing targets and spent fuel at SRS pursuant to the analysis and decisions in the EIS (October 1995) and RODs (December 1995 and February 1996) on *Interim Management of Nuclear Materials* at SRS, and from the proposed demonstration of electrometallurgical treatment at Argonne National Laboratory-West pursuant to the analysis in the *Environmental Assessment for Electrometallurgical Treatment Research and Demonstration Project in the Fuel Conditioning Facility at Argonne National Laboratory–West* (May 1996) (Finding of No Significant Impact, May 15, 1996). As part of the proposed electrometallurgical treatment demonstration, HEU derived from the demonstration would be blended down to LEU at Argonne National Laboratory-West; therefore, such material would not be blended down as part of the HEU EIS.

fuel) in the material to be blended to LEU, as if such HEU had been separated from the irradiated fuel pursuant to health and safety, stabilization, or other non-defense activities. However, such HEU may actually remain in its present form (without the HEU ever being separated) and be disposed of as high-level waste (HLW) in a repository or alternative pursuant to the *Nuclear Waste Policy Act*.[8]

With respect to the surplus HEU that could be blended to commercial fuel feed for power reactors, including the 50 t of HEU proposed to be transferred to USEC, the decisions and associated contracts concerning 1) which facility(ies) would blend the material, and 2) marketing of the fuel, may be made by USEC, by a private successor to USEC, by other private entities acting as marketing agents for DOE, or by DOE.

The Department of Energy has concluded that the Preferred Alternative would best serve the purpose and need for the HEU disposition program for several reasons. DOE considers all of the action alternatives (2 through 5) to be roughly equivalent in terms of serving the nonproliferation objective of the program. Both 4-percent LEU in the form of commercial spent nuclear fuel and 0.9-percent LEU oxide for disposal as LLW—and any allocation between them—fully serve the nonproliferation objective, as both processing of the spent fuel and re-enrichment of the 0.9-percent LEU to make new weapons-usable material would be technologically difficult and expensive. However, alternatives that include commercial use better serve the economic recovery objective of the program by allowing for peaceful, beneficial reuse of the material. Commercial use would reduce the amount of blending that would be required for disposition (a 14 to 1 blending ratio of blendstock to HEU as opposed to 70 to 1 for waste) and minimize Government waste disposal costs that would be incurred if all (or a greater portion of) the material were blended to waste. The sale of LEU derived from surplus HEU would yield returns on prior investments to the Federal Treasury. Finally, the analysis in the HEU EIS indicates that commercial use of LEU derived from surplus HEU would minimize overall environmental impacts because blending for commercial use involves generally lower impacts, and because adverse environmental impacts from uranium mining, milling, conversion, and enrichment would be avoided by using this material rather than mined uranium to produce nuclear fuel.

[Text deleted.]

An indirect impact of the Preferred Alternative would be the creation of spent nuclear fuel (through the use of LEU fuel derived from surplus HEU in power reactors). However, since the nuclear fuel derived from surplus HEU would replace nuclear fuel that would have been created from newly mined uranium (or NU) without this action, there would be no additional spent fuel generated. Because LEU derived from HEU supplants LEU from NU, the environmental impacts of uranium mining, milling, conversion, and enrichment to generate an equivalent amount of commercial reactor fuel would be avoided (see Section 4.7 of the HEU EIS). 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.*).

[Text deleted.]

With respect to the ultimate disposal of LLW material, certain DOE LLW is currently disposed of at commercial facilities and other DOE LLW is stored and disposed of at DOE sites. A location where LLW derived from DOE's surplus HEU can be disposed of has not been designated. Disposal of DOE LLW would be pursuant to DOE's *Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-D, draft issued in August 1995) (Waste Management PEIS) and associated ROD(s), and any subsequent NEPA documents tiered from or supplementing the Waste Management PEIS. Waste

[8] If HEU currently in irradiated fuel remains in its current form, it would be managed pursuant to the analyses and decisions in the *Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement* (April 1995) and the associated RODs (60 FR 28680, June 1, 1995, amended by 61 FR 9441, March 8, 1996), and subsequent, project-specific or site-specific NEPA documentation. Such spent fuel could be disposed of as HLW in a repository pursuant to the *Nuclear Waste Policy Act* (42 USC 10101 *et seq.*). DOE is in the process of characterizing the Yucca Mountain Site in Nevada as a potential repository under that Act.

material derived from surplus HEU would be required to meet LLW acceptance criteria of the DOE's Office of Environmental Management. For purposes of analysis of LLW transportation impacts only, this EIS assumes the use of the existing LLW facility at the Nevada Test Site (NTS) as a representative facility. Other sites being analyzed in the Waste Management PEIS for disposal of LLW include ORR, SRS, and the Hanford Site in Washington. No LLW would be transferred to NTS (or any alternative LLW facility) until completion of the Waste Management PEIS (or other applicable project or site-specific NEPA documentation such as the NTS Site-Wide EIS) and in accordance with decisions in the associated ROD(s). [Text deleted.] Additional options for disposal of LLW may be identified in other documents.

Continued storage of surplus HEU prior to blending may be required for some time. The storage, pending disposition (for up to 10 years) of surplus HEU at the Y-12 Plant (where most of the HEU is stored or destined to be stored), is analyzed in the *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/EA-0929, September 1994) (Y-12 EA). Impacts from storage, as analyzed in the Y-12 EA and incorporated by reference herein, are briefly summarized in the HEU EIS. Should the surplus HEU disposition actions continue beyond 10 years, subsequent storage of surplus HEU pending disposition will be pursuant to and consistent with the ROD associated with the Storage and Disposition PEIS or tiered NEPA documents.[9]

Screening Process Alternatives

The Department of Energy used a screening process along with public input to identify a range of reasonable options for the disposition of surplus HEU.[10] The process was conducted by a screening committee that consisted of five DOE technical program managers, assisted by technical advisors from DOE's National Laboratories and other support staff. The committee was responsible for identifying the reasonable alternatives to be evaluated. It compared alternatives against screening criteria, considered input from the public, and used technical reports and analyses from the National Laboratories and industry to develop a final list of alternatives.

The first step in the screening process was to develop criteria against which to judge potential alternatives. The criteria were developed for the screening process based on the President's nonproliferation policy of September 1993, the January 1994 *Joint Statement by the President of the Russian Federation and the President of the United States of America on Non-proliferation of Weapons of Mass Destruction and the Means of Their Delivery*, and the analytical framework established by the National Academy of Sciences in its 1994 report, *Management and Disposition of Excess Weapons Plutonium*. These criteria reflect domestic and policy interests of the United States, including nonproliferation; security; environment, safety, and health; timeliness and technological viability; cost-effectiveness; international cooperation; and additional benefits. The criteria were discussed at the public scoping workshops, and participants were invited to comment further using questionnaires. The questionnaires allowed participants to rank criteria based on relative importance, comment on the appropriateness of the criteria, and suggest new criteria. Details on how the screening process was developed, applied, and the results obtained were published in a separate report, *Summary Report of the Screening Process to Determine Reasonable Alternatives for Long-Term Storage and Disposition of Weapons-Usable Fissile Materials* (DOE/MD-0002, March 29, 1995).

The Department of Energy began with nine potential alternatives for the disposition of surplus HEU. These alternatives were evaluated in the screening process to identify those reasonable alternatives that merited further evaluation in the HEU EIS. As a result of the screening

[9] Under the No Action Alternative for the Storage and Disposition PEIS, if storage of surplus HEU pending disposition (or no action) continued beyond 10 years, storage facilities at Y-12 would be maintained to ensure safe facility operation, or surplus HEU material might be moved out of the Y-12 Plant at the end of the 10-year period with the completion of the relocation within the following 5 years. Subsequent NEPA review would be conducted as required.

[10] The disposition of surplus HEU was originally within the scope of the Storage and Disposition PEIS. Separate analyses were conducted for Pu, HEU, and other fissile materials during the screening process to identify reasonable alternatives for each. Therefore, the results of the screening process are not affected by the separation of the disposition of surplus HEU from the Storage and Disposition PEIS.

process, five alternatives were identified as reasonable alternatives for further analysis:

- No HEU disposition action (continued storage)
- Direct sale of HEU to a commercial vendor for subsequent blending to LEU
- Blending HEU to 19-percent assay LEU and selling as commercial reactor fuel feed material
- Blending HEU to 4-percent LEU and selling as commercial reactor fuel feed material
- Blending HEU to 0.9-percent LEU for disposal as waste

Following the screening process, the five alternatives identified as reasonable were further refined. The blend to 0.9 percent and discard as waste alternative, which was originally intended to address only material not suitable for use as commercial fuel, was expanded to include all surplus HEU. Although this would not recover the material's economic value, it would meet nonproliferation goals. [Text deleted.]

The blend to LEU (19 percent or less enrichment) and sell alternative was eliminated from analysis because LEU with an enrichment level of 19 percent cannot be used commercially as reactor fuel without further blending; it presents criticality concerns (for transportation and storage before down blending) that would need to be accommodated; and, as an interim blending level, it is not as economical as blending directly to 4 percent in a one-step process.

CHARACTERIZATION OF SURPLUS HIGHLY ENRICHED URANIUM MATERIAL

The surplus HEU material in inventory varies in levels of enrichment and purity (contamination with undesirable isotopes and chemicals). The predominant decision affecting the process choices for any batch of surplus HEU would depend on its disposition as fuel or waste.

An important factor in determining the disposition of any specific batch of HEU would be whether it can be blended to meet the chemical and isotopic specifications of the American Society for Testing and Materials (ASTM) for commercial reactor fuel. Of particular concern are the ASTM specifications for concentrations of the isotopes U-234 and U-236 relative to U-235 in the blended LEU product. U-234 is a major contributor to radiation exposure, which could be of concern during fuel fabrication, and U-236 inhibits the nuclear reaction in reactor cores, reducing core lifetime or requiring higher enrichments to achieve a normal core life. A substantial amount of the surplus HEU could meet those ASTM specifications when blended with NU or LEU. The surplus HEU material could be characterized as commercial, off-spec, or non-commercial depending upon its ability to be used as reactor fuel.

Commercial Material—If the HEU material has a low ratio of undesirable isotopes (U-234 and U-236), it is considered a commercial quality material (in-spec). The selection of uranium blendstock of adequate quality and form will allow production of LEU that meets the ASTM specifications for use in fabrication of commercial reactor fuel.

Off-Spec Material—If the ratio of U-234 and U-236 is high in the HEU material relative to U-235 content (off-spec), then the ability to blend to the ASTM commercial fuel specifications may be limited. If customers are found (for example, private or public utilities) who are willing to use off-spec LEU, then this surplus HEU could be blended to commercial reactor fuel feed.

Non-Commercial Material—This is material that cannot be economically recovered from its existing form, such as HEU in spent fuel, HEU in low concentrations in waste or residues, and HEU in equipment that will not undergo decontamination and decommissioning in the foreseeable future. Some of this HEU material is also in dismantled weapons components that cannot be recovered because the technology has not yet been developed to recover the HEU.

Figure S-3 provides a material flow diagram for the disposition of surplus HEU.

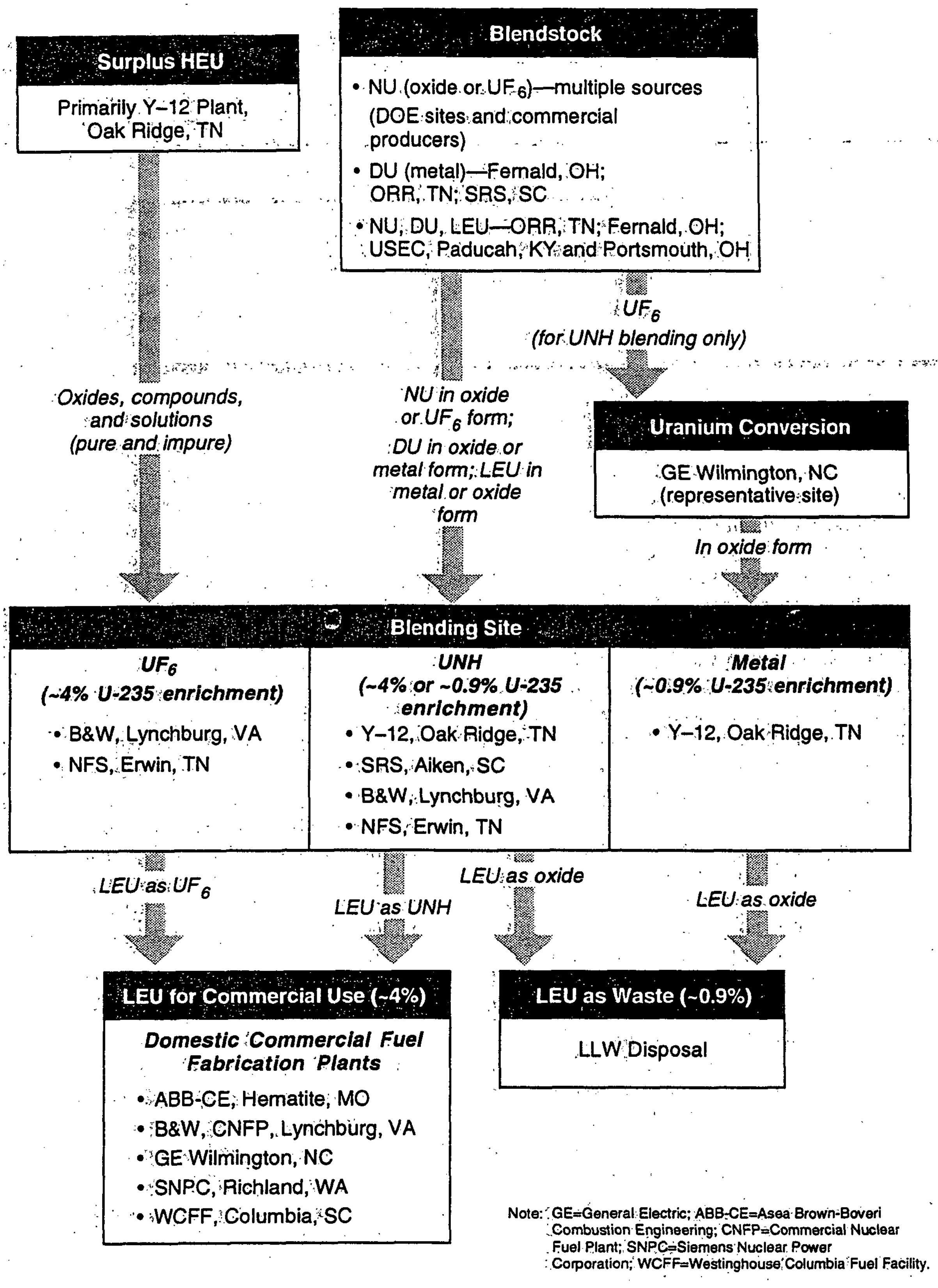


Figure S–3. Material Flow Diagram for Surplus Highly Enriched Uranium Disposition.

Highly Enriched Uranium Disposition Alternatives

The screening process alternatives were further refined by combining the direct sale of surplus HEU (buyer to blend HEU to LEU) alternative and the blend HEU to 4-percent LEU and sell as commercial reactor fuel feed alternative. This was done because the potential environmental impacts of these two alternatives are the same. They differ only in whether the surplus HEU is sold before or after blending.

Finally, the alternatives were further refined to account for various combinations of blending technologies, candidate sites, and end products. The possible list of combinations is virtually infinite; therefore, DOE has selected reasonable alternatives that not only represent the spectrum of reasonable alternatives, but also include logical choices for consideration at the time the ROD is issued. These alternatives, listed in Table S–1, are described in detail in the following section. Timeframes shown in Table S–1 reflect assumptions concerning DOE's ability to make material available, market conditions, and legislative requirements to avoid adverse material impact on the domestic uranium industry. A graphical representation of the time required to complete alternative based on the use of 1, 2, or 4 blending sites, is shown in Figure S–4.

Several blending technologies and facilities are likely to be used for different portions of the surplus inventory, and the decisions regarding those technologies and facilities are likely to be made in part by USEC or other private entities outside DOE. Thus, specific decisions concerning the locations where the surplus HEU disposition action will be implemented will be multidimensional and will likely involve multiple decisionmakers. The alternatives as described are not intended to represent exclusive choices among which DOE (or other decisionmakers) must choose, but rather are proffered to define representative points within the matrix of possible reasonable alternatives.[11] Section 4.5.6 of the HEU EIS explains how impacts would change if the actual allocation between alternatives, end products (commercial fuel feed or waste), blending processes, and blending sites differed from the representative reasonable alternatives.

To provide a conservative analysis, presenting maximum potential impacts, the alternatives explained below address the disposition of the entire surplus HEU inventory (nominally 200 t). For the reasons explained previously in the Preferred Alternative section, a portion of this inventory may not be available for blend down since it is currently in the form of irradiated fuel.

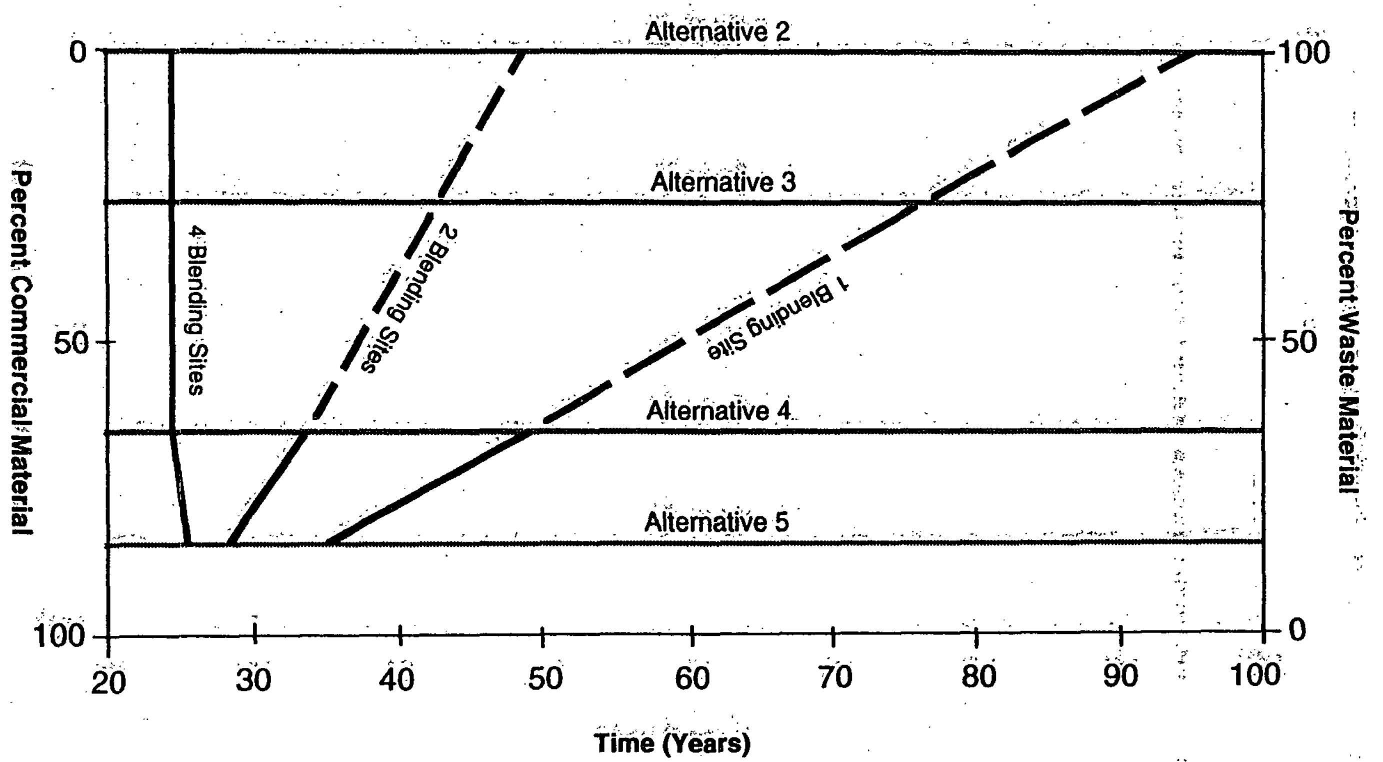
For the commercial use alternatives, LEU material with commercial value would be transported following blending to fuel fabricators for use in fabricating commercial nuclear reactor fuel. Currently, there are five potential domestic commercial facilities[12] that could process LEU derived from surplus HEU into commercial nuclear reactor fuel and over 100 domestic commercial electrical power nuclear reactors that could potentially use the commercial nuclear reactor fuel. The exact allocation, site-specific location, and timing of the eventual processing and commercial nuclear reactor use are not known at this time, have not been specifically proposed, and would be contingent upon the needs and specifications of the potential customers for the fuel. 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.*).

No Action

Under the No Action Alternative, DOE would continue to store surplus HEU (primarily at DOE's Y–12 Plant). Storage of surplus HEU (until disposition) is analyzed for a period of up to 10 years

[11] For example, while the alternatives assess blending either 85, 65, or 25 percent of the material to commercial fuel, another percentage might more accurately represent ultimate disposition. Similarly, while two of the variations assume that material is divided evenly among the four possible facilities (25 percent to each), some other distribution among three or four facilities is possible. [Text deleted.] Such variations would be within the range of alternatives analyzed in this EIS.

[12] At this time, the five potential domestic commercial fuel fabricators are: 1) Asea Brown-Boveri Combustion Engineering, Hematite, Missouri; 2) B&W, Lynchburg, Virginia; 3) General Electric Nuclear Production, Wilmington, North Carolina; 4) Siemens Nuclear Power Corporation, Richland, Washington; and 5) Westinghouse Columbia Fuel Facility, Columbia, South Carolina. Foreign fuel fabricators and foreign commercial electrical power nuclear reactors might also receive material, but are not as likely as domestic fabricators and reactors.



— — Not analyzed in EIS

Source: Table 2.1.2–1.

Assumptions:
1) Commercial blending periods are based on 8 t/yr total (constrained by material availability, market conditions, and legislative requirements).
2) Waste blending periods based on 2.1 t/yr at each site (constrained by facility processing rates for UNH blending).
3) Commercial use alternatives (3 through 5) assume all commercial material would be blended first, then waste material.

3227/HEU

Figure S–4. Time Required to Complete Various Alternatives Based on Number of Blending Sites Used.

in the Y–12 EA. Should the surplus HEU disposition actions continue beyond 10 years, subsequent storage of surplus HEU pending disposition will be pursuant to and consistent with the ROD associated with the Storage and Disposition PEIS or tiered NEPA documents.[13] Current operations at each of the potential HEU blending sites (Y–12, SRS, B&W, and NFS) would continue.

No Commercial Use (0/100 Fuel/Waste Ratio)

Under this alternative, DOE would blend the entire stockpile of surplus HEU (200 t) to LEU and dispose of it as waste. This would include surplus HEU with or without commercial value. The blending would be performed at all four sites. Although this alternative would not recover any of the economic value of HEU for the Government, it is evaluated for all surplus HEU to provide a comprehensive evaluation of a full range of alternatives in the HEU EIS.

[Figure deleted.]

Surplus HEU could be blended to waste as either UNH or as metal at a rate per site of up to 2.1 t/yr or 3.1 t/yr, respectively. All blending sites have UNH blending capability. Only the Y–12 Plant at ORR has the capability to perform metal blending. [Text deleted.]

The blending of surplus HEU for waste would not be initiated before an LLW disposal facility were identified to accept the LLW. Surplus HEU would remain in storage at the Y–12 Plant or at another storage facility pursuant to the Storage and Disposition PEIS pending identification of the LLW disposal facility.

Limited Commercial Use (25/75 Fuel/Waste Ratio)

Under this alternative, 50 t of surplus HEU would be blended to commercial fuel, while the remaining 75 percent (150 t) would be blended and then disposed of as waste. The title to 50 t of surplus HEU would be transferred to USEC. USEC (or a successor private corporation) then would select the commercial site or sites for blending 50 t of surplus HEU to LEU for use in commercial fuel. The remaining 150 t would be blended to waste.

This alternative would blend 50 t of HEU at the two commercial sites. The 50 t would be distributed equally between the commercial sites, each blending 25 t of material.[14] The remaining 150 t of surplus HEU material would be blended to waste using all four blending sites. Each DOE site and commercial site would receive 37.5 t of waste material for blending.

[Text deleted.]

Substantial Commercial Use (65/35 Fuel/Waste Ratio)

This alternative assumes that 35 percent of the surplus HEU would be blended to LLW and disposed of as waste, leaving 65 percent of the material available for commercial use. The title to 50 t of surplus HEU would be transferred to USEC. USEC (or a successor private corporation) then would select blending sites for blending 50 t of surplus HEU to LEU for use in commercial fuel. The remaining quantity of potentially commercially usable HEU (80 t), could be blended at any or all of the four sites. The LEU product would be sold for use in commercial reactor fuel. The remaining 70 t of surplus HEU would be blended to waste.

There are four variations of this alternative using different combinations of sites. These particular combinations of sites are representative only. The actual distribution among blending sites may differ, depending on programmatic, commercial, or other considerations. The first variation would blend all of the HEU at the two DOE sites, with the HEU split equally between them. ORR and SRS would each blend 65 t of HEU to LEU for commercial fuel and 35 t of HEU to LEU for disposal as waste. The second variation would blend all of the HEU at the

[13] Under the No Action Alternative for the Storage and Disposition PEIS, if storage of surplus HEU pending disposition (or no action) continued beyond 10 years, storage facilities at Y–12 would be maintained to ensure safe facility operation, or surplus HEU material might be moved out of the Y–12 Plant at the end of the 10-year period with the completion of the relocation within the following 5 years. Subsequent NEPA review would be conducted as required.

[14] This distribution and the distributions for Alternatives 4 and 5 are assumed only for purpose of analysis. It is not intended to foreclose the selection of another distribution that might include DOE sites or only one site.

two commercial sites, with the HEU split equally between them. B&W and NFS would each blend 65 t of HEU to LEU for commercial fuel and 35 t of HEU to LEU for disposal as waste. The third variation would blend the HEU at all four sites, with the HEU split equally among them. Each site would blend 32.5 t of HEU to LEU for commercial fuel and 17.5 t of HEU to LEU for disposal as waste. The fourth variation would blend all of the HEU at a single site. The site would blend 130 t of HEU to LEU for commercial fuel and 70 t of HEU to LEU for disposal as waste.

[Text deleted.]

Maximum Commercial Use (85/15 Fuel/Waste Ratio—Preferred Alternative)

Under this alternative, it is assumed that only 15 percent of the surplus HEU would be blended and disposed of as waste. The title to 50 t of surplus HEU would be transferred to USEC. USEC (or successor corporation) then would select blending sites for blending 50 t of surplus HEU to LEU for use in commercial fuel. The remaining quantity of potentially commercially usable HEU (120 t) could be blended at any or all of the four sites. The LEU product would be sold for use in commercial reactor fuel. The remaining 30 t of surplus HEU would be blended to waste.

There are four variations of this alternative using different combinations of sites. They are the same as those assessed for the previous alternative. The first variation would blend all of the HEU at the two DOE sites, with the HEU split equally between them. ORR and SRS would each blend 85 t of HEU to LEU for commercial fuel and 15 t of HEU to LEU for disposal as waste. The second variation would blend all of the HEU at the two commercial sites, with the HEU split equally between them. B&W and NFS would each blend 85 t of HEU to LEU for commercial fuel, and 15 t of HEU to LEU for disposal as waste. The third variation would blend all of the HEU at all four sites, with the HEU split equally among them. Each site would blend 42.5 t of HEU to LEU for commercial fuel and 7.5 t of HEU to LEU for disposal as waste. The fourth variation would blend all of the HEU at a single site. The site would blend 170 t of HEU to LEU for commercial fuel and 30 t of HEU to LEU for disposal as waste.

[Text deleted.]

CANDIDATE SITES

Four candidate sites are analyzed in the HEU EIS for disposition (using one or more of the blending processes) of surplus HEU. They are DOE's Y–12 Plant at ORR, SRS, and two privately owned and operated facilities, B&W and NFS. The Y–12 Plant is the interim storage site for most of the surplus HEU. B&W and NFS have Nuclear Regulatory Commission (NRC) licenses to process HEU. All of these sites are currently performing, or until recently have performed, national security activities involving HEU.

All candidate sites currently have technically viable HEU conversion and blending capabilities and could begin, in the relatively near future, to blend surplus HEU to proliferation-resistant forms consistent with the President's nonproliferation policy. New sites and facilities are not considered reasonable for blending, given the availability of existing sites and facilities, because new facilities would require capital investment and may not be cost effective. Moreover, new construction would pose additional impacts to the environment, although impacts from normal operations would be similar.

The Y–12 Plant has both molten metal and UNH blending capabilities. The commercial vendor sites, B&W and NFS, have only UNH blending capability at this time. UNH facilities at Y–12 and SRS are currently not in operation and may require upgrading before conversion and blending operations can resume. B&W and NFS hold NRC licenses for their HEU operations, including blending. [Text deleted.]

No capability currently exists for conversion of HEU to UF_6 at the candidate sites; therefore, new processing equipment would need to be installed to provide capability for UF_6 blending of surplus HEU. B&W and NFS are analyzed as reasonable representative sites for new UF_6 conversion and blending capability because those are the only commercial sites that currently have NRC licenses to process HEU. UF_6 conversion and blending equipment could be installed in existing buildings at those facilities, and they have indicated they would consider possible installation of such equipment.[15]

Y–12 Plant, Oak Ridge, Tennessee. The Y–12 Plant is located on a 1,770-hectare (ha) (4,370-acre) site within the city boundaries of Oak Ridge, approximately 19 kilometers (km) (12 miles [mi]) west of Knoxville, Tennessee. ORR's Y–12 Plant is the primary location of several Defense Program missions, including maintaining the capabilities to fabricate components (primarily uranium and lithium) for nuclear weapons, storing uranium and lithium parts, dismantling nuclear weapon components returned from the national stockpile, processing special nuclear materials, and providing special production support for DOE design agencies and other departmental programs. Y–12 currently has capabilities for UNH and metal blending.

Molten metal blending is performed in the Building 9212 Casting Facility. The casting facility has 12 vacuum induction furnaces, but due to use of the facility for other missions and routine maintenance requirements, it is assumed that 6 of the 12 furnaces with 75-percent availability would be available to perform HEU blending. Blending can occur at a maximum rate of 3.1 t/yr for molten metal blending of 50-percent assay HEU to 0.9-percent assay LEU with DU operating 21 shifts per week. Use of all 12 vacuum induction furnaces with 75-percent availability would double the blending capacity.

Uranyl nitrate hexahydrate blending is performed in the Building 9212-Chemical Recovery Facility. The blending process consists of feed size reduction, oxidation, nitric acid dissolution, purification, UNH blending, and drying and crystallizing to produce UNH crystals. Blending can occur at a rate of 5.6 t/yr for UNH blending of 50-percent assay HEU to 4-percent assay LEU, operating 21 shifts per week or 1.5 t/yr of 50-percent HEU assay to 0.9-percent LEU for waste disposal. This capacity can be doubled if a second denitrator, which has been purchased by Y–12 but not yet installed, is added to the system.

Since capabilities exist at Y–12 to perform HEU blending operations, no additional facilities need to be constructed. Minor modifications to existing buildings, such as the installation of a second denitrator that has already been acquired, may be needed to increase throughput capabilities. Y–12 facilities are currently not operating in order to improve conduct of operations, and must successfully complete an Operational Readiness Review prior to restart based on DOE O 425.1, *Startup and Restart of Nuclear Facilities.* Blending operations are expected to resume in 1997.

Savannah River Site, Aiken, South Carolina. The Savannah River Site occupies an area of approximately 80,130 ha (198,000 acres) located 32 km (20 mi) south of Aiken, South Carolina. Its primary mission was to produce strategic isotopes (Pu-239 and tritium) used in the development and production of nuclear weapons for national defense. The current mission is to store, treat, stabilize, and dispose of waste materials; manage and dispose of nuclear materials and facilities; restore the environment and manage natural resources; develop mission-supportive partnerships; and support national security and nuclear materials requirements. SRS currently has the capability for UNH blending.

Except as noted below, SRS has the capability to blend HEU to either 4-percent or 0.9-percent LEU. The facilities for UNH processes are located in the F- and H-Canyons. [Text deleted.]

The existing facility that could be used to solidify blended down UNH solutions at SRS (the FA-Line) is not designed to be critically safe for processing solutions with enrichment levels higher than about 1 percent. Thus, SRS could perform UNH blending of HEU to 0.9-percent LEU and subsequent solidification, but it could not, at present, solidify (crystallize and/or oxidize) HEU that is blended to commercial enrichment levels (4 to 5 percent). There are about 20 t of surplus HEU at SRS. (The quantities of the various forms of surplus HEU at SRS remain classified.) While it is virtually all off-spec material, including solutions and some irradiated fuel, most of it is considered to be potentially suitable for commercial use. (In connection with the *Final*

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[15] If either or both B&W and NFS should decide to construct additional facilities for UF_6 conversion and blending, construction impacts would likely include land disturbance and minor air emissions from construction equipment, and the applicable NRC license would need to be amended. Any such construction would be based on the business judgment of these commercial facilities and would not be necessitated by DOE's proposed action. Environmental impacts would be analyzed by those facilities as part of the NEPA review associated with the NRC licensing process.

Environmental Impact Statement Interim Management of Nuclear Materials EIS [DOE/EIS-0220, October, 1995] and the associated ROD(s), the Department will dissolve and stabilize some of the irradiated fuel in the F-Canyon and/or H-Canyon at SRS to make it suitable for safe storage. If carried out, that process would result in the separation of the HEU, thus making it available to the HEU disposition program.)

One or more of several options for providing for solidification of UNH solutions at commercial enrichment levels at SRS may be proposed in the future, although none is being proposed by DOE at this time.[16] DOE could complete a partially built Uranium Solidification Facility in the H-Area at SRS or build a new facility. Another possibility is that a private, commercial entity or another Federal agency would build such a facility either within the SRS (on land leased from DOE) or nearby. Such a private facility would need to be licensed by the NRC. To conservatively estimate impacts, the HEU EIS includes the impacts of the solidification process as if it could occur at SRS. If a solidification facility were proposed and constructed, impacts would likely include land disturbance and minor air emissions from construction equipment. If construction of such a facility were proposed, additional NEPA review, as appropriate, would be conducted by DOE (or in connection with NRC licensing proceedings for a private facility). Using existing facilities, blended down LEU UNH solution (at 4- to 5-percent enrichment) could be transported to another facility (such as Y-12, B&W, NFS, or a fuel fabricator) for solidification.[17] Alternatively, all of the SRS material could be blended to about 0.9-percent enrichment and solidified at SRS. (This was the alternative considered in the Interim Management of Nuclear Materials EIS.)

Other minor facility upgrades, such as loading dock modifications for F- and H-Canyons to facilitate the transfer of UNH solutions, would be required to provide blending of HEU to LEU as UNH. [Text deleted.] Blending could theoretically occur at a rate of 37 t/yr of HEU for UNH blending of 50-percent assay HEU to 4-percent assay LEU or 7.5 t/yr to 0.9-percent assay LEU (both canyons, all dissolvers). Actual throughput would likely be significantly lower since the HEU blend down program would have to share the resources (facilities and personnel) with other nuclear materials stabilization activities. The proportion of resources available to the HEU blend down program, and the associated throughput, would be determined by programmatic and budget decisions made to coordinate all nuclear materials stabilization activities. SRS has a complete environmental, safety, and health program to process and handle HEU.[18]

Babcock & Wilcox Site, Lynchburg, Virginia. The B&W facility is located on approximately 212 ha (524 acres) in the northeastern portion of Campbell County, approximately 8 km (5 mi) east of Lynchburg, Virginia. Only UNH blending capability exists at B&W and the facilities are located at the Naval Nuclear Fuel Division. The current primary mission of B&W is fuel fabrication and purification

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[16] The list of possible alternatives is not intended to be, and should not be construed to be, an exhaustive list of all reasonable alternatives for solidification of UNH at commercial enrichment levels at SRS, should such solidification be proposed.

[17] The approximately 20 t of HEU solutions at SRS could be blended to approximately 617 t of 4-percent UNH solution. The UNH solution could be transported from SRS using NRC-certified liquid cargo tank trailers (for example, DOE-specification MC-312, NRC Certificate of Compliance Number 5059), or other DOT-approved Type A fissile packaging to one of several offsite facilities that could perform the solidification of the material. The SRS site is in close proximity to existing commercial fuel fabrication facilities in both South Carolina and North Carolina that could perform the solidification. The South Carolina facility (97 km [61 mi] from SRS) is assumed as a representative solidification site for the purpose of analysis only (it is not proposed at this time). This project (transportation for solidification of 617 t of LEU solution) would require about 350 truckloads of 16,800 kg (37,000 pounds each) of UNH solution (includes 1.8 t uranium per truckload). The impact from nonradiological accidents would be about 3.7×10^{-3} fatalities for the entire project. The risk from radiological accidents is estimated to be 3.9×10^{-5} fatalities for the entire project. The impacts from normal (accident-free) transportation, including handling and air pollution would be about 1.9×10^{-2} fatalities. The combined impact for the total campaign would be about 2.3×10^{-2} fatalities. The location of such off-site solidification and the extent of any transportation may depend in part on future proposals concerning the off-spec material at SRS and/or construction of a UNH solidification facility. Additional NEPA review would be conducted, as appropriate.

[18] As part of ongoing activities to upgrade the Safety Authorization Basis for the nuclear facilities at SRS, DOE is further evaluating the structural integrity and seismic response of the canyon facilities. These analyses are expected to be completed in July 1996.

of HEU and scrap uranium and the removal and recovery of materials generated in manufacturing waste streams to prevent environmental degradation. The capacity of B&W for recovery and purification is about 24 t/yr of HEU.

Babcock & Wilcox is one of only two commercially licensed facilities in the United States capable of providing HEU processing services. The license includes activities associated with both the recovery and the blending of HEU. Current processes are for uranium in UNH form. B&W is licensed to possess or maintain onsite up to 60,000 kilograms (kg) (132,000 pounds [lb]) of U-235 in any required chemical or physical form (except UF_6) and at any enrichment. The total quantities of HEU and uranium oxide blendstock required for the proposed action might exceed these limits for the alternatives in the HEU EIS. Therefore, it might be necessary to increase the licensed possession limits or to schedule and stage the receipt and processing of these materials so that the quantity of uranium onsite would not exceed any NRC requirements.

Babcock & Wilcox can perform the recovery and blending of HEU to LEU as UNH with existing facilities without construction of additional buildings or infrastructure. No capabilities exist for the conversion of HEU to UF_6, and interior modifications to existing B&W facilities—mainly new equipment installation—would be required along with NRC license modification before the UF_6 blending process could be performed.

Nuclear Fuel Services, Inc., Erwin, Tennessee. The NFS facility is located on approximately 25.5 ha (63 acres) in Erwin, Tennessee, immediately northwest of the community of Banner Hill. The primary mission of NFS has been to convert HEU into a classified product used in the fabrication of naval nuclear fuel. NFS was also involved in research on and development of improved manufacturing techniques, recovery and purification of scrap uranium, and removal and recovery of materials generated in manufacturing waste streams to prevent environmental degradation. The capacity of NFS for recovery and purification is about 10 t/yr of HEU at 93-percent enrichment. Only UNH blending capability exists at NFS, which would occur in the 300-Complex Area.

The NFS facility is one of only two commercially licensed facilities in the United States capable of providing HEU processing services. The license includes both the recovery and blending of HEU. NFS facilities blend uranium in UNH form. NFS is licensed to possess up to 7,000 kg (15,000 lb) of U-235 in any chemical or physical form and at any enrichment. The total quantities of the HEU and uranium oxide blendstock required for the proposed action might exceed these limits; therefore it might be necessary to increase the licensed possession limits or to schedule and stage the receipt and processing of these materials so that the quantity of uranium on site would not exceed NRC requirements.

New construction of facilities would not be required at NFS to blend HEU to LEU as UNH. No capabilities exist for the conversion of HEU to UF_6, and modifications to the interior of buildings, mainly new equipment installation, would be required along with license modification before the UF_6 blending process could be performed.

Environmental Impacts

The HEU EIS assesses the direct, indirect, and cumulative environmental consequences of reasonable alternatives under consideration for each of the potentially affected DOE and commercial blending candidate sites.

Basis for Analysis

A number of key assumptions form the basis for the analyses of impacts presented in the HEU EIS. If these assumptions change substantially, DOE will conduct additional NEPA review as appropriate.

- The EIS analyses are based on the disposition of a nominal 200 t of HEU. This amount includes HEU that is currently surplus, as well as additional HEU (not yet identified) that may be declared surplus in the future. The analysis also addresses the expected impacts that would result from the proposed transfer of 7,000 t of NU to USEC.

- The EIS addresses all surplus HEU, in various forms including metals and alloys, oxides and compounds, and solutions, with enrichment levels of 20 percent or greater by weight of the isotope U-235. To assess potential environmental impacts, the blending analyses in the EIS are based on the assumption that surplus HEU is enriched to 50-percent U-235. That assumption is based on an assessment of the relevant portion of materials in the surplus inventory. The relative impacts of blending HEU of different enrichment levels are expected to be either unchanged or essentially proportional, depending on the resource. Therefore, it is reasonable to use 50 percent as the enrichment level for purposes of analysis in the HEU EIS.

- Surplus HEU can be blended down to approximately 4-percent (more or less depending on market demand) LEU for fabrication as fuel in commercial reactors. The representative enrichment level of 4 percent was selected for commercial fuel based on current fuel vendor experience, which ranges between 3 and 5 percent.

- If the enrichment level is reduced to approximately 0.9 percent (depending upon waste acceptance criteria), LEU approaches an NU enrichment state and becomes suitable for disposal as LLW. This enrichment level was selected for waste disposal based on current LLW disposal experience both in the United States and Europe where similar types of waste have been disposed of with an enrichment level slightly greater than 1-percent U-235. This low enrichment level ensures that an inadvertent criticality would not occur. The actual enrichment level of the waste material would be dictated ultimately by the waste acceptance criteria for the selected LLW disposal site.

- The data for UNH and UF_6 blending (for commercial fuel) were based on an HEU throughput of 10 t/yr with an average starting U-235 enrichment of 50-percent HEU blended to a final enrichment of 4-percent U-235 LEU. The data for blending HEU as UNH to 0.9-percent enrichment LEU were based on an HEU throughput of 2.1 t/yr with an average U-235 enrichment of 50 percent. The data for metal blending were based on an HEU throughput of 3.1 t/yr with an average of 50 percent U-235 enrichment level blended to 0.9-percent U-235 enrichment. Since HEU exists in a variety of forms (metal, oxides, alloys, compounds, and solutions), conservative scenarios (those that exhibit the highest potential for environmental impact) were assumed for preprocessing of HEU prior to blending. The assumed blending rates are based on dilution ratios for blending and reasonable judgment about anticipated blending capability and capacity. Actual blending rates will be based on market conditions, blending facility capabilities and capacities, DOE's ability to make the material available, blending contract limitations, and legislative requirements to avoid adverse material impacts on the domestic uranium industry. The blending rates analyzed do not always correspond to the actual capacities of the four sites, but are rates that have been selected for analysis so a comparison can be done of impacts among the sites. All the sites could process material at the analyzed rates.

- Surplus HEU is currently located at 10 DOE sites around the country (See Figure S–1). Most of the unirradiated surplus HEU that is not already at the Y–12 Plant is being moved there for pre-storage processing and interim storage. Therefore, for the purposes of the HEU EIS, it is assumed that most of the surplus HEU will originate from the Y–12 Plant. Two locations where surplus HEU exists (Portsmouth and SRS) may not relocate their HEU to Y–12. Surplus HEU could either be blended at these sites (in the case of SRS) or sent directly to commercial blending sites. The environmental impacts of the proposed transfer of HEU to the Y–12 Plant and its storage there are analyzed in the Y–12 EA.

- Several types of blendstock material could be used during the blending of HEU, such as DU, NU, or LEU. LEU in UF_6 form would be shipped from ORR; Paducah, Kentucky; or Portsmouth (or Piketon), Ohio. The DOE site in Fernald, Ohio, has LEU in metal and oxide form. DU blendstock is available in metal, oxide, and UF_6 forms and may be obtained from Portsmouth, Paducah, Y–12, SRS, Hanford, or Fernald. The NU blendstock could be purchased from domestic uranium producers or obtained from one of the same DOE sites where LEU is available. For the purposes of the EIS transportation analyses, one route (Hanford to all potential blending sites) is used as representative for all the potential shipping routes associated with both the domestic and DOE NU blendstock suppliers, because it is the longest distance from the blending sites.

- The Department of Energy's NTS is used as a representative site to evaluate transportation impacts from the blending sites to a waste disposal site. If another LLW disposal facility is identified, the route-specific transportation impacts may be provided in tiered NEPA documentation, as appropriate.

[Text deleted.]

- No construction of new facilities is proposed or, with the possible exception of SRS, would be required; any expanded capabilities can be accommodated through modification or addition of process equipment in existing facilities. SRS currently does not have a solidification or crystallization facility to convert UNH solutions (for 4 percent enrichment) to UNH crystals as described previously in the candidate sites section. However, impacts were assessed (for UNH blending) in the HEU EIS as if solidification could be performed at SRS. Should new facilities be proposed to add solidification capability at SRS, there would be land disturbance and minor air emissions associated with construction (among other things), and appropriate NEPA review would be conducted at that time if necessary.

- The B&W site and NFS are analyzed for siting new UF_6 capability because these are the only commercial sites that have NRC licenses to process HEU. The addition of new equipment in existing facilities would be required to provide UF_6 capability at those sites. UF_6 blending would not be used to blend surplus HEU to waste, because the process is similar to UNH but includes additional steps. It would only be used to make fuel for the commercial reactor industry. It would not be reasonable to add UF_6 blending capability at DOE sites for blending to commercial fuel feed, and this alternative is not discussed in the EIS due to the capital investment required, the limited use, if any, of such capability for other DOE missions, and environmental concerns that would need to be accommodated. [Text deleted.]

MAJOR COMMENTS RECEIVED ON THE *DISPOSITION OF SURPLUS HIGHLY ENRICHED URANIUM DRAFT ENVIRONMENTAL IMPACT STATEMENT*

The Department of Energy issued the HEU Draft EIS for public comment in October 1995, and provided a public comment period from October 27, 1995 until January 12, 1996. Public workshops on the HEU Draft EIS were held in Knoxville, Tennessee, on November 14, 1995, and in Augusta, Georgia, on November 16, 1995.

During the 78-day public comment period on the HEU Draft EIS, DOE received comments on the document by mail, fax, telephone recording, electronic mail, and orally at the two public workshops. Altogether, DOE received 468 written or recorded comments from 197 individuals or organizations, plus 220 oral comments provided by some of the 130 individuals who attended the public workshops. All of the comments are presented in Volume II of the HEU Final EIS, the *Comment Analysis and Response Document*.

The major themes that emerged from public comments on the HEU Draft EIS were as follows:

- There was broad support for the fundamental objective of transforming surplus HEU to non-weapons-usable form by blending it down to LEU (for either fuel or waste). However, a few commentors argued that surplus HEU should be retained in its present form for possible future use, either in weapons or breeder reactors.
- Among those who submitted comments, there was substantial opposition to commercial use of LEU fuel derived from surplus HEU because the commentors believed that such use increases proliferation risk by creating commercial spent nuclear fuel, which includes plutonium. Commentors who opposed commercial use generally supported blending surplus HEU to LEU for disposal as waste.
- Substantial concern was expressed by elements of the uranium fuel cycle industry that the entry into the market of LEU fuel derived from surplus HEU from Russian and U.S. weapons programs would depress uranium prices and possibly lead to the closure of U.S. uranium mines, conversion plants, or enrichment plants.
- Several electric utilities that operate nuclear plants and one uranium supplier expressed the belief that LEU fuel derived from surplus HEU would enter the market at a time when worldwide production is expected to fall considerably short of demand and prices are expected to be rising substantially, which in fact has occurred over the course of completing the HEU EIS. These commentors believed that the likely impact of market sales of LEU fuel derived from surplus HEU would be to moderate sharp price escalation.
- Several commentors argued that "blend and store" options should have been evaluated in the EIS.
- Many commentors expressed support for or opposition to the use of particular facilities for surplus HEU disposition actions.
- A few commentors expressed concern regarding the projected worker latent cancer fatality consequences for facility accidents.
- Numerous commentors wanted to see a formal economic analysis of the alternatives included in the EIS.

CHANGES IN THE *DISPOSITION OF SURPLUS HIGHLY ENRICHED URANIUM FINAL ENVIRONMENTAL IMPACT STATEMENT* IN RESPONSE TO COMMENTS

In response to comments received on the HEU Draft EIS as well as other changes in circumstances, the HEU Final EIS has been modified in the following respects:

- The discussion of potential impacts on the uranium industry (Section 4.8 of the HEU Final EIS) has been augmented to reflect the enactment of the *USEC Privatization Act* (Public Law 104-134), and to better reflect the cumulative impacts in light of the U.S.-Russian Agreement to purchase Russian HEU blended down to LEU.
- The discussion of the rates of disposition actions that could result in commercial sales of LEU has been modified in Table S–1 (and Table 2.1.2–1 in the HEU EIS) and throughout the document to better reflect the current assessment of the time required for DOE to make surplus HEU available for disposition, and the legislative requirement to avoid adverse

material impacts on the domestic uranium mining, conversion, or enrichment industries (Public Law 104-134, Section 3112(d)(2)(B)).

- The assessment of impacts to noninvolved workers and the public from accidental releases (radiological) was revised to improve realism in the calculation of doses and the results were incorporated into Chapters 2 and 4 of the HEU Final EIS.

- The HEU Final EIS has been modified to reflect the fact that SRS has effectively lost the ability to perform metal blending and currently lacks the ability to solidify and crystallize material at the 4-percent enrichment level. SRS is now assessed only for UNH blending, and the fact that other arrangements must be made for solidification of commercial-enrichment material is reflected.

- A separate Floodplain Assessment (and Proposed Statement of Findings) has been added to the HEU Final EIS (Section 4.13) pursuant to 10 CFR Part 1022. This assessment is based, in large part, on information that was presented in the water resources sections of the HEU Draft EIS. The discussion of potential flooding at the NFS site has been expanded in response to comments.

- Several changes have been made to the cumulative impacts section (Section 4.6) to reflect changes in the status of other projects and their associated NEPA documents.

- Numerous other minor technical and editorial changes have been made to the document.

UNCHANGED DEPARTMENT OF ENERGY POLICY POSITIONS

Some DOE policy positions have remained unchanged between the Draft and the HEU Final EIS notwithstanding significant comments that counseled a different approach:

- A substantial number of comments opposed commercial use of LEU fuel derived from surplus HEU. These commentors maintained that commercial use increases proliferation risks by creating plutonium-containing spent nuclear fuel. DOE does not agree, however, that spent nuclear fuel poses proliferation risks.[19] Furthermore, reactors that might use LEU fuel derived from surplus HEU would simply use other fuel obtained from NU if the LEU fuel derived from surplus HEU did not exist, so there would be no increase in spent fuel and no increase in Pu created in that spent fuel.

- Most of the comments that opposed commercial use of LEU derived from surplus HEU also expressed opposition to commercial nuclear power in general. Because of the rate that LEU derived from surplus HEU would be made available (due to market prices, market supply, DOE's ability to make the material available, and legislative requirements), the proposed HEU disposition would be neutral in its impacts on commercial nuclear power. The program would not depend on or require any resurgence in the construction of nuclear power plants in the United States.[20] Furthermore, commercial use of LEU (derived from surplus HEU) would make beneficial use of a valuable resource, offsetting the costs of disposition actions, and minimizing adverse environmental impacts (when

[19] Although spent fuel contains Pu, which if separated is a weapons-usable fissile material, spent fuel is extremely radioactive and hazardous to handle and, thus, it is difficult and costly to separate Pu from spent fuel. In accordance with recommendations of the National Academy of Sciences, it is the policy of the United States to make weapons-usable fissile materials at least as proliferation-resistant as commercial spent fuel.

[20] Discussion of the merits of commercial nuclear power production is beyond the scope of this document.

compared to blending down to waste, for example).

- Numerous commentors expressed a wish to participate in all aspects of DOE's decisionmaking, including the evaluation of economic considerations. An economic analysis of the alternatives has been prepared to aid the decisionmaker, and is available for public comment separately from the HEU Final EIS. (This analysis has been disseminated to all commentors who expressed an interest in it.)

- The Department of Energy received comments suggesting that the alternative of blending some or all of the HEU to 19-percent LEU and storing it should be evaluated. This option was considered by the screening committee for fissile materials disposition as a specific option (the screening process is explained in Chapter 2 of the HEU Final EIS). However, this alternative is not reasonable because it would delay final disposition, present criticality concerns (for transportation and storage before blending down) that would need to be accommodated, delay recovery of the economic value of the material, and add storage costs. Furthermore, this option would be practically applicable to only a small portion (20 t or about 40 t if an SRS crystallization facility is subsequently proposed and constructed) of the current surplus HEU inventory.[21]

[21] Of the approximately 175 t of current surplus HEU inventory, approximately 62 t is irradiated fuel and other non-commercial material, 10 t is under IAEA safeguards, and 63 t has either already been transferred or is proposed to be transferred to USEC. The remaining 40 t of potentially commercial HEU includes 20 t of metal at (or destined for) Y–12 and another 20 t at SRS which is in forms (such as solutions) that could not be stabilized (after blending down) for transportation to other sites without construction of a solidification or crystallization facility, and/or without added transportation and safety concerns that would need to be accommodated. SRS material could most reasonably be blended using UNH on site. Since SRS does not currently have a solidification or crystallization facility to make the blended down material stable for storage, it appears reasonable to consider the blend to 19 percent and store option only for the 20 t at Y–12.

Summary of Alternatives Analysis

The analysis of the impacts of the alternatives in Tables S–2 and S–3 is based on four particular points on the fuel/waste spectrum: 0-percent, 25-percent, 65-percent, and 85-percent fuel use. The reader could calculate a reasonable estimate of the impacts of other points on the fuel/waste spectrum by interpolating the results as presented. For example, the impacts of a 75/25 fuel/waste ratio for a given set of sites would be between those presented for Alternatives 4 (65/35) and 5 (85/15) for the same sites.

The impacts for particular sites could also be approximated for different combinations of sites than those analyzed below. To determine the impacts of blending a different quantity of material at a particular site, the assumed quantity can be divided by the appropriate process rate (10 t/yr for blending to fuel as UF_6 or UNH, 3.1 t/yr for blending to waste as metal, and 2.1 t/yr for blending to waste as UNH) to yield the time period necessary to blend that quantity at that rate. Multiplying the resultant time period by the annual impact figures for resource areas that are additive (site infrastructure, water, radiological exposure, waste management, and transportation) yields the total impacts for that quantity and site. For the remaining resources (air quality, socioeconomics, and chemical exposure), the annual impact would be the maximum of any blending process used in that blending scenario for that site.

The analyses are based in part on DOE's ability to supply HEU to one or more sites at the process blending rates. If, as is expected, DOE is unable to supply material to multiple sites at the blending rates analyzed (for example, 10 t/yr to all four sites), the impacts in a given year would be reduced accordingly; however, since the impacts in this section are based upon blending the entire 200 t, the total campaign impacts would be similar to those described in the EIS, only spread over a longer time period.

[Text deleted.]

The analyses support several preliminary conclusions. For most resource areas, the impacts decrease as the portion of material blended for commercial use increases. This conclusion is based on the analysis of impacts from blending operations and transportation of materials only. It does not include the impacts from the endpoints: use of commercial nuclear fuel in reactors (and management of the resulting spent fuel) or disposal of LLW. These impacts are or will be assessed as part of the licensing process for nuclear plants, or as existing or anticipated environmental documents for sites for disposal of the LLW and spent fuel (such as the sitewide EIS for NTS, and an anticipated EIS concerning a potential repository for commercial spent fuel). Since the use of LEU derived from HEU in reactors would supplant the use of LEU from mined uranium, the preferred alternative would involve no incremental use of nuclear fuel (or spent fuel to be managed) than that which would otherwise occur. In contrast, the LLW to be disposed of from HEU that is blended to waste does represent an incremental quantity of LLW that would not have been disposed of in the absence of this proposed action. This distinction, together with the avoided environmental impacts from uranium mining, milling, and enrichment, further enhances the preferability of maximizing commercial use of surplus HEU.

The analyses show some differences between the impacts of the different blending processes. For example, for blending to waste, metal blending generates considerably more process LLW than does UNH blending.

Impacts on Uranium Mining and Nuclear Fuel Cycle Industries

The impacts of surplus HEU disposition on the uranium mining, conversion, and enrichment sectors will depend in large part on the degree to which supply and demand in the nuclear fuel market is balanced during the period of delivery to the market. Because the disposition of U.S. surplus HEU—taken together with the purchase of LEU derived from Russian HEU pursuant to the U.S.-Russian HEU Agreement—would increase the supply of LEU, there is the potential for adverse material impacts on domestic markets.

The *USEC Privatization Act*, which was signed into law in April 1996, authorizes sales from DOE's stockpiles of uranium, including LEU derived from HEU. Such sales may not be made unless the Secretary determines that the sale will not have an adverse material impact on the domestic uranium mining, conversion, or enrichment industry, taking into account the sales of uranium under the Russian HEU Agreement and the Suspension Agreement (Public Law 104-134, Section 3112(d)). The Act also specifies numerical limits, with certain exceptions, on annual deliveries to commercial end-users of material from Russian HEU obtained pursuant to the Russian HEU Agreement and material from the 50 t of U.S. HEU that is proposed to be transferred to USEC as part of Alternatives 3, 4, and 5 in this EIS.

The transfer of U.S.-origin HEU to commercial end users is not expected to have an adverse material impact on the nuclear fuel cycle industries. Although some impacts to each of the industry sectors (uranium mining and milling, uranium conversion, and uranium enrichment) would result from the proposed action, these impacts are likely to be minor and temporary. There are several factors that will ameliorate potential adverse economic impacts to these sectors.

- The *USEC Privatization Act* limits the delivery of both U.S. and Russian HEU to end users so as to avoid adverse material impacts on domestic production.
- Transfer of the U.S. HEU to end users would peak when Russian transfers are still small, thus limiting the cumulative impacts.
- Short term demand for uranium products (oxide, UF_6, and LEU) is currently strong, with producers in each of the affected sectors operating at highest capacities.

The cumulative impacts from the U.S.-origin HEU and the Russian HEU would vary over the period of delivery. During the period from 1995 to 2000, impacts to the nuclear fuel cycle industries would be minimal because of the limitations on deliveries to end users pursuant to the *USEC Privatization Act*. The largest cumulative impacts to these industries would occur during the period from 2000 to 2009, during which deliveries of U.S.-origin HEU to end users would peak under the Preferred Alternative and delivery allowances of Russian HEU would also increase on a yearly basis. During this period, the surplus U.S. and Russian HEU could displace up to 40 percent of the domestic uranium oxide production. However, most of the displacement would be due to the Russian HEU.[22]

The impacts on the conversion and enrichment sectors would appear to be smaller than for the uranium mining and milling sector. World demand for conversion services is projected to be strong during this period, and as stated earlier, all commercial plants are expected to be operating at almost full capacity in the foreseeable future. The enrichment sector would also suffer some displacement of its services. However, the loss of some market in the short term is not expected to result in significant employment impacts. After the year 2009, the U.S.-origin HEU would be almost fully commercialized, and any impacts to domestic nuclear fuel cycle industries would be solely attributable to the Russian HEU.

Impacts of Transferring Natural Uranium to the United States Enrichment Corporation

The proposal to transfer title to 50 t of surplus HEU to USEC includes the transfer of title to 7,000 t of NU now owned by DOE. This material is in the form of UF_6 and is part of a larger quantity of UF_6 that is in storage at DOE's Portsmouth and Paducah gaseous diffusion plants, which are currently being leased to USEC for uranium enrichment operations.[23] The NU was originally purchased by DOE to be enriched for use in nuclear weapons, but is no longer needed for that purpose.

The most likely disposition of the 7,000 t of NU is eventual use as feedstock for enrichment to nuclear power plant fuel, the usual business of the enrichment plants. If it is so used, and follows the typical path of NU that is enriched for commercial use, it would probably be enriched to about 2-percent U-235 at the Paducah plant, and would then be transported to the Portsmouth plant for additional enrichment to an appropriate commercial enrichment, generally about 4 percent. From there the enriched UF_6 would be transported to a commercial fuel fabrication plant for conversion and fabrication of nuclear fuel. The ongoing normal operations of the enrichment plants, including transportation of materials, are covered by existing NEPA documents.[24]

The shipment of 7,000 t of NU (0.71-percent enrichment) in UF_6 form from Paducah to the Portsmouth plant has been evaluated in the HEU EIS. The total health risk would be 0.129 fatalities for the entire 7,000 t. If the material is enriched to 2-percent LEU before transport, the 7,000 t of NU would be reduced to 2,490 t. The total health risk would be 0.0458 fatalities for the 2,490 t. These impacts include the loading and unloading of trucks and the return of empty vehicles to the origin.

Environmental Justice in Minority and Low-Income Populations

An environmental justice analysis was performed to assess whether the proposed action or alternatives could cause disproportionate adverse health impacts on minority and low-income populations residing in communities around the candidate sites. The analysis was conducted using a two-step process. First, a demographic analysis was performed for all of the 1990 Census tracts located within an 80-km (50-mi) radius of the candidate sites. The demographic data were also summarized for the region of influence (ROI), the area most directly affected by the proposed actions and the area where at least 90 percent of the workers reside. The second step

[22] Also contributing to cumulative impacts would be the 7,000 t of NU that is proposed to be transferred to USEC along with 50 t of HEU. The marginal impact of this material on the uranium mining and conversion sectors is expected to be modest, as the rate of its delivery to end users is limited by the *USEC Privatization Act* (Section 3112 (c)(2)), and it is expected to be commercialized in the early years before Russian shipments increase to substantial levels. The NU would not impact the enrichment sector, as it would still need to be enriched.

[23] Any future proposal to sell the remaining inventory of NU in the form of UF_6 would be to conduct separate NEPA review as appropriate.

[24] Energy Research and Development Administration (ERDA), 1977, *Final Environmental Statement, Portsmouth Gaseous Diffusion Plant Expansion, Piketon, OH*, ERDA-1549, Washington, DC; ERDA, 1977, *Final Environmental Impact Statement, Portsmouth Gaseous Diffusion Plant Site, Piketon, OH*, ERDA-1555, Washington, DC; U.S. Department of Energy, 1982, *Final Environmental Impact Assessment of the Paducah Gaseous Diffusion Plant Site, Paducah, KY*, DOE/EA-0155, Washington, DC.

involved performing public health impact analyses to assess whether vulnerable populations would be disproportionately affected by facility operations through routine and accidental releases of radiation and toxic emissions.

Selected demographic characteristics of the ROI for each of the four candidate sites are analyzed to show Census tracts where racial minority populations comprise 50 percent or more (simple majority) of the total population in the Census tract, or where racial minority populations comprise less than 50 percent, but greater than 25 percent, of the total population in the Census tract, or where low-income populations (income of less than $8,080 for a family of two) comprise 25 percent or more of the total population in the Census tract). [Text deleted.]

Any impacts to surrounding communities would most likely result from toxic/hazardous air pollutants and radiological emissions. Public and occupational health impacts from normal operations show that air emissions and releases are low and are within regulatory limits. The analysis also shows that cumulative effects of continuous operation over time would result in low levels of exposure to workers and the public. The public health impact analysis conducted for all alternatives estimates that the maximum additional cancer fatalities from accident-free operational activities would occur at ORR from either the blending of HEU to LEU as UNH for commercial fuel or the blending of HEU to LEU as metal. Under all blending alternatives, the maximum radiation dose to the maximally exposed individual of the public is 2.0 millirem (mrem) annually, and the fatal cancer risk is $2.0x10^{-5}$ for 20 years for normal operations. For postulated accidents, the maximum latent cancer fatalities per accident to the maximally exposed individual of the public ranges from $5.7x10^{-4}$ to $1.9x10^{-2}$; the total campaign risk (cancer fatality probability for the total campaign) ranges from $1.4x10^{-6}$ to $1.7x10^{-5}$. The maximum latent cancer fatalities per accident for the alternatives in the population within 80 km (50 mi) ranges from $6.9x10^{-2}$ to 1.4; the total campaign risk ranges from $1.6x10^{-4}$ to $1.2x10^{-3}$. The probability of the severe accidents is about 10^{-4} per year and ranges from about 10^{-3} to 10^{-5}. Given the low probability of these accidents, there would not be any disproportionate risk of significant adverse impacts to particular populations, including low-income and minority populations, from accidents. Except for SRS, the analysis of the demographics data for the communities surrounding the candidate sites indicates that even if there were high and adverse health risks to these communities, the impacts would not appear to disproportionately affect minority or low-income populations.

COMPARISON OF ALTERNATIVES

A comparison of the site-specific environmental impacts of the surplus HEU disposition alternatives is presented in this section. The combined impacts of each alternative for the disposition of the 200 t of surplus HEU inventory, which may involve multiple technologies, sites, and end products, are summarized. The annual operational impacts of each of the blending technologies for various resources at all candidate sites are fully described in Sections 4.3 and 4.4 of the HEU EIS.

For each alternative analyzed other than the no action alternative, there are two potential processes for blending to commercial fuel (UNH and UF_6) and two potential processes for blending to waste (UNH and metal). The impacts and, in the case of blending to waste, the processing rate of the respective processes differ. In other words, the magnitude of expected impacts and the time required to complete disposition actions depend on the process selected.

Material could be blended to waste at the two DOE sites using UNH blending; however, at ORR either UNH or metal blending could be used for blending to waste. Similarly, material could be blended to commercial fuel feed at the two commercial sites using either UNH or UF_6 blending. To provide conservatism in the site-specific analyses below, where there is such a choice of applicable processes at a site (that is, blending to waste at DOE's ORR [Y-12 Plant] and blending to commercial fuel feed at the commercial sites), the value given for each resource area is based on whichever process produces the greatest impact.

For blending to waste at DOE sites, the UNH process would produce the greatest impact in all resource areas except three. The metal process would produce the greatest impacts for liquid LLW generated, solid LLW generated, and solid LLW after treatment. Therefore, the analyses below conservatively use the metal impacts for these three resource areas and the UNH impacts for all other resource areas at Y-12.

For blending to commercial fuel feed at the commercial sites, the UF_6 process would produce the greatest impacts in all resource areas except three. The UNH process would produce the greatest impacts for liquid hazardous waste generated, solid nonhazardous waste after treatment, and transportation. The analyses below conservatively use the UNH impacts for these three resource areas, and the UF_6 impacts for all other resource areas.

The analyses indicate that all four sites have the capacity to process material with minimal impacts to workers, the public, or the environment during normal operations. For the two DOE sites, the generation of waste based on an increased usage of utilities represents small increases—less than 5 percent over current operations. For the two commercial sites, the generation of waste based on an increased usage of utilities represents increases of over 20 percent, but both facilities have adequate capacities to accommodate the increases since neither site is currently operating at full capacity. The NFS site would require a large increase in water usage (166 percent) and fuel requirements (933 percent). [Text deleted.] Because the quantity of water and fuel used in the past for similar operations is comparable to that used for the proposed action and in the analyses in the HEU EIS, it is anticipated that the increase in these requirements can easily be accommodated at NFS.

A comparison of the incremental environmental impacts of the HEU disposition alternatives is summarized in Tables S-2 and S-3. Table S-2 compares the total campaign and maximum incremental impacts for each resource and alternative at each of the four alternative blending sites. Table S-3 presents the summary comparison of total campaign maximum incremental impacts for each alternative. In addition, impacts associated with no action are included for a baseline comparison.

Impacts shown in Tables S-2 and S-3 are based on the maximum impact for each resource at each site (that is, the maximum electricity needed for either UNH or UF_6 blending to fuel or UNH or metal blending to waste) using a 10 t/yr processing rate for commercial blending and a 2.1 or 3.1 t/yr processing rate for blending to waste. These processing rates (analyzed in the HEU EIS) were also used to determine the duration of commercial blending for each alternative. If two sites were used for commercial blending, a total of 20 t would be blended annually (10 t/yr at each site) and would take 4 years to blend 80 t of HEU, whereas, in the case of 4 sites, a total of 40 t/yr would be blended continuing over a period of 2 years to blend 80 t. However, as shown in Table S-1, DOE expects to make only 8 t of surplus HEU available for commercial use annually due to material availability, market conditions, and legislative requirements which would reduce the annual processing rate for each site when multiple sites are used. Therefore, because total campaign impacts presented in Table S-2 use incremental impacts estimated for each resource using the processing rates analyzed in this EIS, they represent upper bound total campaign impacts. If surplus HEU is made available at less than the combined capacity of blending sites, it would take longer to blend the surplus inventory to commercial fuel. In such a case, total campaign impacts are anticipated to be roughly the same, but would be realized at lower rates over a longer period of time.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site

Alternative 1: No Action

Site Infrastructure Baseline Characteristics (No Action)

Site	Y-12	SRS	B&W	NFS
Electricity (MWh/yr)	420,500	659,000	64,700	21,800
Electric peak load (MWe)	62	130	14.3	3.5
Diesel/oil (l/yr)	0	28,400,000	470,000	36,000
Natural gas (m^3/yr)	66,000,000	0	2,850,000	12,900
Coal (t/yr)	2,940	210,000	0	0
Steam generation (kg/hr)	99,000	85,400	1,460	6,260
Water usage (l/yr)	7,530,000,000	153,687,000,000	195,000,000	57,000,000

Note: MWh=megawatt hour; MWe=megawatt electric; l=liter; m^3=cubic meter.
Source: Derived from tables in Section 4.2 of the EIS.

Estimated Ambient Concentrations of Criteria Pollutants From Existing Sources at Each Candidate Site Boundary (No Action)

Pollutant	Averaging Time	Most Stringent Regulations or Guidelines ($\mu g/m^3$)	Y-12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)	B&W ($\mu g/m^3$)	NFS ($\mu g/m^3$)
Carbon monoxide (CO)	8 hours	10,000[a]	5	22	4	1.97
	1 hour	40,000[a]	11	171	13.1	2.52
Lead (Pb)	Calendar Quarter	1.5[a]	0.05	0.0004	[b]	[b]
Nitrogen dioxide (NO_2)	Annual	100[a]	3	5.7	3.5	0.62
Particulate matter (PM_{10})	Annual	50[a]	1	3	0.02	0.03
	24 hours	150[a]	2	50.6	0.16	0.21
Sulfur dioxide (SO_2)	Annual	80[a]	2	14.5	0.34	0.02
	24 hours	365[a]	32	196	2.28	0.15
	3 hours	1,300[a]	80	823	11.8	0.35
Mandated by South Carolina, Tennessee, and Virginia						
Total suspended particulates (TSP)	Annual	60[c]	1[d]	12.6	0.03	0.03[d]
	24 hours	150[c]	2	47[d,e]	0.22	0.21
Gaseous fluorides (as HF)	1 month	0.8[c]	0.2	0.09	[b, d]	0.02
	1 week	1.6[c]	0.3	0.39	[b, d]	<0.06
	24 hours	2.9[c]	<0.6	1.04	[b, d]	0.06
	12 hours	3.7[c]	<0.6	1.99	[b, d]	0.1
	8 hours	250[c]	0.6	<2.99[d]	[b, d]	0.11

[a] Federal standard.
[b] No emissions from processes used at the site.
[c] State standard or guideline.
[d] No State standard.
[e] Based on maximum measured SRS ambient monitoring data for 1985.
[Text deleted.]
Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y-12 include other ORR operations; m^3=cubic meter.
Source: Derived from tables in Section 4.2 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Socioeconomic Parameters Baseline Characteristics (No Action)

Site	ORR	SRS	B&W	NFS
Employment	15,273	19,208	1,846	325
Payroll (million $)	523	1,149[a]	80	13.2
Regional Economic Area				
Employment				
1995	462,900	243,800	321,400	253,800
2000	488,700	259,400	334,700	265,500
Unemployment (%)				
1994	4.9	6.7	4.9	5.9
Per capita income				
1995 ($)	18,200	17,800	18,000	16,800
2000 ($)	19,214	18,930	18,788	17,594
Region of Influence				
Population				
1995	519,300	477,600	219,900	322,600
2000	548,200	508,300	229,000	337,600
Housing units				
1995	222,000	189,400	90,500	135,700
2000	234,400	201,600	94,300	141,900
[Text deleted.]				

[a] Total payroll for 1992 is based on 1990 employee wage and 1992 total number of employees (SRS 1995a:4).

Source: Derived from tables in Section 4.2 of the EIS.

Potential Radiological Impacts to Workers and the Public Resulting From Normal Operations Baseline Characteristics (No Action)

Receptor	ORR	SRS	B&W	NFS
Natural background radiation dose (mrem/yr)	295	298	329	340
Average worker (mrem/yr)	4	17.9	10	50
Fatal cancer risk for 20 years	3.2×10^{-5}	1.4×10^{-4}	8.0×10^{-5}	4.0×10^{-4}
Maximum worker exposure (mrem/yr)	2,000	3,000	3,300	470[a]
Maximally exposed member of public (mrem/yr)	2[b]	0.32	5.0×10^{-2}	3.3×10^{-2}
Fatal cancer risk for 20 years	2.0×10^{-5}	3.2×10^{-6}	5.0×10^{-7}	3.3×10^{-7}
Total worker dose (person-rem/yr)	68	216	18	16.3
Number of fatal cancers for 20 years	0.54	1.7	0.14	0.13
Total population dose (person-rem/yr)	28	21.5	0.35	0.2
Number of fatal cancers for 20 years	0.28	0.22	3.5×10^{-3}	2.0×10^{-3}

[a] Representative of one-half year.

[b] Representative of air and liquid media only; an additional 1 mrem/yr may be incurred due to direct exposure.

Note: mrem=millirem; rem=roentgen equivalent man.

Source: Derived from tables in Section 4.2 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Potential Hazardous Chemical Impacts[a] to Workers and the Public Resulting From Normal Operations Baseline Characteristics (No Action)

Receptor	ORR	SRS	B&W	NFS
Maximally Exposed Individual				
Hazard index[b]	3.95×10^{-2}	5.16×10^{-3}	1.15×10^{-5}	9.55×10^{-2}
Cancer risk[c]	0	1.31×10^{-7}	1.68×10^{-8}	0
Onsite Worker				
Hazard index[d]	0.154	1.16	4.07×10^{-3}	7.57×10^{-3}
Cancer risk[e]	0	1.94×10^{-4}	3.94×10^{-5}	0

[a] Includes any background emissions that would be present at the site in the absence of site operations plus site emissions that exist at the present time.

[b] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[c] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[d] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[e] Lifetime cancer risk=(emissions for 8-hr.) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.2 of the EIS.

Baseline Characteristics for Annual Waste Generated (No Action)

Waste Category	ORR	SRS	B&W	NFS
Low-Level				
Liquid (m^3)	2,576	0	50,005	18,900
Solid (m^3)	8,030	14,100	620	3,000
Mixed Low-Level				
Liquid (m^3)	84,210	115	0	<1
Solid (m^3)	960	18	14	<1
Hazardous				
Liquid (m^3)	32,640	Included in solid	55,115	<1
Solid (m^3)	1,434	74	0	<1
Nonhazardous				
Liquid (m^3)	1,743,000	700,000	576,160	56,700
Solid (m^3)	52,730	6,670	1,700	2,300

Note: m^3=cubic meter

Source: Derived from tables in Section 4.2 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Alternative 2: No Commercial Use (0/100 Fuel/Waste Ratio)

Total Campaign[a] Site Infrastructure Incremental Impacts Using All Four Sites (200 t to waste)

Characteristic	Y-12	SRS	B&W	NFS	Total
Electricity (MWh)	119,000	119,000	119,000	119,000	476,000
Diesel/oil (l)	1,352,000	2,024,000	8,004,000	8,004,000	19,384,000
Natural gas (m^3)	471,000	0[b]	471,000	471,000	1,413,000
Coal (t)	8,640	8,640	0[c]	0[c]	17,280
Steam (kg)	207,000	207,000	207,000	207,000	828,000

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore, liquid petroleum gas (approximately 671,000 l) would be substituted for a natural gas requirement of 471,000 m^3.

[c] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to a fuel oil energy equivalent. Fuel oil energy content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t.

Note: BTU=British thermal unit.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using All Four Sites (200 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines ($\mu g/m^3$)	Y-12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)	B&W ($\mu g/m^3$)	NFS ($\mu g/m^3$)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07	5.22	0.6
	1 hour	40,000[a]	53	0.14	16.96	0.77
Lead (Pb)	Calendar Quarter	1.5[a]	b	b	b	b
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01	0.1	0.02
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01	0.02	<0.01
	24 hours	150[a]	0.37	<0.01	0.16	0.02
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02	0.27	0.04
	24 hours	365[a]	29.3	0.32	1.82	0.27
	3 hours	1,300[a]	161	0.71	9.41	0.64
Mandated by South Carolina, Tennessee, and Virginia						
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05	0.02	<0.01[d]
	24 hours	150[c]	80.16	0.88[d]	0.16	0.02
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b	b, d	b
	1 week	1.6[c]	b	b	b, d	b
	24 hours	2.9[c]	b	b	b, d	b
	12 hours	3.7[c]	b	b	b, d	b
	8 hours	250[c]	b	b, d	b, d	b

[a] Federal standard.

[b] No emissions from UNH and metal blending process.

[c] State standard or guideline.

[d] No State standard.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y-12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Water Resources Incremental Impacts Using All Four Sites (200 t to waste)

Resource	Y–12	SRS	B&W	NFS	Total
Water (million l)	452	452	452	452	1,808
Wastewater (million l)[a]	446	446	446	446	1,784

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using All Four Sites (200 t to waste)

Characteristic	Y–12	SRS	B&W	NFS
Direct employment	125	125	125	125
Indirect employment	319	245	283	251
Total jobs	444	370	408	376
Unemployment rate change (percent)	-0.09	-0.14	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using All Four Sites (200 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Involved Workers					
Total dose to involved workforce[a] (person-rem)	269	269	269	269	1,076
Risk (cancer fatalities per campaign)	0.108	0.108	0.108	0.108	0.43
Maximally Exposed Individual (Public)					
Dose to maximally exposed individual member of the public (mrem)	0.928	5.95×10^{-2}	4.52×10^{-2}	3.33	NA[b]
Risk (cancer fatality per campaign)	4.64×10^{-7}	2.98×10^{-8}	2.26×10^{-8}	1.67×10^{-6}	NA[b]
Population Within 80 km					
Dose to population within 80 km[c] (person-rem)	3.81	3.81	0.405	28.6	36.6
Risk (cancer fatalities per campaign)	1.91×10^{-3}	1.91×10^{-3}	2.03×10^{-4}	1.43×10^{-2}	1.83×10^{-2}

[a] The involved workforce is 125 for UNH blending and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W, and 1,260,000 for NFS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Facility Accidents Incremental Impacts Using All Four Sites (200 t to waste)[a]

Receptor	Y–12	SRS	B&W	NFS
Campaign accident frequency[b]	2.4×10^{-3}	2.4×10^{-3}	2.4×10^{-3}	2.4×10^{-3}
Noninvolved Workers[c]				
Latent cancer fatalities per accident	0.4	8.7×10^{-2}	0.94	8.4×10^{-2}
Risk (cancer fatalities per campaign)	9.4×10^{-4}	2.1×10^{-4}	2.2×10^{-3}	2.0×10^{-4}
Maximally Exposed Individual (Public)				
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}	5.7×10^{-4}	1.3×10^{-4}
Risk (cancer fatality per campaign)	1.2×10^{-6}	7.3×10^{-9}	1.4×10^{-6}	3.0×10^{-7}
Population Within 80 km[d]				
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}	4.0×10^{-2}	5.8×10^{-2}
Risk (cancer fatalities per campaign)	1.6×10^{-4}	3.8×10^{-5}	9.5×10^{-5}	1.4×10^{-4}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 50 t HEU to 0.9-percent LEU as UNH waste at each site).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Chemical Exposure Incremental Impacts Using All Four Sites (200 t to waste)

Receptor	Y–12	SRS	B&W	NFS
Maximally Exposed Individual (Public)				
Hazard index[a]	1.92×10^{-3}	2.13×10^{-4}	6.90×10^{-6}	1.01×10^{-2}
Cancer risk[b]	2.66×10^{-15}	2.30×10^{-16}	7.43×10^{-18}	1.08×10^{-14}
Onsite Worker				
Hazard index[c]	6.30×10^{-3}	5.65×10^{-3}	2.34×10^{-3}	3.21×10^{-3}
Cancer risk[d]	8.18×10^{-14}	7.35×10^{-14}	3.06×10^{-14}	4.19×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Waste Generation Incremental Impacts Using All Four Sites (200 t to waste)

Waste Category[a]	Y–12	SRS	B&W	NFS	Total
Low-Level					
Liquid (m^3)	4,510	452	452	452	5,866
Solid (m^3)	8,780	1,640	1,640	1,640	13,700
Mixed Low-Level					
Liquid (m^3)	167	167	167	167	668
Solid (m^3)	0	0	0	0	0
Hazardous					
Liquid (m^3)	262	262	262	262	1,048
Solid (m^3)	0	0	0	0	0
Nonhazardous (Sanitary)					
Liquid (m^3)	428,000	428,000	428,000	428,000	1,712,000
Solid (m^3)	19,500	19,500	19,500	19,500	78,000
Nonhazardous (Other)					
Liquid (m^3)	18,200	18,200	18,200	18,200	72,800
Solid (m^3)	0	0	0	0	0
Solid Low-Level (m^3)[b]	5,810	881	881	881	8,453
Solid Nonhazardous (m^3)[b]	14,100	14,100	14,100	14,100	56,400
LEU Low-Level (m^3)[c]	9,820	9,730	9,730	9,730	39,010

[a] Waste volumes are based on the blending process which produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Transportation Risk Incremental Impacts Using All Four Sites (200 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Accident-Free Operations					
Fatalities to the public from radiological effects	0.13	0.15	0.15	0.14	0.58
Fatalities to the crew from radiological effects	0.11	0.11	0.11	0.11	0.44
Fatalities to the public from nonradiological effects	$1.1x10^{-2}$	$1.5x10^{-2}$	$1.7x10^{-2}$	$1.2x10^{-2}$	$5.5x10^{-2}$
Accidents					
Fatalities to the public from radiological effects[a]	$4.3x10^{-3}$	$4.8x10^{-3}$	$5.0x10^{-3}$	$4.8x10^{-3}$	$1.88x10^{-2}$
Fatalities to the public from nonradiological effects	0.4	0.48	0.5	0.45	1.83
Fatalities to the crew from nonradiological effects	0.11	0.14	0.14	0.12	0.51
Total Fatalities	0.77	0.9	0.93	0.84	3.43

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Alternative 3: Limited Commercial Use (25/75 Fuel/Waste Ratio)

Total Campaign[a] Site Infrastructure Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Characteristic	Y–12	SRS	B&W	NFS	Total
Electricity (MWh)	89,000	89,000	152,000	152,000	482,000
Diesel/oil (l)	1,017,000	1,522,000	7,211,000	7,211,000	16,961,000
Natural gas (m^3)	354,000	0[b]	406,000	406,000	1,166,000
Coal (t)	6,480	6,480	0[c]	0[c]	12,960
Steam (kg)	155,400	155,400	177,100	177,100	665,000

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore, liquid petroleum gas (approximately 504,000 l) would be substituted for a natural gas requirement of 354,000 m^3.

[c] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to a fuel oil energy equivalent. Fuel oil energy content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t. A coal requirement of 7,845 t equals 6,040,000 l of fuel oil.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m^3)	Y–12 (μg/m^3)	SRS (μg/m^3)	B&W (μg/m^3)	NFS (μg/m^3)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07	5.43	0.62
	1 hour	40,000[a]	53	0.14	17.63	0.8
Lead (Pb)	Calendar Quarter	1.5[a]	[b]	[b]	[b]	[b]
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01	0.14	0.03
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01	0.03	<0.01
	24 hours	150[a]	0.37	<0.01	0.19	0.03
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02	0.4	0.05
	24 hours	365[a]	29.3	0.32	2.74	0.4
	3 hours	1,300[a]	161	0.71	14.11	0.96
Mandated by South Carolina, Tennessee, and Virginia						
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05	0.03	<0.01[d]
	24 hours	150[c]	80.16	0.88[d]	0.19	0.03

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines ($\mu g/m^3$)	Y–12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)	B&W ($\mu g/m^3$)	NFS ($\mu g/m^3$)
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b	trace[d, e]	trace[e]
	1 week	1.6[c]	b	b	trace[d, e]	trace[e]
	24 hours	2.9[c]	b	b	trace[d, e]	trace[e]
	12 hours	3.7[c]	b	b	trace[d, e]	trace[e]
	8 hours	250[c]	b	b, d	trace[d, e]	trace[e]

[a] Federal standard.

[b] No lead emissions from any of the blending processes and no gaseous fluoride emissions from UNH and metal blending processes.

[c] State standard or guideline.

[d] No State standard.

[e] Hydrofluorination is anticipated to be a closed system with a scrubber filter exhaust system. Therefore, emission of gaseous fluorides is estimated to be a trace amount.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate site. Pollutant concentrations shown for Y–12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Resource	Y–12	SRS	B&W	NFS	Total
Water (million l)	340	340	390	390	1,460
Wastewater (million l)[a]	336	336	384	384	1,440

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Characteristic	Y–12	SRS	B&W	NFS
Direct employment	125	125	126	126
Indirect employment	319	245	285	253
Total jobs	444	370	411	379
Unemployment rate change (percent)	-0.09	-0.14	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Involved Workers					
Total dose to involved workforce[a] (person-rem)	202	202	238	238	880
Risk (cancer fatalities per campaign)	8.08×10^{-2}	8.08×10^{-2}	9.52×10^{-2}	9.52×10^{-2}	0.352
Maximally Exposed Individual (Public)					
Dose to maximally exposed individual member of the public (mrem)	0.698	4.48×10^{-2}	4.27×10^{-2}	3.13	NA[b]
Risk (cancer fatality per campaign)	3.49×10^{-7}	2.24×10^{-8}	2.14×10^{-8}	1.57×10^{-6}	NA[b]
Population Within 80 km					
Dose to population within 80 km[c] (person-rem)	2.86	2.86	0.384	27.2	33.3
Risk (cancer fatalities per campaign)	1.43×10^{-3}	1.43×10^{-3}	1.92×10^{-4}	1.36×10^{-2}	1.67×10^{-2}

[a] The involved workforce is 125 for UNH blending, 126 for UF_6 blending, and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled since they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts Using All Four Sites (50 t to fuel and 150 to waste)[a]

Receptor	Y–12	SRS	B&W	NFS
Campaign accident frequency[b]	1.8×10^{-3}	1.8×10^{-3}	1.8×10^{-3}	1.8×10^{-3}
Noninvolved Workers[c]				
Latent cancer fatalities per accident	0.4	8.7×10^{-2}	30	2.5
Risk (cancer fatalities per campaign)	7.1×10^{-4}	1.6×10^{-4}	9.2×10^{-3}	7.8×10^{-4}
Maximally Exposed Individual (Public)				
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}	1.9×10^{-2}	3.0×10^{-3}
Risk (cancer fatality per campaign)	8.9×10^{-7}	5.5×10^{-9}	5.8×10^{-6}	9.9×10^{-7}
Population Within 80 km[d]				
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}	1	1.4
Risk (cancer fatalities per campaign)	1.2×10^{-4}	2.9×10^{-5}	3.2×10^{-4}	4.6×10^{-4}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 25 t HEU to 4-percent LEU as UF_6 fuel and 37.5 t HEU to 0.9-percent LEU as UNH waste at B&W and NFS, and 37.5 t HEU to 0.9-percent LEU as UNH waste at Y–12 and SRS).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Chemical Exposure Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Receptor	Y–12	SRS	B&W	NFS
Maximally Exposed Individual (Public)				
Hazard index[a]	$1.92x10^{-3}$	$2.13x10^{-4}$	$6.90x10^{-6}$	$1.01x10^{-2}$
Cancer risk[b]	$1.22x10^{-15}$	$1.36x10^{-16}$	$4.39x10^{-18}$	$6.40x10^{-15}$
Onsite Worker				
Hazard index[c]	$6.30x10^{-3}$	$5.65x10^{-3}$	$2.34x10^{-3}$	$3.21x10^{-3}$
Cancer risk[d]	$4.83x10^{-14}$	$4.34x10^{-14}$	$1.81x10^{-14}$	$2.48x10^{-14}$

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Waste Generation Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Waste Category[a]	Y–12	SRS	B&W	NFS	Total
Low-Level					
Liquid (m^3)	3,390	369	463	463	4,685
Solid (m^3)	6,600	1,330	1,600	1,600	11,130
Mixed Low-Level					
Liquid (m^3)	125	125	523	523	1,296
Solid (m^3)	0	0	0	0	0
Hazardous					
Liquid (m^3)	197	197	417	417	1,228
Solid (m^3)	0	0	0	0	0
Nonhazardous (Sanitary)					
Liquid (m^3)	322,000	322,000	367,000	367,000	1,378,000
Solid (m^3)	14,700	14,700	16,700	16,700	62,800
Nonhazardous (Other)					
Liquid (m^3)	13,700	13,700	16,500	16,500	60,400
Solid (m^3)	0	0	3	3	6
Solid Low-Level (m^3)[b]	4,370	662	885	885	6,802
Solid Nonhazardous (m^3)[b]	10,600	10,600	12,100	12,100	45,400
LEU Low-Level (m^3)[c]	7,380	7,320	7,320	7,320	29,340

[a] Waste volumes are based on the blending process that produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Transportation Risk Incremental Impacts Using All Four Sites (50 t to fuel and 150 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Accident-Free Operations					
Fatalities to the public from radiological effects	0.1	0.11	0.14	0.13	0.48
Fatalities to the crew from radiological effects	0.08	0.08	0.1	0.1	0.36
Fatalities to the public from nonradiological effects	8.2×10^{-3}	1.1×10^{-2}	1.6×10^{-2}	1.1×10^{-2}	4.6×10^{-2}
Accidents					
Fatalities to the public from radiological effects[a]	3.2×10^{-3}	3.6×10^{-3}	4.7×10^{-3}	4.5×10^{-3}	1.6×10^{-2}
Fatalities to the public from nonradiological effects	0.3	0.36	0.46	0.42	1.54
Fatalities to the crew from nonradiological effects	0.09	0.1	0.13	0.12	0.43
Total Fatalities	0.58	0.67	0.85	0.78	2.89

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Alternative 4: Substantial Commercial Use (65/35 Fuel/Waste Ratio)

Variation a) Two Department of Energy Sites

Total Campaign[a] Site Infrastructure Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Characteristic	Y–12	SRS	Total
Electricity (MWh)	109,000	109,000	218,000
Diesel/oil (l)	1,318,000	1,947,000	3,265,000
Natural gas (m^3)	441,000	0[b]	441,000
Coal (t)	8,410	8,410	16,820
Steam (kg)	201,600	201,600	403,200

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore, liquid petroleum gas (approximately 628,000 l) would be substituted for a natural gas requirement of 441,000 m^3.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines ($\mu g/m^3$)	Y–12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07
	1 hour	40,000[a]	53	0.14
Lead (Pb)	Calendar Quarter	1.5[a]	b	b
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01
	24 hours	150[a]	0.37	<0.01
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02
	24 hours	365[a]	29.3	0.32
	3 hours	1,300[a]	161	0.71
Mandated by South Carolina and Tennessee				
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05
	24 hours	150[c]	80.16	0.88[d]

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines ($\mu g/m^3$)	Y–12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b
	1 week	1.6[c]	b	b
	24 hours	2.9[c]	b	b
	12 hours	3.7[c]	b	b
	8 hours	250[c]	b	b, d

[a] Federal standard.

[b] No emissions from UNH and metal blending processes.

[c] State standard or guideline.

[d] No State standard.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y–12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Total Water Resources Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Resource	Y–12	SRS	Total
Water (million l)	441	441	882
Wastewater (million l)[a]	433	433	866

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Characteristic	Y–12	SRS
Direct employment	125	125
Indirect employment	319	245
Total jobs	444	370
Unemployment rate change (percent)	-0.09	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Receptor	Y–12	SRS	Total
Involved Workers			
Total dose to involved workforce[a] (person-rem)	262	262	524
Risk (cancer fatalities per campaign)	0.105	0.105	0.21
Maximally Exposed Individual (Public)			
Dose to maximally exposed individual member of the public (mrem)	0.905	5.80×10^{-2}	NA[b]
Risk (cancer fatality per campaign)	4.53×10^{-7}	2.90×10^{-8}	NA[b]
Population Within 80 km			
Dose to population within 80 km[c] (person-rem)	3.71	3.71	7.42
Risk (cancer fatalities per campaign)	1.86×10^{-3}	1.86×10^{-3}	3.71×10^{-3}

[a] The involved workforce is 125 for UNH blending and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12 and 710,000 for SRS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 to waste)[a]

Receptor	Y–12	SRS
Campaign accident frequency[b]	1.7×10^{-3}	1.7×10^{-3}
Noninvolved Workers[c]		
Latent cancer fatalities per accident	0.4	8.7×10^{-2}
Risk (cancer fatalities per campaign)	7.5×10^{-4}	1.7×10^{-4}
Maximally Exposed Individual (Public)		
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}
Risk (cancer fatality per campaign)	9.5×10^{-7}	5.8×10^{-9}
Population Within 80 km[d]		
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}
Risk (cancer fatalities per campaign)	1.3×10^{-4}	3.1×10^{-5}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 65 t HEU to 4-percent as LEU as UNH fuel and 35 t HEU to 0.9-percent LEU as UNH waste at each site).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12 and 710,000 for SRS.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Chemical Exposure Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Receptor	Y–12	SRS
Maximally Exposed Individual (Public)		
Hazard index[a]	3.84×10^{-3}	4.26×10^{-4}
Cancer risk[b]	4.01×10^{-15}	4.47×10^{-16}
Onsite Worker		
Hazard index[c]	1.26×10^{-2}	1.13×10^{-2}
Cancer risk[d]	1.60×10^{-13}	1.43×10^{-13}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Waste Generation Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Waste Category[a]	Y–12	SRS	Total
Low-Level			
Liquid (m^3)	3,310	460	3,770
Solid (m^3)	6,650	1,650	8,300
Mixed Low-Level			
Liquid (m^3)	416	416	832
Solid (m^3)	0	0	0
Hazardous			
Liquid (m^3)	756	756	1,512
Solid (m^3)	0	0	0
Nonhazardous (Sanitary)			
Liquid (m^3)	418,000	418,000	836,000
Solid (m^3)	19,000	19,000	38,000
Nonhazardous (Other)			
Liquid (m^3)	17,700	17,700	35,400
Solid (m^3)	0	0	0
Solid Low-Level (m^3)[b]	4,380	917	5,297
Solid Nonhazardous (m^3)[b]	13,700	13,700	27,400
LEU Low-Level (m^3)[c]	6,890	6,830	13,720

[a] Waste volumes are based on the blending process that produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes HEU irradiated fuel that is currently in the surplus inventory (quantity is identified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Transportation Risk Incremental Impacts Using Two Department of Energy Sites (130 t to fuel and 70 t to waste)

Receptor	Y-12	SRS	Total
Accident-Free Operations			
Fatalities to the public from radiological effects	0.15	0.18	0.33
Fatalities to the crew from radiological effects	0.11	0.12	0.23
Fatalities to the public from nonradiological effects	1.4×10^{-2}	1.7×10^{-2}	3.1×10^{-2}
Accidents			
Fatalities to the public from radiological effects[a]	5.2×10^{-3}	5.8×10^{-3}	1.1×10^{-2}
Fatalities to the public from nonradiological effects	0.48	0.56	1.04
Fatalities to the crew from nonradiological effects	0.14	0.16	0.3
Total Fatalities	0.9	1.04	1.94

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Variation b) Two Commercial Sites

Total Campaign Site Infrastructure Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Characteristic	B&W	NFS	Total
Electricity (MWh)	246,000	246,000	492,000
Diesel/oil (l)	8,713,000	8,713,000	17,426,000
Natural gas (m^3)	468,000	468,000	936,000
Coal (t)	0[a]	0[a]	0
Steam (kg)	201,600	201,600	403,200

[a] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to a fuel oil energy equivalent. Fuel oil energy content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t. A coal requirement of 9,590 t equals 7,400,000 l of fuel oil.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	B&W (μg/m³)	NFS (μg/m³)
Carbon monoxide (CO)	8 hours	10,000[a]	5.43	0.62
	1 hour	40,000[a]	17.63	0.8
Lead (Pb)	Calendar Quarter	1.5[a]	[b]	[b]
Nitrogen dioxide (NO_2)	Annual	100[a]	0.14	0.03
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01
	24 hours	150[a]	0.19	0.03
Sulfur dioxide (SO_2)	Annual	80[a]	0.4	0.05
	24 hours	365[a]	2.74	0.4
	3 hours	1,300[a]	14.11	0.96

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	B&W (μg/m³)	NFS (μg/m³)
Mandated by Tennessee and Virginia				
Total suspended particulates (TSP)	Annual	60[c]	0.03	<0.01[d]
	24 hours	150[c]	0.19	0.03
Gaseous fluorides (as HF)	1 month	1.2[c]	trace[d, e]	trace[e]
	1 week	1.6[c]	trace[d, e]	trace[e]
	24 hours	2.9[c]	trace[d, e]	trace[e]
	12 hours	3.7[c]	trace[d, e]	trace[e]
	8 hours	250[c]	trace[d, e]	trace[e]

[a] Federal standard

[b] No emissions from UF_6 and UNH blending processes.

[c] State standard or guideline.

[d] No State standard.

[e] Hydrofluorination is anticipated to be closed with scrubber filter exhaust system. Therefore, emission of gaseous fluorides is estimated to be a trace amount.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Resource	B&W	NFS	Total
Water (million l)	447	447	894
Wastewater (million l)[a]	435	435	870

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Characteristic	B&W	NFS
Direct employment	126	126
Indirect employment	285	253
Total jobs	411	379
Unemployment rate change (percent)	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Table S-2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Receptor	B&W	NFS	Total
Involved Workers			
Total dose to involved workforce[a] (person-rem)	283	283	566
Risk (cancer fatalities per campaign)	0.113	0.113	0.226
Maximally Exposed Individual (Public)			
Dose to maximally exposed individual member of the public (mrem)	5.45×10^{-2}	3.96	NA[b]
Risk (cancer fatality per campaign)	2.73×10^{-8}	1.98×10^{-6}	NA[b]
Population Within 80 km			
Dose to population within 80 km[c] (person-rem)	0.492	35	35.5
Risk (cancer fatalities per campaign)	2.46×10^{-4}	1.75×10^{-2}	1.78×10^{-2}

[a] The involved workforce is 125 for UNH blending and 126 for UF_6 blending.
[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.
[c] The population within 80 km (50 mi) in the year 2010 is 730,000 for B&W and 1,260,000 for NFS.
Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 to waste)[a]

Receptor	B&W	NFS
Campaign accident frequency[b]	1.7×10^{-3}	1.7×10^{-3}
Noninvolved Workers[c]		
Latent cancer fatalities per accident	30	2.5
Risk (cancer fatalities per campaign)	2.1×10^{-2}	1.8×10^{-3}
Maximally Exposed Individual (Public)		
Latent cancer fatality per accident	1.9×10^{-2}	3.0×10^{-3}
Risk (cancer fatality per campaign)	1.3×10^{-5}	2.2×10^{-6}
Population Within 80 km[d]		
Latent cancer fatalities per accident	1	1.4
Risk (cancer fatalities per campaign)	7.2×10^{-4}	1.0×10^{-3}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 65 t HEU to 4-percent LEU as UF_6 fuel and 35 t HEU to 0.9-percent LEU as UNH waste at each site).
[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.
[c] The noninvolved workers are workers onsite but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.
[d] The population within 80 km (50 mi) in the year 2010 is 730,000 for B&W and 1,260,000 for NFS.
Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Chemical Exposure Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Receptor	B&W	NFS
Maximally Exposed Individual (Public)		
Hazard index[a]	1.38×10^{-5}	2.02×10^{-2}
Cancer risk[b]	1.45×10^{-17}	2.11×10^{-14}
Onsite Worker		
Hazard index[c]	4.68×10^{-3}	6.42×10^{-3}
Cancer risk[d]	5.97×10^{-14}	8.18×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Waste Generation Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Waste Category[a]	B&W	NFS	Total
Low-Level			
Liquid (m^3)	636	636	1,272
Solid (m^3)	2,100	2,100	4,200
Mixed Low-Level			
Liquid (m^3)	1,150	1,150	2,300
Solid (m^3)	0	0	0
Hazardous			
Liquid (m^3)	756	756	1,512
Solid (m^3)	0	0	0
Nonhazardous (Sanitary)			
Liquid (m^3)	418,000	418,000	836,000
Solid (m^3)	19,000	19,000	38,000
Nonhazardous (Other)			
Liquid (m^3)	20,300	20,300	40,600
Solid (m^3)	7	7	14
Solid Low-Level (m^3)[b]	1,200	1,200	2,400
Solid Nonhazardous (m^3)[b]	13,700	13,700	27,400
LEU Low-Level (m^3)[c]	6,830	6,830	13,660

[a] Waste volumes are based on the blending process that produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Transportation Risk Incremental Impacts Using Two Commercial Sites (130 t to fuel and 70 t to waste)

Receptor	B&W	NFS	Total
Accident-Free Operations			
Fatalities to the public from radiological effects	0.18	0.16	0.34
Fatalities to the crew from radiological effects	0.12	0.12	0.24
Fatalities to the public from nonradiological effects	$1.9x10^{-2}$	$1.5x10^{-2}$	$3.4x10^{-2}$
Accidents			
Fatalities to the public from radiological effects[a]	$6.0x10^{-3}$	$5.6x10^{-3}$	$1.16x10^{-2}$
Fatalities to the public from nonradiological effects	0.57	0.53	1.1
Fatalities to the crew from nonradiological effects	0.16	0.15	0.31
Total Fatalities	1.06	0.98	2.04

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Variation c) All Four Sites

Total Campaign[a] Site Infrastructure Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Characteristic	Y-12	SRS	B&W	NFS	Total
Electricity (MWh)	54,700	54,700	124,000	124,000	357,400
Diesel/oil (l)	659,000	973,000	4,364,000	4,364,000	10,360,000
Natural gas (m^3)	220,000	0[b]	234,000	234,000	688,000
Coal (t)	4,210	4,210	0[c]	0[c]	8,420
Steam (kg)	100,800	100,800	100,800	100,800	403,200

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore liquid petroleum gas (approximately 313,000 l) would be substituted for a natural gas requirement of 220,000 m^3.

[c] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to a fuel oil energy equivalent. Fuel oil energy content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t. A coal requirement of 4,800 t equals 3,700,000 l of fuel oil.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	Y–12 (μg/m³)	SRS (μg/m³)	B&W (μg/m³)	NFS (μg/m³)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07	5.43	0.62
	1 hour	40,000[a]	53	0.14	17.63	0.8
Lead (Pb)	Calendar Quarter	1.5[a]	b	b	b	b
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01	0.14	0.03
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01	0.03	<0.01
	24 hours	150[a]	0.37	<0.01	0.19	0.03
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02	0.4	0.05
	24 hours	365[a]	29.3	0.32	2.74	0.4
	3 hours	1,300[a]	161	0.71	14.11	0.96
Mandated by South Carolina, Tennessee, and Virginia						
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05	0.03	<0.01[d]
	24 hours	150[c]	80.16	0.88[d]	0.19	0.03
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b	trace[d, e]	trace[e]
	1 week	1.6[c]	b	b	trace[d, e]	trace[e]
	24 hours	2.9[c]	b	b	trace[d, e]	trace[e]
	12 hours	3.7[c]	b	b	trace[d, e]	trace[e]
	8 hours	250[c]	b	b, d	trace[d, e]	trace[e]

[a] Federal standard.

[b] No lead emissions from any of the blending processes and no gaseous fluorides from UNH and metal blending processes.

[c] State standard or guideline.

[d] No State standard.

[e] Hydrofluorination is anticipated to be a closed system with scrubber filter exhaust system. Therefore, emission of gaseous fluorides is estimated to be a trace amount.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y–12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Resource	Y–12	SRS	B&W	NFS	Total
Water (million l)	220	220	224	224	888
Wastewater (million l)[a]	216	216	218	218	868

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Socioeconomic Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Characteristic	Y–12	SRS	B&W	NFS
Direct employment	125	125	126	126
Indirect employment	319	245	285	253
Total jobs	444	370	411	379
Unemployment rate change (percent)	-0.09	-0.14	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Normal Operations Radiological Exposure Incremental Impacts for All Four Sites (130 t to fuel and 70 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Involved Workers					
Total dose to involved workforce[a] (person-rem)	131	131	141	141	544
Risk (cancer fatalities per campaign)	$5.24x10^{-2}$	$5.24x10^{-2}$	$5.65x10^{-2}$	$5.65x10^{-2}$	0.218
Maximally Exposed Individual (Public)					
Dose to maximally exposed individual member of the public (mrem)	0.452	$2.90x10^{-2}$	$2.73x10^{-2}$	1.98	NA[b]
Risk (cancer fatality per campaign)	$2.26x10^{-7}$	$1.45x10^{-8}$	$1.37x10^{-8}$	$9.94x10^{-7}$	NA[b]
Population Within 80 km					
Dose to population within 80 km[c] (person-rem)	1.86	1.86	0.246	17.5	21.5
Risk (cancer fatalities per campaign)	$9.30x10^{-4}$	$9.30x10^{-4}$	$1.24x10^{-4}$	$8.80x10^{-3}$	$1.08x10^{-2}$

[a] The involved workforce is 125 for UNH blending, 126 for UF_6 blending, and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual can not be totaled because they are based on maximum exposure to an individual at each site using site specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Facility Accidents Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)[a]

Receptor	Y–12	SRS	B&W	NFS
Campaign accident frequency[b]	8.3×10^{-3}	8.3×10^{-3}	8.3×10^{-3}	8.3×10^{-3}
Noninvolved Workers[c]				
Latent cancer fatalities per accident	0.4	8.7×10^{-2}	30	2.5
Risk (cancer fatalities per campaign)	3.8×10^{-4}	8.3×10^{-5}	1.1×10^{-2}	9.0×10^{-4}
Maximally Exposed Individual (Public)				
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}	1.9×10^{-2}	3.0×10^{-3}
Risk (cancer fatality per campaign)	4.7×10^{-7}	2.9×10^{-9}	6.8×10^{-6}	1.1×10^{-6}
Population Within 80 km[d]				
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}	1	1.4
Risk (cancer fatalities per campaign)	6.5×10^{-5}	1.5×10^{-5}	3.7×10^{-4}	5.1×10^{-4}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 32.5 t HEU to 4-percent LEU as UNH fuel and 17.5 t HEU to 0.9-percent LEU as UNH waste at Y–12 and SRS, and 32.5 t HEU to 4-percent LEU as UF_6 fuel and 17.5 t HEU to 0.9-percent LEU and UNH waste at B&W and NFS).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Chemical Exposure Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Receptor	Y–12	SRS	B&W	NFS
Maximally Exposed Individual (Public)				
Hazard index[a]	1.92×10^{-3}	2.13×10^{-4}	6.90×10^{-6}	1.01×10^{-2}
Cancer risk[b]	1.00×10^{-15}	1.12×10^{-16}	3.62×10^{-18}	5.28×10^{-15}
Onsite Worker				
Hazard index[c]	6.30×10^{-3}	5.65×10^{-3}	2.34×10^{-3}	3.21×10^{-3}
Cancer risk[d]	3.98×10^{-14}	3.58×10^{-14}	1.49×10^{-14}	2.05×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Waste Generation Incremental Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Waste Category[a]	Y–12	SRS	B&W	NFS	Total
Low-Level					
Liquid (m^3)	1,640	230	319	319	2,508
Solid (m^3)	3,300	824	1,050	1,050	6,224
Mixed Low-Level					
Liquid (m^3)	210	210	583	583	1,586
Solid (m^3)	0	0	0	0	0
Hazardous					
Liquid (m^3)	382	382	382	382	1,528
Solid (m^3)	0	0	0	0	0
Nonhazardous (Sanitary)					
Liquid (m^3)	209,000	209,000	209,000	209,000	836,000
Solid (m^3)	9,510	9,510	9,510	9,510	38,040
Nonhazardous (Other)					
Liquid (m^3)	8,870	8,870	10,100	10,100	37,940
Solid (m^3)	0	0	3	3	6
Solid Low-Level (m^3)[b]	2,170	459	601	601	3,831
Solid Nonhazardous (m^3)[b]	6,860	6,860	6,860	6,860	27,440
LEU Low-Level (m^3)[c]	3,420	3,400	3,400	3,400	13,620

[a] Waste volumes are based on the blending process which produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Transportation Risk Impacts Using All Four Sites (130 t to fuel and 70 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Accident-Free Operations					
Fatalities to the public from radiological effects	0.08	0.09	0.09	0.08	0.34
Fatalities to the crew from radiological effects	0.06	0.06	0.06	0.06	0.24
Fatalities to the public from nonradiological effects	7.0×10^{-3}	9.0×10^{-3}	9.7×10^{-3}	7.4×10^{-3}	3.3×10^{-2}
Accidents					
Fatalities to the public from radiological effects[a]	2.6×10^{-3}	2.9×10^{-3}	3.0×10^{-3}	2.8×10^{-3}	1.13×10^{-2}
Fatalities to the public from nonradiological effects	0.24	0.28	0.28	0.26	1.06
Fatalities to the crew from nonradiological effects	0.07	0.08	0.08	0.07	0.3
Total Fatalities	0.46	0.52	0.52	0.48	1.98

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Variation d) Single Site

The incremental impacts of blending all surplus HEU to LEU at a single DOE site are the same as either the total or maximum impacts presented in Variation a. Blending all at a single commercial site can be obtained from Variation b. The only exception is the normal operations dose and risk to the maximally exposed individual of the public and the population within 80 km (50 mi). The dose to the maximally exposed individual for Y-12, SRS, B&W, and NFS is 1.81, 0.116, 0.109, and 7.92 mrem, respectively. The risk of cancer fatalities per campaign is $9.06x10^{-7}$, $5.80x10^{-8}$, $5.46x10^{-8}$, and $3.96x10^{-6}$, respectively. The dose to the population within 80 km (50 mi) for Y-12, SRS, B&W, and NFS is 7.41, 7.41, 0.982, and 69.9 person-rem, respectively. The risk of cancer fatalities per campaign is $3.7x10^{-3}$, $3.7x10^{-3}$, $4.9x10^{-4}$, and $3.5x10^{-2}$, respectively.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Alternative 5: Maximum Commercial Use (85/15 Fuel/Waste Ratio)

Variation a) Two Department Of Energy Sites

Total Campaign[a] Site Infrastructure Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Characteristic	Y–12	SRS	Total
Electricity (MWh)	69,700	69,700	139,400
Diesel/oil (l)	886,000	1,293,000	2,179,000
Natural gas (m^3)	286,000	0[b]	286,000
Coal (t)	5,680	5,680	11,360
Steam (kg)	136,000	136,000	272,000

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore, liquid petroleum gas (approximately 407,000 l) would be substituted for a natural gas requirement of 286,000 m^3.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines ($\mu g/m^3$)	Y–12 ($\mu g/m^3$)	SRS ($\mu g/m^3$)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07
	1 hour	40,000[a]	53	0.14
Lead (Pb)	Calendar Quarter	1.5[a]	[b]	[b]
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01
	24 hours	150[a]	0.037	<0.01
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02
	24 hours	365[a]	29.3	0.32
	3 hours	1,300[a]	161	0.71

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	Y–12 (μg/m³)	SRS (μg/m³)
Mandated by South Carolina and Tennessee				
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05
	24 hours	150[c]	80.16	0.88[d]
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b
	1 week	1.6[c]	b	b
	24 hours	2.9[c]	b	b
	12 hours	3.7[c]	b	b
	8 hours	250[c]	b	b, d

[a] Federal standard.

[b] No lead emissions from any of the blending processes and no gaseous fluoride emissions from UNH and metal blending processes.

[c] State standard or guideline.

[d] No State standard.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y–12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Resource	Y–12	SRS	Total
Water (million l)	296	296	592
Wastewater (million l)[a]	291	291	582

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Characteristic	Y–12	SRS
Direct employment	125	125
Indirect employment	319	245
Total jobs	444	370
Unemployment rate change (percent)	-0.09	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS	Total
Involved Workers			
Total dose to involved workforce[a] (person-rem)	176	176	352
Risk (cancer fatalities per campaign)	7.05×10^{-2}	7.05×10^{-2}	0.141
Maximally Exposed Individual (Public)			
Dose to maximally exposed individual member of the public (mrem)	0.608	3.90×10^{-2}	NA[b]
Risk (cancer fatality per campaign)	3.04×10^{-7}	1.95×10^{-8}	NA[b]
Population Within 80 km			
Dose to population within 80 km[c] (person-rem)	2.5	2.5	5
Risk (cancer fatalities per campaign)	1.25×10^{-3}	1.25×10^{-3}	2.50×10^{-3}

[a] The involved workforce is 125 for UNH blending and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12 and 710,000 for SRS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)[a]

Receptor	Y–12	SRS
Campaign accident frequency[b]	8.5×10^{-4}	8.5×10^{-4}
Noninvolved Workers[c]		
Latent cancer fatalities per accident	0.4	8.7×10^{-2}
Risk (cancer fatalities per campaign)	4.0×10^{-4}	8.9×10^{-5}
Maximally Exposed Individual (Public)		
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}
Risk (cancer fatality per campaign)	5.1×10^{-7}	3.1×10^{-9}
Population Within 80 km[d]		
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}
Risk (cancer fatalities per campaign)	6.9×10^{-5}	1.6×10^{-5}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 85 t HEU to 4 percent as UNH fuel and 15 t HEU to 0.9-percent LEU as UNH waste at each site).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12 and 710,000 for SRS.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Chemical Exposure Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS
Maximally Exposed Individual (Public)		
Hazard index[a]	3.84×10^{-3}	4.26×10^{-4}
Cancer risk[b]	2.69×10^{-15}	2.99×10^{-16}
Onsite Worker		
Hazard index[c]	1.26×10^{-2}	1.13×10^{-2}
Cancer risk[d]	1.08×10^{-13}	9.66×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Waste Generation Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Waste Category[a]	Y–12	SRS	Total
Low-Level			
Liquid (m^3)	1,530	322	1,852
Solid (m^3)	3,260	1,140	4,400
Mixed Low-Level			
Liquid (m^3)	441	441	882
Solid (m^3)	0	0	0
Hazardous			
Liquid (m^3)	826	826	1,652
Solid (m^3)	0	0	0
Nonhazardous (Sanitary)			
Liquid (m^3)	281,000	281,000	561,000
Solid (m^3)	12,800	12,800	25,600
Nonhazardous (Other)			
Liquid (m^3)	12,000	12,000	24,000
Solid (m^3)	0	0	0
Solid Low-Level (m^3)[b]	2,120	654	2,774
Solid Nonhazardous (m^3)[b]	9,220	9,220	18,440
LEU Low-Level (m^3)[c]	2,930	2,900	5,830

[a] Waste volumes are based on the blending process that produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Transportation Risk Incremental Impacts Using Two Department of Energy Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS	Total
Accident-Free Operations			
Fatalities to the public from radiological effects	0.12	0.14	0.26
Fatalities to the crew from radiological effects	0.08	0.08	0.16
Fatalities to the public from nonradiological effects	1.1×10^{-2}	1.4×10^{-2}	2.5×10^{-2}
Accidents			
Fatalities to the public from radiological effects[a]	4.1×10^{-3}	4.7×10^{-3}	8.8×10^{-3}
Fatalities to the public from nonradiological effects	0.38	0.43	0.81
Fatalities to the crew from nonradiological effects	0.11	0.12	0.23
Total Fatalities	0.7	0.79	1.49

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Variation b) Two Commercial Sites

Total Campaign Site Infrastructure Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Characteristic	B&W	NFS	Total
Electricity (MWh)	248,000	248,000	496,000
Diesel/oil (l)	6,438,000	6,438,000	12,876,000
Natural gas (m^3)	322,000	322,000	644,000
Coal (t)	0[a]	0[a]	0
Steam (kg)	136,000	136,000	272,000

[a] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to a fuel oil energy equivalent. Fuel oil content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t. A coal requirement of 7,230 t equals 5,600,000 l of fuel oil.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Air Quality Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	B&W (μg/m³)	NFS (μg/m³)
Carbon monoxide (CO)	8 hours	10,000[a]	5.43	0.62
	1 hour	40,000[a]	17.63	0.8
Lead (Pb)	Calendar Quarter	1.5[a]	b	b
Nitrogen dioxide (NO_2)	Annual	100[a]	0.14	0.03
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01
	24 hours	150[a]	0.19	0.03
Sulfur dioxide (SO_2)	Annual	80[a]	0.4	0.05
	24 hours	365[a]	2.74	0.4
	3 hours	1,300[a]	14.11	0.96

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)—Continued

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (µg/m³)	B&W (µg/m³)	NFS (µg/m³)
Mandated by Tennessee and Virginia				
Total suspended particulates (TSP)	Annual	60[c]	0.03	<0.01[d]
	24 hours	150[c]	0.19	0.03
Gaseous fluorides (as HF)	1 month	1.2[c]	trace[d, e]	trace[e]
	1 week	1.6[c]	trace[d, e]	trace[e]
	24 hours	2.9[c]	trace[d, e]	trace[e]
	12 hours	3.7[c]	trace[d, e]	trace[e]
	8 hours	250[c]	trace[d, e]	trace[e]

[a] Federal standard.
[b] No emissions from UF_6 and UNH blending processes.
[c] State standard or guideline.
[d] No State standard.
[e] Hydrofluorination is anticipated to be a closed system with scrubber filter exhaust system. Therefore, emission of gaseous fluoride is estimated to be a trace amount.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites.
Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Resources	B&W	NFS	Total
Water (million l)	305	305	610
Wastewater (million l)[a]	295	295	590

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.
Source: Derived from tables in Section 4.3 of the EIS.

Maximum Socioeconomic Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Characteristic	B&W	NFS
Direct employment	126	126
Indirect employment	285	253
Total jobs	411	379
Unemployment rate change (percent)	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Normal Operations Radiological Exposure Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Receptor	B&W	NFS	Total
Involved Worker			
Total dose to involved workforce[a] (person-rem)	203	203	406
Risk (cancer fatalities per campaign)	$8.12x10^{-2}$	$8.12x10^{-2}$	0.162
Maximally Exposed Individual (Public)			
Dose to maximally exposed individual member of the public (mrem)	$4.32x10^{-2}$	3.12	NA[b]
Risk (cancer fatality per campaign)	$2.16x10^{-8}$	$1.56x10^{-6}$	NA[b]
Population Within 80 km			
Dose to population within 80 km[c] (person-rem)	0.393	28.1	28.5
Risk (cancer fatalities per campaign)	$1.97x10^{-4}$	$1.41x10^{-2}$	$1.43x10^{-2}$

[a] The involved workforce is 125 for UNH blending and 126 for UF_6 blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 730,000 for B&W and 1,260,000 for NFS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts for Two Commercial Sites (170 t to fuel and 30 t to waste)[a]

Receptor	B&W	NFS
Campaign accident frequency[b]	$8.5x10^{-4}$	$8.5x10^{-4}$
Noninvolved Workers[c]		
Latent cancer fatalities per accident	30	2.5
Risk (cancer fatalities per campaign)	$2.6x10^{-2}$	$2.2x10^{-3}$
Maximally Exposed Individual (Public)		
Latent cancer fatality per accident	$1.9x10^{-2}$	$3.0x10^{-3}$
Risk (cancer fatality per campaign)	$1.7x10^{-5}$	$2.7x10^{-6}$
Population Within 80 km[d]		
Latent cancer fatalities per accident	1	1.4
Risk (cancer fatalities per campaign)	$8.9x10^{-4}$	$1.2x10^{-3}$

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 85 t HEU to 4 percent as UF_6 fuel and 15 t HEU to 0.9-percent LEU as UNH waste at each site).

[b] Values shown represent probability for the life of campaign and are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 730,000 for B&W and 1,260,000 for NFS.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Chemical Exposure Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Receptor	B&W	NFS
Maximally Exposed Individual (Public)		
Hazard index[a]	1.38×10^{-5}	2.02×10^{-2}
Cancer risk[b]	9.70×10^{-18}	1.41×10^{-14}
Onsite Worker		
Hazard index[c]	4.68×10^{-3}	6.42×10^{-3}
Cancer risk[d]	4.03×10^{-14}	5.51×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Waste Generation Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Waste Category[a]	B&W	NFS	Total
Low-Level			
Liquid (m^3)	551	551	1,102
Solid (m^3)	1,720	1,720	3,440
Mixed Low-Level			
Liquid (m^3)	1,400	1,400	2,800
Solid (m^3)	0	0	0
Hazardous			
Liquid (m^3)	826	826	1,652
Solid (m^3)	0	0	0
Nonhazardous (Sanitary)			
Liquid (m^3)	281,000	281,000	562,000
Solid (m^3)	12,800	12,800	25,600
Nonhazardous (Other)			
Liquid (m^3)	15,200	15,200	30,400
Solid (m^3)	9	9	18
Solid Low-Level (m^3)[b]	1,020	1,020	2,040
Solid Nonhazardous (m^3)[b]	9,220	9,220	18,440
LEU Low-Level (m^3)[c]	2,900	2,900	5,800

[a] Waste volumes are based on the blending process that produces the highest volume for each category.

[b] Process waste after treatment.

[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Transportation Risk Incremental Impacts Using Two Commercial Sites (170 t to fuel and 30 t to waste)

Receptor	B&W	NFS	Total
Accident-Free Operations			
Fatalities to the public from radiological effects	0.14	0.13	0.27
Fatalities to the crew from radiological effects	0.08	0.08	0.16
Fatalities to the public from nonradiological effects	$1.5x10^{-2}$	$1.2x10^{-2}$	$2.7x10^{-2}$
Accidents			
Fatalities to the public from radiological effects[a]	$4.8x10^{-3}$	$4.4x10^{-3}$	$9.2x10^{-3}$
Fatalities to the public from nonradiological effects	0.43	0.41	0.84
Fatalities to the crew from nonradiological effects	0.12	0.11	0.23
Total Fatalities	0.79	0.75	1.54

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.

Source: Derived from tables in Appendix G of the EIS.

Variation c) All Four Sites

Total Campaign[a] Site Infrastructure Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Characteristic	Y–12	SRS	B&W	NFS	Total
Electricity (MWh)	35,200	35,200	125,500	125,500	321,400
Diesel/oil (l)	449,000	655,000	3,259,000	3,259,000	7,622,000
Natural gas (m^3)	143,000	0[b]	161,000	161,000	465,000
Coal (t)	2,840	2,840	0[c]	0[c]	5,680
Steam (kg)	68,000	68,000	68,000	68,000	272,000

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Annual values are presented in Section 2.2.2.

[b] Natural gas is not available at SRS; therefore, liquid petroleum gas (approximately 204,000 l) would be substituted for a natural gas requirement of 143,000 m^3.

[c] Fuel oil is considered the primary fuel at B&W and NFS; therefore, blending facility coal requirements have been converted to fuel oil energy equivalent. Fuel oil energy content is assumed to be 40,128 BTUs/l, and the coal energy content is assumed to be 30.9 million BTUs/t. A coal requirement of 3,610 t equals 2,800,000 l of fuel oil.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Air Quality Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Pollutant	Averaging Time	Most Stringent Regulation or Guidelines (μg/m³)	Y–12 (μg/m³)	SRS (μg/m³)	B&W (μg/m³)	NFS (μg/m³)
Carbon monoxide (CO)	8 hours	10,000[a]	11.5	0.07	5.43	0.62
	1 hour	40,000[a]	53	0.14	17.63	0.8
Lead (Pb)	Calendar Quarter	1.5[a]	b	b	b	b
Nitrogen dioxide (NO_2)	Annual	100[a]	1.33	0.01	0.14	0.03
Particulate matter (PM_{10})	Annual	50[a]	0.03	<0.01	0.03	<0.01
	24 hours	150[a]	0.37	<0.01	0.19	0.03
Sulfur dioxide (SO_2)	Annual	80[a]	2.46	0.02	0.4	0.05
	24 hours	365[a]	29.3	0.32	2.74	0.4
	3 hours	1,300[a]	161	0.71	14.11	0.96
Mandated by South Carolina, Tennessee, and Virginia						
Total suspended particulates (TSP)	Annual	60[c]	6.74[d]	0.05	0.03	<0.01[d]
	24 hours	150[c]	80.16	0.88[d]	0.19	0.03
Gaseous fluorides (as HF)	1 month	0.8[c]	b	b	trace[d, e]	trace[e]
	1 week	1.6[c]	b	b	trace[d, e]	trace[e]
	24 hours	2.9[c]	b	b	trace[d, e]	trace[e]
	12 hours	3.7[c]	b	b	trace[d, e]	trace[e]
	8 hours	250[c]	b	b, d	trace[d, e]	trace[e]

[a] Federal standard.

[b] No lead emissions from any of the blending processes and no gaseous fluoride emissions from UNH and metal blending processes.

[c] State standard or guideline.

[d] No State standard.

[e] Hydrofluorination is anticipated to be a closed system with scrubber filter exhaust system. Therefore, emission of gaseous fluorides is estimated to be a trace amount.

Note: Ozone, as a criteria pollutant, is not directly emitted or monitored by the candidate sites. Pollutant concentrations shown for Y–12 include other ORR operations.

Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Water Resources Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Resource	Y–12	SRS	B&W	NFS	Total
Water (million l)	150	150	154	154	608
Wastewater (million l)[a]	148	148	149	149	594

[a] Includes sanitary and nonhazardous, nonradioactive (other) liquid discharges after treatment.

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Socioeconomic Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Characteristic	Y–12	SRS	B&W	NFS
Direct employment	125	125	126	126
Indirect employment	319	245	285	253
Total jobs	444	370	411	379
Unemployment rate change (percent)	-0.09	-0.14	-0.12	-0.14

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Normal Operations Radiological Exposure Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Involved Worker					
Total dose to involved workforce[a] (person-rem)	89	89	103	103	384
Risk (cancer fatalities per campaign)	3.56×10^{-2}	3.56×10^{-2}	4.12×10^{-2}	4.12×10^{-2}	0.154
Maximally Exposed Individual Public					
Dose to maximally exposed individual member of the public (mrem)	0.308	1.98×10^{-2}	2.19×10^{-2}	1.58	NA[b]
Risk (cancer fatality per campaign)	1.54×10^{-7}	9.90×10^{-9}	1.10×10^{-8}	7.90×10^{-7}	NA[b]
Population Within 80 km					
Dose to population within 80 km[c] (person-rem)	1.26	1.26	0.199	14.2	16.9
Risk (cancer fatalities per campaign)	6.30×10^{-4}	6.30×10^{-4}	9.95×10^{-5}	7.10×10^{-3}	8.45×10^{-3}

[a] The involved workforce is 125 for UNH blending, 126 for UF_6 blending, and 72 for metal blending.

[b] The dose and the latent cancer fatality for the maximally exposed individual cannot be totaled because they are based on maximum exposure to an individual at each site using site-specific information.

[c] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Note: NA=not applicable.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Facility Accidents Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)[a]

Receptor	Y–12	SRS	B&W	NFS
Campaign accident frequency[b]	4.3×10^{-4}	4.3×10^{-4}	4.3×10^{-4}	4.3×10^{-4}
Noninvolved Workers[c]				
Latent cancer fatalities per accident	0.4	8.7×10^{-2}	30	2.5
Risk (cancer fatalities per campaign)	2.0×10^{-4}	4.4×10^{-5}	1.3×10^{-2}	1.1×10^{-3}
Maximally Exposed Individual Public				
Latent cancer fatality per accident	5.0×10^{-4}	3.1×10^{-6}	1.9×10^{-2}	3.0×10^{-3}
Risk (cancer fatality per campaign)	2.6×10^{-7}	1.6×10^{-9}	8.4×10^{-6}	1.4×10^{-6}

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Maximum Facility Accidents Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)[a]—Continued

Receptor	Y–12	SRS	B&W	NFS
Population Within 80 km[d]				
Latent cancer fatalities per accident	6.9×10^{-2}	1.6×10^{-2}	1	1.4
Risk (cancer fatalities per campaign)	3.5×10^{-5}	8.2×10^{-6}	4.5×10^{-4}	6.3×10^{-4}

[a] The risk values for this alternative are based on the most conservative combination of the options within the alternative (that is, blending 42.5 t HEU to 4-percent LEU as UNH fuel and 7.5 t HEU to 0.9-percent LEU as UNH waste at Y–12 and SRS, and 42.5 t HEU to 4-percent LEU as UF_6 fuel and 7.5 t HEU to 0.9-percent LEU as UNH waste at B&W and NFS).

[b] Values shown represent probability for the life of campaign which are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[c] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[d] The population within 80 km (50 mi) in the year 2010 is 1,040,000 for Y–12; 710,000 for SRS; 730,000 for B&W; and 1,260,000 for NFS.

Source: Derived from tables in Section 4.3 of the EIS.

Maximum Chemical Exposure Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS	B&W	NFS
Maximally Exposed Individual (Public)				
Hazard index[a]	1.92×10^{-3}	2.13×10^{-4}	6.90×10^{-6}	1.01×10^{-2}
Cancer risk[b]	6.84×10^{-16}	7.63×10^{-17}	2.47×10^{-18}	3.60×10^{-15}
Onsite Worker				
Hazard index[c]	6.30×10^{-3}	5.65×10^{-3}	2.34×10^{-3}	3.21×10^{-3}
Cancer risk[d]	2.71×10^{-14}	2.44×10^{-14}	1.02×10^{-14}	1.39×10^{-14}

[Text deleted.]

[a] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for maximally exposed individual.

[b] Lifetime cancer risk=(emissions concentrations) x (0.286 [converts concentrations to doses]) x (slope factor).

[Text deleted.]

[c] Hazard index=sum of individual hazard quotients (noncancer adverse health effects) for workers.

[d] Lifetime cancer risk=(emissions for 8-hr) x (0.286 [converts concentrations to doses]) x (0.237 [fraction of year exposed]) x (0.571 [fraction of lifetime working]) x (slope factor).

Source: Derived from tables in Section 4.3 of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Total Campaign Waste Generation Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Waste Category[a]	Y–12	SRS	B&W	NFS	Total
Low-Level					
Liquid (m^3)	767	163	279	279	1,488
Solid (m^3)	1,640	575	872	872	3,959
Mixed Low-Level					
Liquid (m^3)	223	223	709	709	1,864
Solid (m^3)	0	0	0	0	0
Hazardous					
Liquid (m^3)	418	418	418	418	1,672
Solid (m^3)	0	0	0	0	0
Nonhazardous (Sanitary)					
Liquid (m^3)	142,000	142,000	142,000	142,000	568,000
Solid (m^3)	6,480	6,480	6,480	6,480	25,920
Nonhazardous (Other)					
Liquid (m^3)	6,060	6,060	7,710	7,710	27,540
Solid (m^3)	0	0	4	4	8
Solid Low-Level (m^3)[b]	1,060	331	516	516	2,423
Solid Nonhazardous (m^3)[b]	4,670	4,670	4,670	4,670	18,680
LEU Low-Level (m^3)[c]	1,470	1,470	1,470	1,470	5,880

[a] Waste volumes are based on the blending process that produces the highest volume for each category.
[b] Process waste after treatment.
[c] End product waste as a result of blending. Includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified), which potentially could be disposed of as high-level waste.
Source: Derived from tables in Section 4.3 of the EIS.

Total Campaign Transportation Risk Incremental Impacts Using All Four Sites (170 t to fuel and 30 t to waste)

Receptor	Y–12	SRS	B&W	NFS	Total
Accident-Free Operations					
Fatalities to the public from radiological effects	0.06	0.07	0.07	0.06	0.26
Fatalities to the crew from radiological effects	0.04	0.04	0.05	0.05	0.16
Fatalities to the public from nonradiological effects	5.7×10^{-3}	6.9×10^{-3}	7.4×10^{-3}	6.1×10^{-3}	2.6×10^{-2}
Accidents					
Fatalities to the public from radiological effects[a]	2.1×10^{-3}	2.4×10^{-3}	2.4×10^{-3}	2.2×10^{-3}	9.1×10^{-3}
Fatalities to the public from nonradiological effects	0.19	0.22	0.22	0.21	0.83
Fatalities to the crew from nonradiological effects	0.05	0.06	0.06	0.06	0.23
Total Fatalities	0.35	0.40	0.41	0.39	1.55

[a] The transportation crew and the public are considered as one population for the purposes of radiological accidents.
Source: Derived from tables in Appendix G of the EIS.

Table S–2. Summary Comparison of Maximum Incremental Impacts for Each Alternative and Candidate Site—Continued

Variation d) Single Site

The incremental impacts of blending all surplus HEU to LEU at a single DOE site are the same as either the total or maximum impacts presented in Variation a. Blending all at a single commercial site can be obtained from Variation b. The only exception is the normal operations dose and risk to the maximally exposed individual of the public and the population within 80 km (50 mi). The dose to the maximally exposed individual for Y–12, SRS, B&W, and NFS is 1.22, 0.078, 0.0864, and 6.24 mrem, respectively. The risk of cancer fatalities per campaign is $6.08x10^{-7}$, $3.9x10^{-8}$, $4.32x10^{-8}$, and $3.12x10^{-6}$, respectively. The dose to the population within 80 km (50 mi) for Y–12, SRS, B&W, and NFS is 5.01, 5.01, 0.787, and 56.3 person-rem, respectively. The risk of cancer fatalities per campaign are $2.5x10^{-3}$, $2.5x10^{-3}$, $3.9x10^{-4}$, and $2.8x10^{-2}$, respectively.

Table S–3. *Summary Comparison of Total Campaign[a] Incremental Environmental Impacts for the Disposition of Surplus Highly Enriched Uranium for Each Alternative*

	Alternative 2 No Commercial Use 0/100 Fuel/Waste	Alternative 3 Limited Commercial Use 25/75 Fuel/Waste	Alternative 4 Substantial Commercial Use 65/35 Fuel/Waste	Alternative 5 Maximum Commercial Use 85/15 Fuel/Waste
Site Infrastructure				
Electricity (MWh)	476,000	482,000	492,000	496,000
Diesel/oil (l)	19,384,000	16,961,000	17,426,000	12,876,000
Natural gas (m^3)	1,413,000	1,166,000	936,000	644,000
Coal (t)	17,280	12,960	16,820	11,360
Steam (kg)	828,000	665,000	403,200	272,000
Air Quality and Noise				
The impacts for all four alternatives would be negligible. UNH and metal blending would be used for Alternative 2 and UNH, UF_6 and metal blending would be used for Alternatives 3, 4, and 5 and give similar incremental annual emissions. The maximum incremental annual emissions for all four alternatives would be less than 1 percent of the NAAQS standard for all criteria pollutants.				
Water				
Water (million l)	1,808	1,460	894	610
Wastewater (million l)	1,784	1,440	870	590
Socioeconomics				
The impacts for all four alternatives would be negligible. For Alternative 2, the UNH blending process to 0.9-percent LEU waste gives the maximum impacts. For Alternative 2, the maximum direct employment for any of the four sites would be 125 employees and the indirect employment would range from 245 at SRS to 319 at Y–12. The unemployment changes for all four sites range from 0.09 percent to 0.14 percent. The only difference between Alternatives 3, 4, and 5 from Alternative 2 is that the maximum direct employment at B&W and NFS would be 126 since the UF_6 blending process could be used.				
Radiological Exposure				
Involved Workers				
Total dose to involved workforce (person-rem)	1,076	880	566	406
Risk (cancer fatalities per campaign)	0.43	0.352	0.226	0.162
Maximally Exposed Individual (Public)				
Dose to maximum exposed individual member of the public (mrem)	3.33	3.13	3.96	3.12
Risk (cancer fatality per campaign)	1.67×10^{-6}	1.57×10^{-6}	1.98×10^{-6}	1.56×10^{-6}

Table S–3. Summary Comparison of Total Campaign[a] Incremental Environmental Impacts for the Disposition of Surplus Highly Enriched Uranium for Each Alternative—Continued

	Alternative 2 No Commercial Use 0/100 Fuel/Waste	Alternative 3 Limited Commercial Use 25/75 Fuel/Waste	Alternative 4 Substantial Commercial Use 65/35 Fuel/Waste	Alternative 5 Maximum Commercial Use 85/15 Fuel/Waste
Population Within 80 km				
Dose to population within 80 km (person-rem)	36.6	33.3	35.5	28.5
Risk (cancer fatalities per campaign)	1.83×10^{-2}	1.67×10^{-2}	1.78×10^{-2}	1.43×10^{-2}
Facility Accidents[b]				
Campaign accident frequency[c]	2.4×10^{-3}	1.8×10^{-3}	1.7×10^{-3}	8.5×10^{-4}
Noninvolved Workers[d]				
Latent cancer fatalities per accident	0.94	30	30	30
Risk (cancer fatalities per campaign)	2.2×10^{-3}	9.2×10^{-3}	2.1×10^{-2}	2.6×10^{-2}
Maximally Exposed Individual (Public)				
Latent cancer fatality per accident	5.7×10^{-4}	1.9×10^{-2}	1.9×10^{-2}	1.9×10^{-2}
Risk (cancer fatality per campaign)	1.4×10^{-6}	5.8×10^{-6}	1.3×10^{-5}	1.7×10^{-5}
Population Within 80 km				
Latent cancer fatalities per accident	6.9×10^{-2}	1.4	1.4	1.4
Risk (cancer fatalities per campaign)	1.6×10^{-4}	4.6×10^{-4}	1.0×10^{-3}	1.2×10^{-3}
Chemical Exposure				
The impacts for all four alternatives would be negligible. For all four alternatives, the maximum incremental hazard index for the maximally exposed individual (public) is 2.02×10^{-2}, and for workers onsite it is 1.26×10^{-2}. These values are several orders of magnitude under 1.0, the regulatory health limit. The maximum incremental cancer risk for the maximally exposed individual (public) is 2.11×10^{-14}, and for workers onsite it is 1.08×10^{-13}. These values are below the regulatory limit of 1.0×10^{-6}. This represents an increase in cancer risk of 1 in 480 billion to the public and about 1 in a million to onsite workers.				
Waste Management				
Low-Level				
Liquid (m^3)	5,866	4,685	3,770	1,852
Solid (m^3)	13,700	11,130	8,300	4,400
Mixed Low-Level				
Liquid (m^3)	668	1,296	2,300	2,800
Solid (m^3)	0	0	0	0
Hazardous				
Liquid (m^3)	1,048	1,228	1,528	1,672
Solid (m^3)	0	0	0	0

Table S–3. Summary Comparison of Total Campaign[a] Incremental Environmental Impacts for the Disposition of Surplus Highly Enriched Uranium for Each Alternative—Continued

	Alternative 2 No Commercial Use 0/100 Fuel/Waste	Alternative 3 Limited Commercial Use 25/75 Fuel/Waste	Alternative 4 Substantial Commercial Use 65/35 Fuel/Waste	Alternative 5 Maximum Commercial Use 85/15 Fuel/Waste
Nonhazardous (Sanitary)				
Liquid (m^3)	1,712,000	1,378,000	836,000	568,000
Solid (m^3)	78,000	62,800	38,040	25,920
Nonhazardous (Other)				
Liquid (m^3)	72,800	60,400	40,600	30,400
Solid (m^3)	0	6	14	18
Solid Low-Level (m^3)[e]	8,453	6,802	5,297	2,774
Solid Nonhazardous (m^3)[e]	56,400	45,400	27,440	18,680
LEU Low-Level (m^3)[f]	39,010	29,340	13,720	5,900
Transportation Risk				
Accident-Free Operations				
Fatalities to the public from radiological effects	0.58	0.48	0.34	0.27
Fatalities to the crew from radiological effects	0.44	0.36	0.24	0.2
Fatalities to the public from nonradiological effects	$5.5x10^{-2}$	$4.6x10^{-2}$	$3.4x10^{-2}$	$2.7x10^{-2}$
Accidents				
Fatalities to the public from radiological effects[g]	$1.88x10^{-2}$	$1.6x10^{-2}$	$1.2x10^{-2}$	$9.2x10^{-3}$
Fatalities to the public from nonradiological effects	1.83	1.54	1.1	0.84
Fatalities to the crew from nonradiological effects	0.51	0.44	0.3	0.23
Total Fatalities	3.43	2.89	2.04	1.57

[a] Total campaign refers to the time required to complete blending disposition actions evaluated for Alternatives 2 through 5. Values shown represent total impacts over the life of campaign except for facility accidents for which maximum values are presented over the life of the campaign.

[b] Values shown for facility accidents represent maximum consequences that could possibly occur under each alternative.

[c] Values shown represent probability for the life of campaign which are calculated by multiplying annual frequency (10^{-4}) by the total number of years of operation.

[d] The noninvolved workers are workers on site but not associated with operations of the blending and conversion facilities. Involved workers, those that are near an accident, would likely be exposed to lethal doses of radiation, if such an accident were to occur.

[e] Process waste after treatment.

[f] End product waste as a result of blending includes irradiated fuel that is currently in the surplus HEU inventory (quantity is classified) which potentially could be disposed of as high-level waste.

[g] The transportation crew and the public are considered as one population for the purposes of radiological accidents.