



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—
August 28, 2002

received
9/4/02 ch

RECORD COPY

115

DISTRIBUTION LIST

Dear Stakeholder:

**NATIONAL ENVIRONMENTAL POLICY ACT ENVIRONMENTAL
ASSESSMENT FOR THE IMPLEMENTATION OF THE AUTHORIZED
LIMITS PROCESS FOR WASTE ACCEPTANCE AT THE C-746-U LANDFILL,
PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY**

Enclosed are copies of the subject document which were prepared by the Department of Energy (DOE) to comply with the requirements of the National Environmental Policy Act (NEPA). Based on the results of the Environmental Assessment analysis, DOE has determined that the proposed action does not constitute a major Federal action that would significantly affect the quality of the human environment. Therefore, preparation of an Environmental Impact Statement is not required, and DOE has issued a Finding of No Significant Impact for the proposed action.

If you have further questions about this action, please call me at (865) 576-0411.

Sincerely,

David R. Allen
NEPA Compliance Officer
Oak Ridge Operation Office

Enclosure

cc w/enclosure:

William E. Murphie, EM-30, FORS
Carol Borgstrom, EH-42, FORS
Walter Perry, M-4, ORO
Rachel H. Blumenfeld, CC-10, ORO
James L. Elmore, SE-30-1, ORO
Harvey Rice, EM-92, ORO
David Tidwel, EM-98 4 copies
DMC/Kevil

D-04300-0372



Letter from David R. Allen to Distribution

Subject: **NATIONAL ENVIRONMENTAL POLICY ACT ENVIRONMENTAL ASSESSMENT FOR THE IMPLEMENTATION OF THE AUTHORIZED LIMITS PROCESS FOR WASTE ACCEPTANCE AT THE C-746-U LANDFILL, PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY**

Distribution List:

Environmental Information Center
115 Memorial Drive
Paducah, KY 42001

Wayne L. Davis
Kentucky Department of Fish
and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601

Carl Froede Jr.
Remedial Project Manager
U.S. Environmental Protection Agency
Region 4
61 Forsythe Street
Atlanta, Georgia 30303

Tim Kreher
West Kentucky Wildlife Management Area
10535 Ogden Landing Road
Kevil, Kentucky 42053

McCracken County Public Library
555 Washington Street
Paducah, Kentucky 42001

Tuss Taylor
Kentucky Division for Waste Management
14 Reilly Road, Frankfort Office Park
Frankfort, Kentucky 40601

Eric Scott
Radiation Control Branch, Cabinet for
Human Resources
275 East Main Street, Mail Stop HS2E-D
Frankfort, Kentucky 40621

DOE/ORO Public Reading Room
475 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830

Bechtel Jacobs Company
Sam Leone, BJC
Gordon Dover, BJC
Steve Davis, BJC
Patrick Willison, BJC
Greg Cook, BJC
Kevil Document Center, BJC
Stan Knaus, BJC
SSAB Office, BJC

Stacey Young *9 copies for SSAB*
Public Affairs
Bechtel Jacobs Company
761 Veterans Ave.
Kevil, KY 42053

WESKEM
Dan Watson *4 copies*

received

9/4/02 ch

RECORD COPY DOE/EA-1414

**Final Environmental Assessment on the
Implementation of the Authorized Limits Process
for Waste Acceptance at the C-746-U Landfill
Paducah Gaseous Diffusion Plant
Paducah, Kentucky**

August 2002



U.S. Department of Energy
Oak Ridge Operations Office

D-04380-0312

FINDING OF NO SIGNIFICANT IMPACT

ENVIRONMENTAL ASSESSMENT ON THE IMPLEMENTATION OF THE AUTHORIZED LIMITS PROCESS FOR WASTE ACCEPTANCE CRITERIA AT THE C-746-U LANDFILL PADUCAH GASEOUS DIFFUSION PLANT PADUCAH, KENTUCKY

AGENCY: U.S. DEPARTMENT OF ENERGY

ACTION: FINDING OF NO SIGNIFICANT IMPACT

SUMMARY: The U.S. Department of Energy (DOE) has completed an environmental assessment (DOE/EA-1414) for the proposed implementation of the authorized limits process for waste acceptance at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky. Based on the results of the impact analysis reported in the EA, which is incorporated herein by this reference, DOE has determined that the proposed action is not a major Federal action that would significantly affect the quality of the human environment within the context of the *National Environmental Policy Act* of 1969 (NEPA). Therefore, preparation of an environmental impact statement is not necessary, and DOE is issuing this Finding of No Significant Impact (FONSI).

PUBLIC AVAILABILITY OF EA AND FONSI: The EA and FONSI may be reviewed at and copies of the document obtained from either of the following locations:

U.S. Department of Energy's
Public Reading Room
230 Warehouse Road
Oak Ridge, Tennessee 37830
Phone: (865) 241-4780

U.S. Department of Energy's
Environmental Information Center
115 Memorial Drive
Paducah, Kentucky 42001
Phone: (270) 462-2550

FURTHER INFORMATION ON THE NEPA PROCESS: For further information on the NEPA process, contact:

David R. Allen
NEPA Compliance Officer
U.S. Department of Energy
P.O. Box 2001
Oak Ridge, Tennessee 37831
Phone: (865) 576-0411

BACKGROUND: DOE plans to implement the authorized limits process for determining the acceptability of waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Certain authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE control, consistent with radiation protection standards for general employees, members of the public, and the environment. DOE Order 5400.5 also provides guidelines for determining authorized limits for waste streams that are not addressed by the

numeric authorized limits contained in DOE Order 5400.5.¹ Authorized limits determinations would be made in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific. Waste streams containing residual radioactive materials below approved authorized limits would not require radiological control under the *Atomic Energy Act* (AEA) and would not be considered radioactive waste. DOE prepared an environmental assessment (EA) to assess potential environmental impacts of the project in accordance with NEPA.

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated either as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. Waste streams that may be accepted for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, certain remediation waste, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

Proposed Action. The proposed action is to implement the authorized limits process per DOE Order 5400.5 to determine the acceptability of waste streams containing residual radioactive materials in mass or volume for disposal at the C-746-U Landfill on a waste stream-specific basis. These limits would be developed on a waste stream-specific basis and formally approved in accordance with the requirements of DOE Order 5400.5 (or successor documents) and associated guidance. Waste streams containing residual amounts of surface radioactivity would be accepted for disposal if below the generic authorized limits enumerated in DOE Order 5400.5 (Table IV-1). Any other authorized limits for surface radioactivity, as well as authorized limits for all volumetric radioactivity, would have to be formally evaluated and approved by DOE on a waste stream-specific basis in accordance with DOE Order 5400.5 requirements. The waste acceptance criteria for the landfill would be revised to specify that the authorized limits process must be used where appropriate to determine and document the acceptability of waste for disposal. As before, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted. The only offsite waste that would be accepted for disposal in the C-746-U Landfill would be waste generated as a direct result of PGDP operations and activities (e.g., concrete rubble from waste area grouping 17).

The cognizant DOE field office (i.e. Oak Ridge Operations Office) has chosen to use a 1 mrem/year dose level constraint in developing authorized limits for any wastes to be disposed of at the C-746-U Landfill. Approval of authorized limits for waste streams to be disposed of at the C-746-U Landfill would be based on a dose assessment to (1) demonstrate that the levels of residual radioactive materials in a given waste stream would satisfy criteria specified in DOE Order 5400.5 and associated guidance as well as to (2) satisfy the DOE dose level constraint of 1 mrem/year EDE to the public for the C-746-U Landfill.²

¹ Throughout this EA, references to DOE Order 5400.5 also refer to any documents that might later succeed and, or, supplement DOE Order 5400.5 as it pertains to determinations regarding disposal of materials containing residual levels of radioactivity.

² The potential acceptance of a waste stream that results in a calculated dose estimate greater than 1 mrem/yr is not reasonably anticipated at this time. However, if such a situation should arise, DOE would initiate additional NEPA review, as appropriate, in the course of reviewing each waste stream for acceptability at the C-746-U Landfill.

The dose assessment would evaluate the potential dose to both workers and the public under current and potential future scenarios. Each analysis would be modeled for specific waste streams at the landfill using conservative assumptions to estimate the potential doses. Only those waste streams estimated to result in doses of 1 mrem/year EDE or less would be eligible for disposal at the landfill.

ALTERNATIVE: In addition to the proposed action, impacts were also evaluated for the no action alternative. In the no action alternative, DOE would continue to operate the C-746-U Landfill for disposal of wastes containing no residual radioactive materials distinguishable from background. Wastes containing, or suspected of containing, residual radioactive material would not be allowed for disposal unless:

- The wastes were surveyed; and
- There was reasonable assurance that residual radioactive material was not detectable in the waste (i.e., residual radioactivity was indistinguishable from background based upon measurements using appropriate, commercially available technology and a comparison with radioactivity levels of similar non-impacted materials).

The authorized limits process would not be used to determine acceptability of waste streams containing residual amounts of radioactivity at the landfill, and no such waste streams would be disposed of at the landfill. Waste generators would retain responsibility for proper management and disposition of the waste at alternate facilities. Waste streams accepted for disposal at the landfill would also have to meet all other WAC for the landfill. As in the past, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted. The only offsite waste that would be accepted for disposal in the C-746-U Landfill would be waste generated as a direct result of PGDP operations and activities.

ENVIRONMENTAL CONSEQUENCES: The impact analysis in the EA addressed the potential effects to workers, the public, biota, water quality and air quality resulting from radiological exposures; the potential for radiological releases to surface water and groundwater and air; and potential indirect effects related to cost-effectiveness of landfill operations.

No potential effects to several resources or areas would be anticipated as a result of implementing either alternative in the assessment. Climate, topography, geology, soils, seismicity, floodplain, wetlands, and cultural resources would not be affected because the alternatives do not involve excavation or construction activities or disturb previously undisturbed areas. Noise levels and transportation would not be affected because use of heavy equipment and truck traffic are already a part of operations at the landfill and on surrounding roadways. Similarly, area demographics and socioeconomics would not be affected as the action would occur at an existing facility. No disproportionate effects to environmental justice populations would be anticipated because no disadvantaged population aggregates have been identified in the area around the landfill.

ENVIRONMENTAL CONSEQUENCES RESULTING FROM ALTERNATIVE 1 - NO ACTION

Radiological Consequences under Alternative 1 - No Action. Under Alternative 1, no wastes containing above-background levels of residual radioactive materials would be disposed at the C-746-U Landfill. Accordingly, radiation doses to facility workers or the public would not be associated with the operation of the landfill, but would come only from background sources. Similarly, there would be no potential effects to biota, water quality, or air quality from exposure to radioactivity as a direct result of implementing Alternative 1 - No Action because no exposures in excess of background levels would occur. Results of a sitewide monitoring program are published annually, and potential radiological doses to the public and to biota are estimated in that annual report.

Other Environmental Consequences under Alternative 1 - No Action. Under Alternative 1, continued operation of the C-746-U Landfill might be determined not to be cost effective. As a result, all wastes generated at the Paducah Site (i.e., both wastes containing low levels of residual radioactive materials as well as wastes containing levels indistinguishable from background) would require alternate disposal. These wastes would have to be stored and managed pending development and approval of an appropriate disposition strategy. If waste generated at the Paducah Site that would otherwise be eligible for disposal at the C-746-U Landfill required offsite disposal, higher costs would be incurred for management and disposition of both waste streams containing radioactivity levels indistinguishable from background and waste streams containing small amounts of residual radioactivity.

ENVIRONMENTAL CONSEQUENCES RESULTING FROM ALTERNATIVE 2 - IMPLEMENT AUTHORIZED LIMITS

Radiological Consequences under Alternative 2 - Implement Authorized Limits Process. Potential radiological doses to workers involved in the active management and disposal of the proposed waste stream, to hypothetical future workers at the facility following closure, and to other potential future occupants, as well as to the offsite public would be individual doses less than 1 mrem/year and collective doses below 10 person-rem. The NCRP has identified a dose of 1 mrem/year as a "negligible" level of exposure to radioactivity (NCRP 1993). This means that the estimated risks from doses less than 1 mrem/year of radioactivity from a given source are so small that they would be difficult to differentiate from the risks from other exposure sources. Potential radiological effects to biota, water quality, or air quality would not be anticipated during routine operations because normal landfill operating procedures provide for dust suppression so any airborne release of material would be minimized, and the liner and leachate collection systems prevent releases to surface and groundwater. Results of a sitewide monitoring program are published annually, and potential radiological doses to the public and to biota are estimated in that annual report.

Other Environmental Consequences under Alternative 2 - Implement Authorized Limits Process. No environmental consequences, other than the potential for radiological exposures as discussed under the Radiological Consequences section above, have been identified under Alternative 2 - Implement Authorized Limits Process.

ENVIRONMENTAL CONSEQUENCES FROM NON-ROUTINE OPERATIONS - ACCIDENT SCENARIO: The integrity of the composite liner system could be damaged as a result of a seismic or other type of catastrophic event. In such a case, the potential for migration into the environment could be increased. Although the physical characteristics of the waste in the landfill (e.g., soils, construction debris) would generally preclude rapid release and transport of contaminants into environmental media, the dose assessment conducted for each potential waste stream considered for disposal at the C-746-U Landfill would include an analysis where containment of the disposed waste may be lost (e.g., the cover system and/or liner system may be breached). Authorized limits resulting from this analysis would be protective of ecological receptors as well as human receptors. Results of this analysis would provide an upper bound on the potential impacts from a hypothetical seismic accident, and authorized limits would be approved only if no unacceptable impacts would be anticipated in the event of an accidental release.

CUMULATIVE IMPACTS: The EA considers the potential cumulative radiological impact of the proposed action and the potential cumulative impact of CERCLA-derived materials in conjunction with other PGDP activities. Other potential actions that could result in exposures to radioactivity at the Paducah Site include: continuing uranium enrichment operations; disposal of radioactive waste in a potential CERCLA disposal facility; and the presence of residual radioactivity below clean-up levels that will be established for contaminated media such as soil and buildings. The potential cumulative radiological impacts from the

proposed action and the no action alternative are estimated to be similar [i.e., in both cases, the potential radiation dose to the public attributable to the operation of the C-746-U Landfill would be a negligible fraction (less than 0.3 percent) of that from background sources of radiation exposure]. Since either Alternative 1 or Alternative 2 would result in negligible levels of exposure to radioactivity, the cumulative effects would be difficult to differentiate from the risks due to other exposure sources. Accordingly, neither alternative would result in unacceptable cumulative effect to humans, biota, water quality or air quality.

DETERMINATION: Based on the findings of this EA, DOE has determined that the proposed implementation of the authorized limits process for waste acceptance at the C-746-U Landfill at the PGDP in Paducah, Kentucky does not constitute a major Federal action that would significantly affect the quality of the human environment within the context of the NEPA. Therefore, preparation of an environmental impact statement is not required.

Issued at Oak Ridge, Tennessee, this 6th day of August 2002.

M. Holland

Michael D. Holland
Acting Manager
U.S. Department of Energy
Oak Ridge Operations
Oak Ridge, Tennessee

DOE/EA-1414

**Final Environmental Assessment on the
Implementation of the Authorized Limits Process
for Waste Acceptance at the C-746-U Landfill
Paducah Gaseous Diffusion Plant
Paducah, Kentucky**

August 2002

TABLE OF CONTENTS

CHAPTER 1.0 INTRODUCTION	1
1.1 Overview of DOE Order 5400.5 and Authorized Limits	1
1.2 Landfill Background	1
1.3 Previous NEPA Documentation and the Scope of this Assessment	2
1.4 Purpose and Need	3
CHAPTER 2.0 DESCRIPTION OF THE ALTERNATIVES	4
2.1 Alternative 1 - No Action	4
2.2 Alternative 2 - Implement Authorized Limits Process	4
2.2.1 Requirements of DOE Order 5400.5	5
2.2.2 Authorized Limits Process	6
2.2.3 Waste Acceptance Procedures	8
CHAPTER 3.0 AFFECTED ENVIRONMENT	9
3.1 Operational History of the C-746-U Landfill	9
3.2 Land Use	11
3.3 Climate and Topography	11
3.4 Earth Resources	12
3.4.1 Geology	12
3.4.2 Soils	12
3.4.3 Seismicity	13
3.5 Water Resources	13
3.5.1 Surface Water	13
3.5.2 Groundwater	14
3.5.3 Floodplain	15
3.5.4 Wetlands	15
3.6 Air Quality and Noise	15
3.6.1 Air Quality	15
3.6.2 Noise	15
3.7 Biological Resources	16
3.7.1 Vegetation	16
3.7.2 Wildlife	16
3.7.3 Threatened and Endangered Species	17
3.8 Cultural Resources	17
3.9 Social and Economic Conditions	17
3.9.1 Demography	17
3.9.2 Economic Activities	17
3.9.3 Environmental Justice	18
3.9.4 Transportation	18
CHAPTER 4.0 ENVIRONMENTAL CONSEQUENCES	19
4.1 Potential Environmental Consequences of Alternative 1 - No Action	20
4.1.1 Radiological Consequences under Alternative 1	20
4.1.2 Other Environmental Consequences under Alternative 1	20

4.2	Potential Environmental Consequences of Alternative 2 - Implement Authorized Limits Process	21
4.2.1	Radiological Consequences under Alternative 2	22
4.2.2	Other Environmental Consequences under Alternative 2	23
4.3	Environmental Consequences from Non-Routine Operations - Accident Scenario	23
CHAPTER 5.0 CUMULATIVE IMPACTS		25
CHAPTER 6.0 REFERENCES		28
CHAPTER 7.0 LIST OF AGENCIES AND PERSONS CONTACTED		31
CHAPTER 8.0 GLOSSARY		33
APPENDIX A CONSULTATIONS AND BIOLOGICAL ASSESSMENT		
APPENDIX B STAKEHOLDER COMMENTS AND DOE RESPONSES		

FIGURES

Figure 3-1	Map of Paducah Gaseous Diffusion Plant, Major Boundaries and Features	10
------------	---	----

TABLES

Table 3.4-1	Background Levels of Radionuclides in Soils and Deep Geologic Media in the Vicinity of the Paducah Gaseous Diffusion Plant	13
-------------	---	----

ACRONYMS

AEA	<i>Atomic Energy Act</i>
ALARA	as low as reasonably achievable
CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act</i>
CEQ	Council on Environmental Quality
CFR	<i>Code of Federal Regulations</i>
DOE	U.S. Department of Energy
DWM	Division of Waste Management
EA	environmental assessment
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ICRP	International Council on Radiation Protection
KAR	Kentucky Administrative Regulations
KDAQ	Kentucky Division for Air Quality
KDEP	Kentucky Department of Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KSNPCK	Kentucky State Nature Preserves Commission
LCD	Lower Continental Deposits
M&I	management and integration
MSL	mean sea level
MSWL	municipal solid waste landfills
NEPA	<i>National Environmental Policy Act</i>
NMSZ	New Madrid Seismic Zone
NORM	naturally occurring radioactive materials
NOV	Notice of Violation
NPL	National Priorities List
NRC	Nuclear Regulatory Committee
NCRP	National Council on Radiation Protection and Measurement
ORO	Oak Ridge Operations Office
PGDP	Paducah Gaseous Diffusion Plant
RCRA	<i>Resource Conservation and Recovery Act</i>
RGA	Regional Gravel Aquifer
SHPO	State Historic Preservation Office
TLD	thermo-luminescent dosimetry
TSCA	<i>Toxic Substances Control Act</i>
TVA	Tennessee Valley Authority
UCD	Upper Continental Deposits
USEC	United States Enrichment Corporation
WAC	Waste Acceptance Criteria
WKWMA	West Kentucky Wildlife Management Area

CHAPTER 1.0 INTRODUCTION

The U.S. Department of Energy (DOE) Oak Ridge Operations Office (ORO) is evaluating implementation of DOE requirements pertaining to authorized limits¹ for materials that contain residual radioactivity at the C-746-U Landfill, an existing, sanitary/industrial landfill, at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky. DOE proposes to implement the authorized limits process for determining the acceptability of waste containing low levels of residual radioactive material for disposal at the C-746-U Landfill. The purpose of evaluating and following the authorized limits process for waste containing residual radioactive materials is to comply with DOE Order 5400.5 and current, associated guidance and to resume normal operations at the landfill. Wastes containing residual radioactive materials below approved authorized limits would not require radiological control under the *Atomic Energy Act* (AEA) and would not be considered radioactive waste. DOE is preparing this environmental assessment (EA) to evaluate potential environmental impacts in accordance with the *National Environmental Policy Act* (NEPA) of 1969 and to ensure that stakeholders have ample opportunity to be informed and participate in DOE's decision-making processes.

1.1 OVERVIEW OF DOE ORDER 5400.5 AND AUTHORIZED LIMITS

DOE Order 5400.5, *Radiation Protection of the Public and the Environment*, became effective on February 8, 1990 and was last amended on January 7, 1993. The purpose of the order is to "...establish standards and requirements for operation of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation." DOE Order 5400.5 was created to replace Chapter XI of DOE Order 5480.1A, *Environmental Protection, Safety, and Health Program for DOE Operations*. The authorized limits discussed in this EA are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE control, consistent with radiation protection standards for general employees, members of the public, and the environment. Material is not considered "radioactive waste" for the purposes of AEA regulation if it contains residual radioactivity below authorized limits.

1.2 LANDFILL BACKGROUND

The C-746-U Landfill was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). Construction of the landfill was needed to continue on-site disposal of certain waste generated at the PGDP after an older landfill at the PGDP was filled to capacity and closed in accordance with Commonwealth requirements. The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations and Subtitle D of RCRA. The landfill is lined, has a leachate collection system, and will have a multi-layer cap when closed. Additional information on landfill history and specifications is provided in Section 3.0 of this EA.

Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site which include soils, wood, concrete, roofing and construction debris, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The facility is not approved for disposal of RCRA-hazardous, TSCA-

¹ The term "authorized limits" is discussed in Sections 1.1 and 2.2 and is in Chapter 8 Glossary.

regulated, or radioactive waste. DOE regulates radioactive waste under DOE Order 435.1 and sends radioactive waste and mixed waste generated at Paducah to appropriate facilities such as the DOE Nevada Test Site, the DOE Hanford Reservation, and the commercial Envirocare of Utah facility.

Some waste streams that were disposed of at the C-746-U Landfill between 1997 and 1999 contained small quantities of residual radioactive materials resulting from either incidental contamination or the presence of naturally occurring radioactive materials. DOE accepted such waste for disposal at the landfill on a case-by-case basis using the generic, authorized limits for surface-contaminated materials from DOE Order 5400.5 and a waste acceptance criteria (WAC) limit of 30 picocurie per gram (pCi/g) total uranium for residual radioactivity in volumetrically-contaminated material. This WAC of 30 pCi/g total uranium was based on a reviewed and published study (Lee et al. 1995). The study was shared and discussed with the Commonwealth of Kentucky regulators (KDEP 1995). Waste characterization packages required by C-746-U Landfill operating procedures for each waste stream were submitted to the Kentucky Division of Waste Management (DWM) for review prior to waste acceptance in a manner similar to that used for special waste. Waste that was accepted at the C-746-U Landfill would also have been potentially eligible for disposal at permitted offsite commercial or municipal solid waste landfills. The acceptance of any waste containing residual amounts of radioactivity was suspended in November 1999, pending resolution of an observation made in a Phase I Investigation Report by the DOE Office of Oversight (DOE 1999).²

Operation of the C-746-U facility is regulated by DOE under the authority of the AEA and the Commonwealth of Kentucky under authority delegated by the U.S. Environmental Protection Agency (EPA) to enforce implementing regulations for RCRA through provisions in regulations for solid waste landfills by the Commonwealth of Kentucky [including, but not limited to, Chapter 224 of Kentucky Revised Statutes (KRS), *Environmental Protection*, and applicable Chapters of Kentucky Administrative Regulations (KAR) Title 401 (e.g., Chapter 30, *Waste Management - General Administrative Procedures*, Chapter 47, *Solid Waste Facilities*, Chapter 48, *Standards for Solid Waste Facilities*, and Chapter 49, *Solid Waste Planning*)]. Under the AEA, DOE has the responsibility and authority to establish radiological limits for protection of the public and the environment, either in the form of release criteria for off-site disposition of waste it generates or for WAC for disposal of materials in a DOE-owned onsite landfill.

1.3 PREVIOUS NEPA DOCUMENTATION AND SCOPE OF THIS ASSESSMENT

As a Federal agency, DOE must comply with NEPA by considering potential environmental impacts associated with proposed actions in the decision-making process. The Council on Environmental Quality (CEQ) promulgated regulations to implement NEPA (40 *Code of Federal Regulations* [CFR] 1500 et seq.) and directed Federal agencies to develop their own implementing regulations for NEPA. DOE regulations (10 CFR 1021) provide additional direction for conducting NEPA reviews of proposed DOE activities. This EA has been prepared in accordance with both CEQ and DOE regulations and with DOE Orders and guidance (e.g., DOE Order 451.1B). Stakeholder participation is an integral part of the NEPA process. A public meeting will be held during a 30-day comment period for the EA, and comments will be welcomed any time during the review period.

² The DOE Office of Oversight observed that "...landfill waste acceptance criteria failed to specify any limits for surface contamination and rely solely on a uranium limit of 30 pCi/g as the only radiological criterion to determine the suitability of the waste for disposal. The technical basis document that established waste acceptance criteria for the landfill does not address surface-contaminated objects, such as roofing material, concrete, rubble, and debris that are disposed of in the landfill. ... Therefore, pursuant to DOE Order 5400.5, this technical basis document should have been approved by the Office of Environment, Safety, and Health." The "technical basis document" referred to by this DOE Office of Oversight observation was the study by Lee et al. (1995) mentioned above and had been published prior to guidance issued in a memorandum (DOE 1995).

Evaluation of the construction, operation, and closure of the C-746-U Landfill was previously documented in the "Environmental Assessment for the Construction, Operation, and Closure of the Solid Waste Landfill at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, EA-1046" (DOE-ORO 1995). That document did not specifically discuss the acceptance of materials containing residual radioactivity, although it did correctly specify that radioactive waste would not be accepted at the landfill. This assessment augments the 1995 EA by describing the process that would be implemented to develop authorized limits for acceptance of waste containing residual amounts of radioactivity at the C-746-U Landfill and the potential effects of implementing the authorized limits process. This EA does not address potential effects from construction, routine operation and closure of the landfill as those were already addressed in the previous EA.

The scope of this EA does not include the identification or evaluation of particular wastes that might be disposed at the C-746-U landfill. As in the past, this landfill would be one of multiple disposal alternatives available for disposition of individual PGDP waste streams, and such disposition would be determined on a project-specific basis. For example, the disposal of any wastes derived from site remediation activities conducted under the *Comprehensive Environmental Response, Compensation, and Liability Act* of 1980 (CERCLA) would be determined through the applicable CERCLA decision documents. Regardless of programmatic origin, only those waste streams that meet the conditions described under the alternatives could be considered for placement in the C-746-U landfill. The potential for cumulative impacts from the C-746-U landfill along with other activities at the PGDP is addressed in Section 5.

Two alternatives for the C-746-U Landfill are evaluated in this EA. Under Alternative 1 - No Action, the current suspension of the previously used uranium acceptance criteria would continue, and only waste containing residual radioactivity indistinguishable from background would be accepted in the future. Under Alternative 2 - Implement Authorized Limits Process, the requirements under DOE Order 5400.5³ for development and implementation of authorized limits for materials containing residual radioactivity would be followed to determine the acceptability of waste to be disposed of at the landfill.

1.4 PURPOSE AND NEED

The purpose of the proposed action is to implement the authorized limits process for acceptance of waste containing residual radioactivity for disposal at the C-746-U Landfill. The need for the proposed action is to comply with DOE Orders and guidance and to resume normal operations at the C-746-U Landfill. The scope of the proposed action is to formally document, approve, and implement the authorized limits process for the C-746-U Landfill to allow disposal of wastes containing residual radioactivity on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements. The scope of the proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

³ Throughout this EA, references to DOE Order 5400.5 also refer to any documents that might later succeed and, or, supplement DOE Order 5400.5 as it pertains to determinations regarding disposal of materials containing residual levels of radioactivity.

2.0 DESCRIPTION OF THE ALTERNATIVES

2.1 ALTERNATIVE 1 - NO ACTION

Under Alternative 1, DOE would continue to operate the C-746-U Landfill for disposal of wastes containing no residual radioactive materials distinguishable from background. Wastes containing, or suspected of containing, residual radioactive material would not be allowed for disposal unless:

- The wastes were surveyed, and
- There was reasonable assurance that residual radioactive material was not detectable in the waste (i.e., residual radioactivity was indistinguishable from background based upon measurements using appropriate, commercially available technology and a comparison with radioactivity levels of similar non-impacted materials)

The authorized limits process would not be used to determine acceptability of waste streams containing residual amounts of radioactivity at the landfill, and no such waste streams would be disposed of at the landfill. Waste generators would retain responsibility for proper management and disposition of the waste at alternate facilities. Waste streams accepted for disposal at the landfill would also have to meet all other WAC for the landfill. As in the past, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted. Similarly, only off-site waste generated as a direct result of PGDP operations and activities would be accepted from off-site for disposal in the C-746-U Landfill.

2.2 ALTERNATIVE 2 - IMPLEMENT AUTHORIZED LIMITS PROCESS

Under Alternative 2, the Preferred Alternative, DOE would implement the authorized limits process per DOE Order 5400.5 to determine the acceptability of waste streams containing residual radioactive materials in mass or volume for disposal at the C-746-U Landfill on a waste stream-specific basis. These authorized limits would differ from the operating limits or WAC historically used at this landfill as these limits would be developed on a waste stream-specific basis and formally approved in accordance with the requirements of DOE Order 5400.5 (or successor documents) and associated guidance. Waste streams containing residual amounts of surface radioactivity would be accepted for disposal if below the generic authorized limits enumerated in DOE Order 5400.5 (Table IV-1). Any other authorized limits for surface radioactivity, as well as authorized limits for all volumetric and radioactivity, would have to be formally evaluated and approved by DOE on a waste stream-specific basis in accordance with DOE Order 5400.5⁴ requirements. The WAC for the landfill would be revised to specify that the authorized limits process must be used where appropriate to determine and document the acceptability of waste for disposal. As before, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted. The only offsite waste that would be accepted for disposal in the C-746-U Landfill would be waste generated as a direct result of PGDP operations and activities (e.g., concrete rubble from WAG 17).

The cognizant DOE field office (i.e. Oak Ridge Operations Office) has chosen to use a 1 mrem/year dose level constraint in developing authorized limits for any wastes to be disposed of at the C-746-U Landfill⁵.

⁴ Throughout this EA, references to DOE Order 5400.5 also refer to any documents that might later succeed and, or, supplement DOE Order 5400.5 as it pertains to determinations regarding disposal of materials containing residual levels of radioactivity.

⁵ The potential acceptance of a waste stream that results in a calculated dose estimate greater than 1 mrem/yr is not reasonably anticipated at this time. However, if such a situation should arise, DOE would initiate additional NEPA review, as appropriate, in the course of reviewing each waste stream for acceptability at the C-746-U Landfill.

Approval of authorized limits for waste streams to be disposed of at the C-746-U Landfill would be based on a dose assessment to demonstrate that the levels of residual radioactive materials in a given waste stream would satisfy criteria specified in DOE Order 5400.5 and associated guidance as well as to satisfy the DOE dose level constraint of 1 mrem/year EDE to the public for the C-746-U Landfill.

The dose assessment would evaluate the potential dose to both workers and the public under current and potential future scenarios. Each analysis would be modeled for specific waste streams at the landfill using conservative assumptions to estimate the potential doses. Only those waste streams estimated to result in doses of 1 mrem/year EDE or less would be eligible for disposal at the landfill.

2.2.1 Requirements of DOE Order 5400.5

DOE Order 5400.5, *Radiation Protection of the Public and Environment*, presents the standards and requirements that apply to DOE sites and contractors for the protection of the public and environment against undue risk from radiation from DOE operations. DOE Order 5400.5 adopts current guidance and standards issued by national and international authoritative bodies on radiation protection and adopts current regulatory guidance applicable to DOE operations. Examples of such organizations include the National Council for Radiation Protection and Measurements (NCRP), International Commission on Radiological Protection (ICRP), Nuclear Regulatory Commission (NRC), and EPA. DOE Order 5400.5 and supporting documents present the requirements and processes for the control and release of real property (land and structures), and non-real property [e.g., personal property, materials (e.g., waste), equipment, and certain effluents] containing residual radioactive material from DOE facilities and operations.

Under DOE Order 5400.5, DOE is required to operate its facilities and conduct its activities so that radiation exposures to members of the public are maintained within the dose limits established in DOE Order 5400.5 and to control radioactive contamination. DOE Order 5400.5 also requires the use of the as low as reasonably achievable (ALARA) process with the objective to attain radiation dose levels that are as far below applicable limits as is practicable and reasonably achievable, taking into account factors such as technical, economic, safety, and social impacts (DOE 1991).

DOE Order 5400.5 presents generic surface contamination guidelines for the unrestricted release of structures, equipment, and materials with residual radioactive materials.⁶ These guidelines are generally consistent with NRC standards. DOE Order 5400.5 does not contain generic or specific guidelines for the release of materials containing residual radioactive materials in mass or volume as a result of DOE operations, with the exception of generic guidelines for radium and thorium in soils.

DOE Order 5400.5 and associated guidance (DOE 1995) present requirements pertaining to the establishment of authorized limits for the disposal of DOE waste streams containing residual radioactive materials at DOE onsite landfills and at non-DOE offsite landfills.

2.2.2 Authorized Limits Process

Under DOE Order 5400.5 and guidance (DOE 1995), DOE has the responsibility and authority under the AEA to establish authorized limits for protection of the public and environment either in the form of release criteria for radionuclides or WAC on a surface and/or volumetric basis for disposal of materials with residual radioactive material in the C-746-U Landfill. Disposal of such material must conform to the requirements of DOE Order 5400.5. DOE must establish authorized limits (1) such that doses to the public will be as far

⁶ Unrestricted release refers to release without restrictions on use due to residual radioactive material (see Chapter 8, Glossary also)

below the dose limits in DOE Order 5400.5 as is practical and (2) in accordance with the ALARA process (DOE 1991).

DOE is also required to ensure the protection of groundwater consistent with the site's groundwater protection objectives established under DOE Order 5400.1, *General Environmental Protection Program*. DOE Order 5400.5 and associated guidance also state that it should not be likely that disposal of wastes with residual radioactive materials in the landfill will result in future requirements for remediation of the landfill. In making this determination, consideration should also be given to any radionuclide limits established in Records of Decision for CERCLA response actions and RCRA corrective actions in areas close to the landfill.

To ensure that the above-referenced requirements are achieved, authorized limits for wastes with residual radioactive material sent to the C-746-U Landfill must be approved by DOE on a waste stream basis and should be:

- Selected on the basis of an ALARA assessment to optimize the balance between risks and benefits including costs and collective doses and selected to ensure that individual doses to the public are less than 25 millirem in a year with a goal of a few millirem in a year or less. (See Section 4.0 for additional discussion on radiation doses.)
- Evaluated to ensure groundwater will be protected in a manner consistent with the objectives of the site's groundwater protection program objectives established under DOE 5400.1 and/or applicable Federal and state requirements (e.g., 401 KAR 48:300).
- Evaluated to verify that the release of the landfill property would not be expected to require remediation under DOE Order 5400.5 requirements for release of property containing residual radioactive material giving due consideration to experience gained from past or on-going CERCLA and RCRA requirements.

The ALARA assessment would be performed on a waste stream basis to establish the authorized limits and would consider factors such as estimated concentrations in waste, total activity being or likely to be disposed in the landfill, fraction of total waste containing residual radioactivity, estimated individual doses from expected or likely use scenarios, an estimate or assessment of collective doses in relation to other alternatives, and potential impacts on natural resources such as groundwater. In considering and assessing doses for each of the waste streams, factors such as land use plans and site maintenance, benchmark cleanup standards, special waste form characteristics, and so forth would be considered in the development of authorized limits. Documentation supporting the authorized limits and disposal records would be maintained to ensure that the site would not have to be remediated in the future or even unnecessarily surveyed to document its radiological condition (DOE 1995).

Review and approval of authorized limits established for each waste stream containing residual radioactive material would be performed by the DOE field office manager, or his/her delegatee, and/or DOE headquarters in accordance with the requirements established in DOE Order 5400.5 and associated guidance.

Some considerations that currently would be used when establishing authorized limits for waste containing residual radioactive materials at the C-746-U Landfill include:⁷

⁷ Future DOE orders and/or guidance may modify factors to be considered in developing authorized limits.

- Waste stream characterization to determine the physical and chemical characteristics of the waste, the quantities of waste, the types and concentrations of residual radioactive materials present in the waste, and the projected duration of the generation/disposal of the waste stream.
- Assessment of surface contamination versus volumetric contamination and potential applicability of existing criteria such as the generic surface contamination guidelines presented in Chapter IV of DOE Order 5400.5.
- Review of features of the C-746-U Landfill such as the subgrade soil under the landfill, the distance from the bottom of the landfill to the groundwater surface, the liner and leachate collection system designed to contain leachate migrating from the waste to prevent release of contaminants to the surrounding environment, the leachate collection and management system, operational soil cover placed over the waste, and the final cover system designed to contain the waste and minimize the infiltration of rainwater, and the post-closure care of the landfill.
- Review of landfill operational practices including dust control and placement of the waste in the landfill.
- Dose assessment to estimate the potential radiation doses that could result from the disposal of waste with residual radioactive material in the landfill. The dose assessment would address the residual radioactive materials in the specific waste stream being evaluated for disposal as well as the cumulative inventory of residual radioactive materials in wastes previously disposed in the landfill. Dose assessments may be performed using specially developed computer models such as RESRAD and TSD-DOSE using waste specific information, landfill specific information, and conservative engineering judgement.
- Assessment of the potential impact on the groundwater as a result of disposal of the waste in the landfill. The assessment would address mobility of the contaminants as well as the engineered features of the landfill such as the liner and leachate collection system and final cover system that are intended to prevent the migration of waste and contaminants from the landfill. The assessment would consider potential risks for and potential impacts of failure of engineered features of the landfill such as the liner, leachate collection system, and final cover system.
- Assessment of potential future remediation of the landfill as a result of the disposal of the waste. This would include a review of applicable RCRA and CERCLA actions at the Paducah Site and applicable Federal or state guidance.
- Evaluation and documentation that the radiation dose levels resulting from the proposed disposal of waste containing residual radioactive material are ALARA taking into consideration appropriate factors such as technical, economic, safety, and social impacts.
- Compilation and documentation of the waste characterization information, assessments, reviews, dose assessments, any necessary coordination with state agencies, and recommended authorized limits.
- Appropriate review and approval of the compiled documentation and recommended authorized limits.

2.2.3 Waste Acceptance Procedures

Waste streams containing residual radioactive materials for which authorized limits are developed and approved under DOE Order 5400.5 and associated requirements would be acceptable for disposal in the C-746-U Landfill contingent on meeting all the WAC (BJC 1999) and requirements applicable to the landfill.

The acceptance and disposal of the waste at the C-746-U Landfill would follow established requirements and procedures for waste characterization, categorization, waste certification, waste review, waste acceptance, and documentation. Any nonconforming items would be rejected and returned to the generator. Established landfill operating procedures would be followed for disposing acceptable wastes. Appropriate records and documentation would be maintained for waste disposed in the landfill.

3.0 AFFECTED ENVIRONMENT

The affected environment includes the landfill site, the Paducah Site, and its immediate surroundings. This description of the affected environment summarizes information from the EA conducted for initial construction, operation and closure of the landfill (DOE-ORO 1995) and from the Phase I investigation conducted by the DOE Office of Oversight (DOE 1999) and has been updated as appropriate.

The PGDP is an operating DOE facility located in western Kentucky, approximately 10 miles west of the city of Paducah and 3 miles south of the Ohio River (Figure 3-1). The PGDP enriches uranium for use in domestic and foreign commercial power reactors. Enrichment operations at PGDP increase the amount of the radioisotope ^{235}U in the process material from the natural abundance of about 0.7 percent to approximately 2 percent (by mass). This slightly enriched material is subsequently sent to the Portsmouth Gaseous Diffusion Plant in Piketon, Ohio for enrichment to higher levels. Since the 1952 start of its operating lifetime, the PGDP has processed more than 1 million tons of uranium.

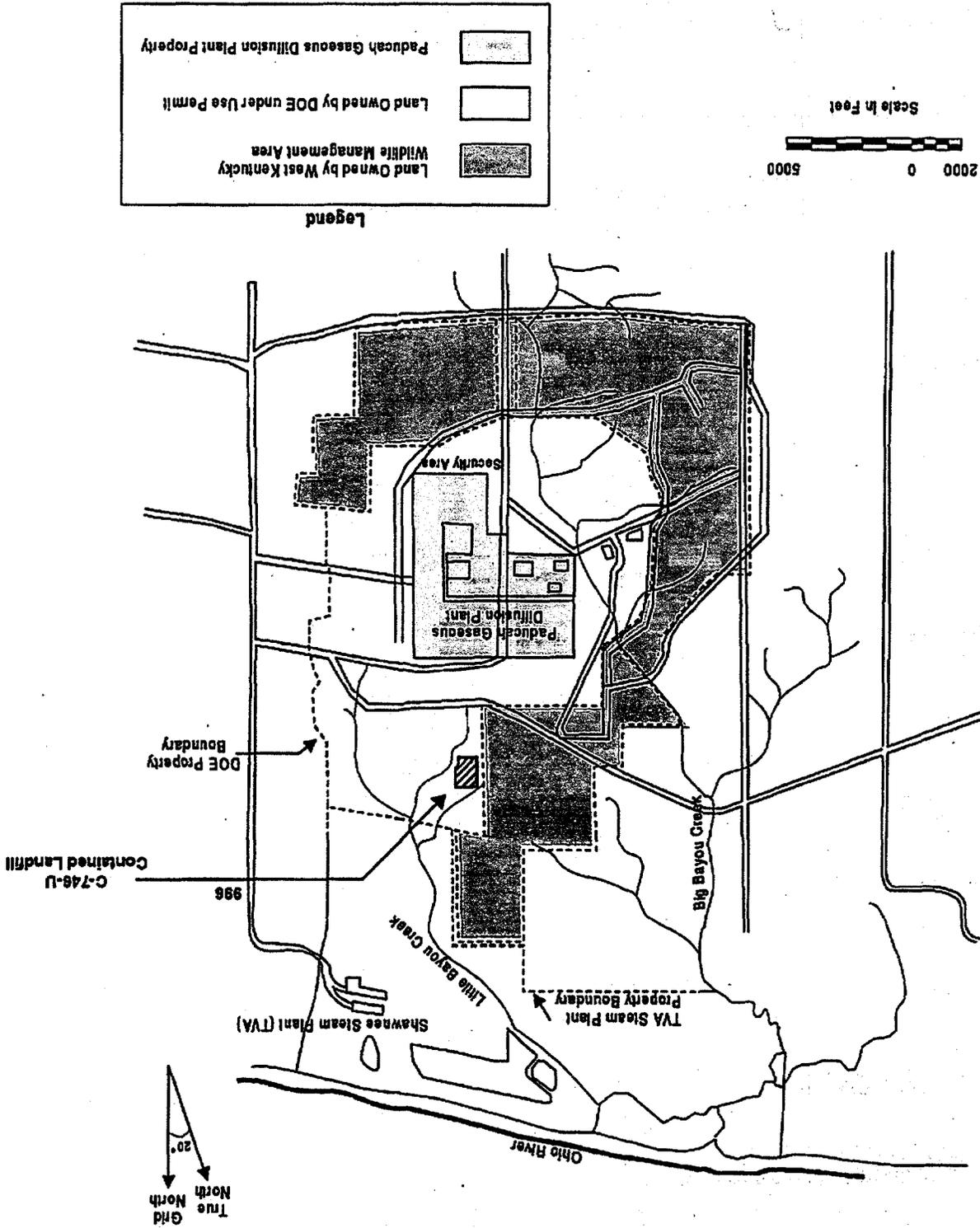
The PGDP was constructed in the early 1950s and has been the responsibility of DOE and its predecessor agencies. Uranium enrichment operations are currently conducted by the United States Enrichment Corporation (USEC), which began leasing uranium enrichment production facilities from DOE in July of 1993. Regulatory oversight of the USEC uranium enrichment operations has been the responsibility of the NRC since 1997 based on a certificate of compliance under 10 CFR 76 issued in November 1996.

DOE is the site "landlord." DOE retains certain responsibilities for the environmental restoration program, many elements of the waste management program, including operation of the C-746-U Landfill, and certain materials generated by past DOE activities. The PGDP was placed on the National Priorities List (NPL) in 1996 because environmental media at the PGDP are contaminated by hazardous substances as a result of past practices on the site. This includes some radiological contamination in soil, surface water, and groundwater; additional source characterization is still required (DOE-ORO 1995). In 1998, DOE contracted Bechtel Jacobs Company LLC as its management and integration (M&I) contractor responsible for directing its environmental management and enrichment facilities program at the Paducah Site. As the M&I contractor, Bechtel Jacobs has subcontracted the environmental restoration and waste management activities to a number of subcontractors.

3.1 OPERATIONAL HISTORY OF THE C-746-U LANDFILL

The C-746-U Landfill began operation in 1997 under Solid Waste Landfill Permit #073-00045 (Kentucky DWM November 4, 1996). The permitted landfill site encompasses 59.7 acres. Five landfill cells have been constructed over an area of approximately 5 acres. The landfill has a composite liner and leachate management system designed to prevent migration of contaminants from the unit in accordance with Kentucky regulations. Conceptual plans addressed in the EA prepared for the construction, operation and closure of the facility (DOE-ORO 1995) call for phased development of an additional five cells based on demand and funding. The closure cap will have a gas vent system, and a multilayer cap (soil, clay, geomembrane, filter fabric, and revegetative soil).

Figure 3-1. Map of Paducah Gaseous Diffusion Plant, Major Boundaries and Features



The C-746-U Landfill was designed and constructed with a composite liner system and leachate collection system in accordance with regulatory requirements to collect leachate that may migrate from the waste and prevent the leachate from entering the environment beneath the landfill. The composite liner system consists of two components that are intended to minimize the potential for release of contaminants. One component consists of a flexible membrane liner, which is a durable, man-made material with very low permeability. The other component is a thick layer of compacted soil with very low permeability. These individual components, when installed as a composite system, provide redundancy for containing the landfill leachate and reducing potential for migration of contaminants in the event of failure of one component of the composite system.

Under the conditions of its operating permit, operators of the C-746-U Landfill must sample and report the results of laboratory analysis for landfill leachate, stormwater runoff, groundwater monitoring wells, and surface water monitoring at the landfill. It is also subject to inspection by the Kentucky regulators and the EPA. No releases of radioactivity have been detected in any of the landfill sampling reports, and no Notices of Violation (NOV) for non-compliance with routine operational requirements have been issued since the landfill commenced operations. Leachate is collected and sent to the local wastewater treatment plant. Air monitoring is conducted at the Paducah Site boundary and is within allowable limits. Radiological monitoring of personnel using thermo-luminescent dosimetry (TLD) has resulted in a single recorded external shallow exposure of 25 mrem/year for a landfill employee since the monitoring began in 1997. This worker also worked at other facilities and it is uncertain if the exposure occurred at the C-746-U Landfill (BJC 2000a).

3.2 LAND USE

The Paducah Site is located within the Jackson Purchase Region of western Kentucky in McCracken County, approximately 3 miles south of the Ohio River and 20 miles east of the confluence of the Ohio and Mississippi rivers. Several small towns are situated within a 5-mile radius of the DOE property boundaries, including Heath and Grahamville to the east and Kevil to the southwest. Bordering the DOE property to the northeast is the Shawnee Steam Plant, which is owned and operated by the Tennessee Valley Authority (TVA). The area surrounding the Paducah Site is predominantly rural, with residences and farms scattered throughout the region. The West Kentucky Wildlife Management Area (WKWMA) encompasses approximately 7,000 acres immediately surrounding the plant (see Figure 3-1).

The Paducah Site is a 3,425-acre site owned by DOE. DOE maintains a buffer zone of approximately 595 acres used for support services, including the wastewater treatment plant, lagoons for process wastewater plant, and construction/demolition debris landfills around the 750-acre fenced security area. The remaining 2,080 acres are licensed to the Commonwealth of Kentucky for the purpose of wildlife management as a part of the surrounding WKWMA. The property within the buffer zone is not licensed to the Commonwealth of Kentucky, although some is managed by the Kentucky Department of Fish and Wildlife Resources (KDFWR) with the permission of DOE. DOE maintains the right to immediately assume possession of any property within the buffer zone if deemed necessary. The landfill was constructed on land within the buffer zone that had previously been licensed to the KDFWR.

3.3 CLIMATE AND TOPOGRAPHY

The Paducah Site is located in the humid continental climate zone, characterized by moderately cold winters and warm summers. The average monthly temperature is 57.6°F, ranging from a low monthly average of 32.6°F in January to a high monthly average of 79.1°F in July. Summers are typically warm and humid, with the maximum daily temperature exceeding 90°F an average of 40 days per year. The relative humidity varies between 60 percent and 85 percent throughout the year.

Precipitation averages 50.3 inches (in) annually with the greatest volumes occurring during the periods of March to July and November to December. Thunderstorm activity is common in the summer months. The prevailing wind direction is from the south to the southwest with an average speed of approximately 10 miles (mi) per hour. Stronger winds occur in the late fall and winter and are generally associated with weather fronts originating from the southwest or northwest.

Topography of the developed areas of the Paducah Site is almost uniformly flat. Average elevations vary from 290 feet (ft) above mean sea level (MSL) on the bank of the Ohio River to 380 ft above MSL at the Paducah Site. The highest elevation on DOE property is 425 ft above MSL and the area has an average slope of 23.7 ft/mi (DOE 1994).

3.4 EARTH RESOURCES

3.4.1 Geology

The near surface geology at the Paducah Site, to a depth of approximately 100 feet, consists of clastic (made up of fragments) continental and marine sedimentary deposits. The clastic continental deposits are represented by two sedimentary sequences from two distinct depositional periods. The younger clastic sequence, known as the Upper Continental Deposits (UCD), is a silt and clay lacustrine deposit with isolated sand and gravel lenses. The UCD exhibits variable thickness ranging from approximately 40 to 65 ft in the vicinity of the landfill. The older clastic sequence, known as the Lower Continental Deposits (LCD), contains a 20- to 40-ft thick sand and gravel unit that forms the Regional Gravel Aquifer (RGA), a potential source of drinking water near the Paducah Site. No residences in the immediate vicinity rely upon the RGA for groundwater supply, as all have been supplied with municipal water. No economic geological resources (e.g., mineral deposits) have been identified at the Paducah Site.

3.4.2 Soils

Soils in the vicinity of the Paducah Site consist of silty loam and silty clay loam lying above the loess (soil derived from glacial, windblown materials) and alluvium surficial deposits. Six soil series are mapped in close proximity to the Paducah Site. These soil series include the Calloway silt loam, Grenada silt loam, Loring silt loam, Falaya-Collins silt loam, Vicksburg silt loam, and the Henry silt loam. The Calloway-Henry association is the predominant soil association found in the vicinity of Paducah. All but the Henry series can be considered prime farmland based on general soil properties.

Levels of naturally occurring radioactive materials may vary considerably between different soils and different locations. A rigorous study of background levels of selected metals and radionuclides in uncontaminated soils at the Paducah Site was conducted to support environmental restoration efforts at the PGDP (DOE 1997). The study was approved by the EPA in 1997 and included information on the following radionuclides: ^{137}Cs , ^{40}K , ^{237}Np , ^{238}Pu , ^{226}Ra , ^{90}Sr , ^{99}Tc , ^{228}Th , ^{230}Th , ^{232}Th , ^{234}U , ^{235}U , and ^{238}U (Table 3.4-1). These radionuclides and their radioactive decay products comprise the most likely radioactive materials that might occur in the waste streams potentially eligible for disposal at the landfill.

TABLE 3.4-1. —Background Levels of Radionuclides in Soils and Deep Geologic Media in the Vicinity of the Paducah Gaseous Diffusion Plant^a

	Soil horizon/hydrologic unit						
	A	B	Loess	HU-2	HU-3	Eoc. Sand	PC Clay
	(pCi/g)						
¹³⁷ Cs	0.494	0.283	0.139	0.140	0.143	0.147	0.141
⁴⁰ K	16.031	16.248	13.036	6.431	5.256	2.451	9.501
²³⁷ Np	0.102	nm ^b	nm	nm	nm	nm	nm
²³⁸ Pu	0.073	nm	nm	nm	nm	nm	nm
²³⁹ Pu	0.025	nm	nm	nm	nm	nm	nm
²²⁶ Ra	1.481	1.518	1.089	1.050	1.150	0.570	1.213
⁹⁰ Sr	4.719	nm	nm	nm	nm	nm	nm
⁹⁹ Tc	2.535	2.779	0.496	0.496	0.548	0.521	0.634
²²⁸ Th	1.582	1.586	1.180	1.061	1.396	0.541	1.393
²³⁰ Th	1.452	1.445	1.217	0.882	1.053	0.374	1.153
²³² Th	1.476	1.487	1.225	1.078	1.326	0.577	1.422
²³⁴ U	2.485	2.438	1.040	0.953	1.182	0.492	1.429
²³⁵ U	0.144	0.143	0.128	0.117	0.112	0.092	0.167
²³⁸ U	1.221	1.166	0.921	0.977	1.009	0.401	1.288

Source: DOE 1997.

^a Background levels are defined as the upper tolerance bound of the 95 percentile.

^b Not measured in subsurface horizons.

3.4.3 Seismicity

Paducah is located in an area with a seismic risk rating of 3, on a scale of 1 to 3, with 3 being the most severe rating based on proximity to the New Madrid Seismic Zone (NMSZ). Several minor seismic tremors have been recorded at the Paducah Site since the early 1950s. However, a release of contaminants or structural failure at the Paducah Site as the result of seismic activity has never occurred, and the potential for releases of contaminants from the Paducah Site resulting from potential seismic events has not been quantified to date.

3.5 WATER RESOURCES

3.5.1 Surface Water

The PGDP is located in the western part of the Ohio River Basin. The confluence of the Ohio and Tennessee rivers is approximately 10 miles upstream of the landfill. The confluence of the Ohio River with the Mississippi River is approximately 20 miles downstream of the landfill. The Paducah Site is located on a local drainage divide; surface flow is to the east and northeast toward Little Bayou Creek and to the west and northwest toward Bayou Creek. The landfill is located within the drainage basin of Little Bayou Creek. Little Bayou Creek originates in the WKWMA and flows north toward the Ohio River along a 6.5-mile course through the eastern portion of the DOE reservation.

Little Bayou Creek has not been formally classified by the Kentucky Department for Environmental Protection (KDEP). However, according to Commonwealth regulations (401 KAR 5:026), any waters not specifically classified by the KDEP are otherwise designated for the following uses: warm water aquatic habitat, primary contact recreation, secondary contact recreation, and domestic water supply. Thus, by default, Little Bayou Creek is classified for these uses.

Little Bayou Creek receives point and non-point source effluent discharges from both DOE and USEC activities at the Paducah Site, including process effluent, treated sewage, and stormwater discharge. The Paducah Site effluent discharges account for nearly all of the flow in Little Bayou Creek.

An intermittent tributary of Little Bayou Creek flows approximately 100 ft from the eastern boundary of the landfill. Another intermittent tributary flows approximately 50 ft from the northwest corner of the landfill boundary.

3.5.2 Groundwater

Groundwater flow through the loess and clay-silt facies of the UCD is predominantly downward in the Paducah Site area. Seasonally saturated perched zones occur in the surficial soils above fragipans (impervious layers of hardened soil) and in isolated sand lenses of the UCD. These sand lenses can produce only limited quantities of water during wet seasons.

Other than an erosional surface at an approximate elevation of 340 ft above MSL in the area of the landfill, soil borings in the UCD penetrate sand lenses at various elevations. These sand lenses appear to be isolated laterally and vertically. The limited extent of sands in the UCD offers little enhancement of pathways for pollution migration. Use of perched aquifers for water supply is unknown in the Paducah Site area, but cannot be ruled out.

Sands in the UCD near the landfill typically do not offer potential for groundwater monitoring. Perched zones exist only locally. Groundwater flow through the UCD is predominantly vertically downward rather than horizontally outward, so groundwater monitoring at the perimeter of the contained waste area would not detect a release from the landfill base. The sands are generally saturated only seasonally. Monitoring wells in these sands could not be relied upon to yield samples for water quality monitoring due to this seasonal variation in water levels.

The uppermost aquifer in the Paducah Site area is the RGA, a source of drinking water in the region. It is developed in the lower gravel facies of the Continental Deposits. Recharge occurs as leakage from the UCD. In general, flow in the RGA is to the north to discharge into the Ohio River or alluvial deposits along the river. The predominantly fine-grained deposits of the Porters Creek Clay and the McNairy Formation act as a basal confining layer for the RGA and Eocene sands. Groundwater movement within the deeper McNairy aquifer is also north toward the Ohio River.

Due to existing groundwater contamination from the PGDP, several nearby private wells have been taken out of service. All potentially affected residences and businesses have been supplied with potable water via connection to municipal water supply lines.

3.5.3 Floodplain

Flooding in the vicinity of the landfill is caused by headwater flooding from Little Bayou Creek and is not affected by backwater flooding from the Ohio River for a 500-year or lesser flood. The 100-year flood elevation for Little Bayou Creek ranges from about 355 to 360 ft above MSL nearest the landfill; however,

the floodplain is over a mile east of the landfill. The elevation of the nearest tributary to Little Bayou Creek is approximately 345 ft MSL. Ground surface elevations at the landfill are approximately 365 ft MSL, well above the 100-year and 500-year flood elevations.

3.5.4 Wetlands

There were no wetlands within the boundaries of the landfill prior to construction. However, a small wetland, approximately 1 acre in area, was present near the northwest corner of the landfill. A perimeter fence was installed at least 50 ft from this wetland, and wastes are not placed within 250 ft of the intermittent stream responsible for this wetland. The site is graded so that water does not accumulate in surface depressions. Vegetation within the perimeter fence consists primarily of grass that is mowed on a regular basis so that native vegetation, including wetland species, have not become established.

3.6 AIR QUALITY AND NOISE

3.6.1 Air Quality

The Kentucky Division for Air Quality (KDAQ) measures air quality at nine monitoring stations in McCracken County. Monitored pollutants include particulate matter, sulfur dioxide, carbon monoxide, ozone (hourly average), and nitrogen dioxide. Measurements are taken to establish values for annual arithmetic means, maximum 24-hour averages, maximum 3-hour averages and hourly averages, as required. None of these standards (primary or secondary) were exceeded at any of the McCracken County monitoring stations when the first EA on construction of the landfill was conducted.

The EPA currently enforces a 1-hour standard for ground-level ozone. An 8-hour standard for ozone had been issued, but was revoked on May 27, 2000. McCracken County is an attainment region where criteria air pollutants do not currently exceed standards. However, McCracken County (which includes the Paducah Site and the city of Paducah) was recently identified by the KDAP as a potential non-attainment area for ozone based on the 8-hour standard. Should the 8-hour standard be reinstated and enforced, McCracken County could be designated as a non-attainment area by the EPA.

3.6.2 Noise

Ambient noise levels are not measured at the PGDP or at any nearby facilities. There are currently no local ordinances concerning noise regulation. The Commonwealth of Kentucky has a law concerning noise regulation but no enforcement or monitoring program exists and no regulations governing the implementation of this law have been promulgated. Noise from industrial processes taking place at the plant are generally restricted to the interior of the plant buildings. Noise levels beyond the plant security fence and near the landfill are generally the result of vehicular traffic moving through the area as well as from ongoing landfill operations.

3.7 BIOLOGICAL RESOURCES

3.7.1 Vegetation

The Paducah Site has been subjected to extensive past disturbance. Vegetative communities are representative of old field succession (i.e., grassy fields, field scrub-shrub, and upland mixed hardwoods). Open grassland areas, managed by the WKWMA personnel, are periodically mowed or burned to maintain early successional vegetation, which is dominated by members of the composite family and various grasses. Management practices of the WKWMA encourage re-establishment of once common native grasses such

as eastern gama grass (*Tripsacum dactyloids*) and Indian grass (*Sogastrum* sp.).

Corn, millet, milo, and soybean are commonly cultivated for wildlife forage. Field scrub-shrub communities consist of sun-tolerant wooded species such as persimmon (*Diospyros virginiana*), maples (*Acer* sp.), black locust (*Robinia pseudoacacia*), sumac (*Rhus* sp.), scattered oaks (*Quercus* sp.), and mixed hardwood species. Upland mixed hardwoods contain a variety of upland and transitional species. Dominant species include oaks, shagbark and shellbark hickory (*Carya ovata*, *C. laciniosa*), and sugarberry (*Celtis laevigata*). Understory vegetative density varies from grasses to a thick understory of shrubs, including sumac, pokeweed (*Phytolacca americana*), honeysuckle (*Lonicera japonica*), blackberry (*Rubus* sp.), and grape (*Vitis* sp.).

A grass cover is maintained on and around the landfill site with the exception of the working face. It is mowed periodically, including to the edges of the stormwater sedimentation pond. Vegetation bordering the streams nearest the landfill, but outside its fenced boundaries, consists of black locust, black willow (*Salix nigra*), sweetgum (*Liquidambar styraciflua*), maple, elm, and oak.

3.7.2 Wildlife

Wildlife species indigenous to hardwood forests and open grassland communities occur in the Paducah Site vicinity. Grassy fields are frequented by rabbits, mice, song birds, and a variety of other small mammals and birds. The red-winged blackbird (*Agelaius phoeniceus*), killdeer (*Charadrius rociferus*), cardinal (*Cardinalis cardinalis*), mourning dove (*Zenaida macroura*), bobwhite quail (*Colinus virginianus*), meadowlark (*Sturnella* sp.), warblers, sparrows, and red-tail hawk (*Buteo jamaicensis*) have been reported.

Scrub-shrub communities support a variety of wildlife, including opossum (*Didelphis virginiana*), vole (*Microtus* sp.), mole (*Scalopus* sp.), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), killdeer, bluejay (*Cyanocitta cristata*), red-winged blackbird, bluebird (*Sialia* sp.), cardinal, mourning dove, shrike (*Lanius* sp.), warblers, turkey (*Meleagris gallopavo*), and meadowlark. Deer, squirrel, raccoon, turkey, songbirds and great horned owls (*Bubo virginianus*) are found within mature woodlands of the Paducah Site. The Ohio River, approximately 3 miles north of the landfill, serves as a major flyway for migratory birds. Migratory birds and transient residents are occasionally seen at the Paducah Site.

Amphibians and reptiles are common throughout the unpaved areas of the Paducah Site. Amphibians likely to occur include American and Woodhouse's toads (*Bufo americanus* and *Bufo woodhousei*). Reptiles include eastern box turtles (*Terrapene carolinia*) and several species of snakes.

The C-746-U Landfill is located near Little Bayou Creek, which is not considered ecologically unique and does not support federally listed threatened or endangered species. Fish populations are numerically dominated by various species of sunfish (DOE-ORO 1995).

Wildlife habitat at the landfill is of poor quality for supporting a variety of terrestrial wildlife species because of the lack of protective vegetative cover and the constant disturbance of the area by equipment and mowing. Large mammals, such as deer, are blocked from accessing the site by perimeter fencing, although smaller animals could transit and forage on the site.

3.7.3 Threatened and Endangered Species

No federally-listed species were previously identified as potentially in the immediate vicinity of the landfill in the first EA (DOE-ORO 1995). No listed species have been identified or reported at the C-746-U Landfill or on the PGDP (DOE 2000). Consultations were conducted in May 2001 with the USFWS, KDFWR, and the Kentucky State Nature Preserves Commission to ascertain the potential presence of listed species near the landfill (Appendix A). Five occurrences of the federally-listed and state-listed Indiana bat, *Myotis sodalis*, have been recently reported at the nearby WKWMA (KDFWR 2001), and one occurrence was reported in 1991 (KSNPC 2001). As a result of these reports and informal consultations with the U.S. Fish & Wildlife Service (FWS 2001), the DOE conducted a Biological Assessment considering potential impacts of the proposed action to the Indiana bat based on the presumption that the bat is present near the landfill (Appendix A).

3.8 CULTURAL RESOURCES

A cultural resources Phase I survey was conducted prior to construction of the landfill and the report was approved by the State Historic Preservation Office (SHPO). The SHPO concurred that areas of cultural or archaeological significance were unlikely to exist in the area proposed for the landfill. No cultural resources were discovered during subsequent construction and operation of the landfill.

3.9 SOCIAL AND ECONOMIC CONDITIONS

3.9.1 Demography

The Paducah Site is surrounded by communities in McCracken and Ballard Counties, Kentucky, and Massac County, Illinois is across the Ohio River. The small communities of Grahamville, Heath, and Kevil are within 5 miles of the DOE property boundary; and the larger municipalities of Paducah and La Center, Kentucky, and Joppa and Metropolis, Illinois, are within a 15-mile radius of the landfill.

Nearby populations are relatively stable. The 1990 census population for McCracken County was 62,879 persons and the 1998 population was 64,405 (BEA 2000). Ballard and Massac Counties have much smaller populations but with the same relative stability. Total population within a 50-mile radius of the plant is approximately 525,000 with approximately 69,000 people residing within 10 miles of the Paducah Site.

3.9.2 Economic Activities

The labor force in McCracken County in 1998 was employed at 46,815 full and part-time jobs. Government and government enterprises accounted for approximately 10 percent of total personal income in the McCracken County in 1998. The average 1998 per capita income in McCracken County had risen to \$25,457 as compared with \$17,450 in 1992 (BEA 2000).

3.9.3 Environmental Justice

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," signed by President Clinton in February 1994, requires each Federal agency to formulate a strategy for addressing environmental issues in human health and environment related programs, policies, planning and public participation processes, enforcement, and rulemakings. The White House memorandum accompanying the Executive Order directs Federal agencies to "analyze the environmental effects . . . of Federal actions, including effects on minority communities and low-income communities, when such analysis is required by NEPA." There are no affected minority populations or Native American

tribes in the area of the Paducah Site or the landfill. The closest community is Grahamville, Kentucky, approximately 2 miles southeast of the landfill. Socioeconomic conditions relating to the construction, operation, and closure of the landfill were reviewed prior to landfill construction.

3.9.4 Transportation

Interstate 24 passes through Paducah, Kentucky, approximately 10 miles east of the Paducah Site. Four Federal highways (US 45, 60, 62, and 68) and many state highways traverse the area. Main access to the plant is via US Highway 60. Because the Paducah Site is located in a secured area, traffic is minimal within the plant and surrounding area and is generally limited to vehicles traveling into or out of two gates. The landfill is not located within the secured Paducah Site area, but is near it and has its own fencing and secured gate. Traffic near the landfill consists chiefly of personnel for the Paducah Site.

4.0 ENVIRONMENTAL CONSEQUENCES

Potential direct and indirect environmental effects may be caused by taking an action. In general, direct effects occur in the same place and at a time close to that of the action. Indirect effects are effects caused by the action but that may not occur until a later time or at a different location. Potential effects may be adverse or beneficial and include, but are not limited to, effects on human health; effects on ecological, aesthetic, or cultural resources; and effects on socioeconomics or land use. Potential effects that would result from an action may be evaluated qualitatively or quantitatively. These effects are addressed in proportion to their potential significance; those with the greatest potential for impact may be quantified or discussed in greater detail than those with little or no impact.

Only those effects potentially caused by Alternative 1 - No Action and Alternative 2 - Implement Authorized Limits Process will be discussed in this EA.

The effects discussed in this EA include:

- Potential effects to workers, the public, biota, water quality and air quality resulting from radiological exposures;
- Potential for radiological releases to surface and groundwater and air; and
- Potential indirect effects related to cost-effectiveness of landfill operations.

No potential effects to the following resources or areas would be anticipated as a result of implementing either alternative in this assessment, and they will not be discussed further in this document:

- Climate and topography;
- Geology, soils, and seismicity;
- Floodplain and wetlands;
- Noise;
- Cultural resources;
- Area demography and economics;
- Environmental justice; and
- Transportation.

Climate, topography, geology, soils, seismicity, floodplain, wetlands, and cultural resources would not be affected because the alternatives do not involve excavation or construction activities or disturb previously undisturbed areas. Noise levels and transportation would not be affected because use of heavy equipment and truck traffic are already a part of operations at the landfill and on surrounding roadways. No disproportionate effects to environmental justice populations would be anticipated because no disadvantaged population aggregates have been identified in the area around the landfill.

4.1 POTENTIAL ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 1 - NO ACTION

As described in Section 1.2, certain wastes containing low levels of residual radioactive materials were disposed at the C-746-U Landfill between 1997 and 1999. Specifically, wastes containing total uranium at concentrations less than 30 pCi/g were identified as acceptable for disposal under the WAC established for the facility. However, in 1999, operation of the facility was modified to accept only wastes containing residual radioactive materials at levels indistinguishable from background levels.

Under Alternative 1, this current mode of operation would continue. For all waste materials where the presence of radioactive materials could not be excluded on the basis of process knowledge, an analysis would be performed to demonstrate reasonable assurance that residual radioactive material in the waste would be indistinguishable from background, based upon measurements using appropriate, commercially available technology and a comparison with radioactivity levels of similar non-impacted materials.

4.1.1 Radiological Consequences under Alternative 1 - No Action

The NCRP estimates that the average American receives an annual radiation dose of approximately 360 mrem/year (or an average of 1 mrem/day) EDE from background sources of radiation (NCRP 1993). (A millirem is a unit of radiation dose equivalent.) Approximately 295 mrem/year of this radiation dose results from natural sources such as potassium in the human body; cosmic rays from the sun; radioactive material in the earth's crust; and radioactive materials in building materials in homes and work places. Approximately 65 mrem/year of the radiation dose results from exposure during medical tests and procedures and exposure to consumer products such as television sets, luminous watch dials, and smoke detectors.

These values are representative for an average U.S. resident and doses to individuals may be lower or higher due to their physical location, medical condition, occupation and lifestyle choices. For example, an additional dose of approximately 16,000 mrem/year to the lungs may be incurred from smoking cigarettes. Similarly, an individual residing at an elevation of 5,000 ft (e.g., Denver, Colorado) typically receives approximately 70 mrem/year more than an individual residing at sea level due to the higher cosmic radiation present at higher elevations. Also, a flight crew member of a commercial airline typically receives an additional dose of approximately 160 mrem/year as a result of spending extended periods of time at high altitude; and an airline passenger typically receives an additional 5 mrem from each cross-country flight. Medical procedures also contribute radiation exposures, such as 100 mrem/year from a plutonium-powered heart pacemaker, 100-500 mrem from a gastrointestinal-tract fluoroscopy procedure, and 10 mrem from a single chest x-ray.

Under Alternative 1, no wastes containing above-background levels of residual radioactive materials would be disposed at the C-746-U Landfill. Accordingly, radiation doses to facility workers or the public would not be associated with the operation of the landfill, but would come from sources such as those discussed above. Similarly, there would be no potential effects to biota, water quality, or air quality from exposure to radioactivity as a direct result of implementing Alternative 1 - No Action because no exposures in excess of background levels would occur. Results of a sitewide monitoring program are published annually, and potential radiological doses to the public and to biota are estimated in this report (BJC 2000b).

4.1.2 Other Environmental Consequences under Alternative 1 - No Action

Under Alternative 1, continued operation of the C-746-U Landfill might be determined not to be cost-effective. That is, since a large fraction of the wastes generated at the Paducah Site that might otherwise be disposed at this facility may contain low levels of residual radioactive materials, the volume of waste

meeting the WAC for disposal under this alternative could be too small to warrant continued operation of the facility. Similarly, the costs for demonstrating that concentrations of residual radioactive materials are indistinguishable from background levels could be prohibitive for some wastes. In this case, operation of the facility would cease and closure of the facility would be initiated. As a result, all wastes generated at the Paducah Site (i.e., both wastes containing low levels of residual radioactive materials as well as wastes containing levels indistinguishable from background) would require alternate disposal; these wastes would have to be stored and managed pending development and approval of an appropriate disposition strategy. Management of waste streams that would not be disposed of in the C-746-U Landfill could result in additional demands on waste storage areas at the Paducah Site, at least temporarily. However, no adverse effects to biota or other local resources should result from this, provided that the waste is properly managed.

If waste generated at the Paducah Site that would otherwise be eligible for disposal at the C-746-U Landfill required off-site disposal, higher costs would be incurred for management and disposition of both waste streams containing radioactivity levels indistinguishable from background and waste streams containing small amounts of residual radioactivity. Off-site disposal at a permitted RCRA Subtitle D (solid waste) landfill would entail meeting DOE documentation requirements for off-site, uncontrolled release of the waste and coordination with appropriate state agencies as well as the designated landfill operator. These administrative requirements and associated costs for disposal of the waste in an off-site solid waste landfill could result in DOE disposing of the waste at a facility permitted to accept low-level radioactive waste, in spite of the extremely low levels of residual radioactive materials present in a portion of the waste. Whether the Paducah waste were disposed of in a solid waste landfill, or in a low-level waste landfill, it would use up landfill capacity that could otherwise be utilized to dispose of other waste. In addition, the funds that were expended during the planning, design, permitting, and construction of C-746-U Landfill would be essentially forfeited without benefit.

The *Environmental Assessment for the Construction, Operation, and Closure of the Solid Waste Landfill at the Paducah Gaseous Diffusion Plant* (DOE-ORO 1995) identified no unacceptable impacts that would result from the C-746-U Landfill with respect to biota, air quality, water quality, or other resources. No effects have been identified under Alternative 1 - No Action in this EA that would alter the conclusions of that study.

4.2 POTENTIAL ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVE 2 - IMPLEMENT AUTHORIZED LIMITS PROCESS

Under Alternative 2, wastes containing low levels of residual radioactive materials may be accepted for disposal at the C-746-U Landfill following the approval of authorized limits developed in accordance with the requirements of DOE Order 5400.5 and associated guidance. As discussed in Section 2.2.2, these requirements include an evaluation to ensure that potential radiation doses to the public would not exceed 25 mrem/year with a goal of a few mrem/year or less (DOE 1995b). The authorized limits must be selected and approved by DOE on the basis of an assessment under the ALARA process to optimize the balance between risks and benefits including costs and collective doses. The DOE ORO Field Office has chosen to use a 1 mrem/year dose level constraint in developing authorized limits for any wastes to be disposed at the C-746-U Landfill.

4.2.1 Radiological Consequences Under Alternative 2 - Implement Authorized Limits Process

The NCRP has identified a dose of 1 mrem/year as a "negligible" level of exposure to radioactivity (NCRP 1993). This means that the estimated risks from doses less than 1 mrem/year of radioactivity from a given source are so small that they would be difficult to differentiate from the risks from other exposure sources. This same dose level of 1 mrem/year also has been adopted for use in deriving clearance standards under American National Standard ANSI/HPS N13.12-1999, *Surface and Volume Radioactivity Standards for Clearance*.

For each waste stream containing residual radioactive materials at concentrations above background levels, DOE would prepare written documentation in accordance with DOE Order 5400.5 and associated guidance supporting the approval of authorized limits for disposal of that waste stream at the C-746-U Landfill. This documentation would include an assessment to estimate potential radiation doses to site workers and the public from the disposal of each waste stream. This assessment would estimate potential doses to workers involved in the active management and disposal of the proposed waste stream, to hypothetical future workers at the facility following closure, and to other potential future occupants, as well as to the off-site public. Both the reasonable maximum individual doses and collective population doses would be estimated. Only those wastes which are estimated to result in individual doses of 1 mrem/year or less collective doses below 10 person-rem would be approved for disposal at this facility. The dose level constraint of 1 mrem/year EDE corresponds to an incremental human health risk of approximately 5×10^{-7} excess cancer mortality (i.e., 5 excess cancers per 10 million persons) per year of exposure, or approximately 1.5×10^{-5} excess lifetime cancer risk over a 30-year exposure duration (i.e., 15 excess cancers per million persons).

The annual dose to workers involved in the disposal of a proposed waste stream at the C-746-U Landfill typically would be estimated using models such as the TSD-DOSE computer code (Pfungston et al. 1998) which has been developed specifically for this purpose. This model was developed on the basis of detailed radiological assessments performed for eight commercial hazardous waste TSD facilities, and incorporates waste- and landfill-specific data to estimate potential radiological doses to onsite workers and the offsite public from management of waste containing very low levels of radioactive materials at a TSD facility. Input parameters for the TSD-DOSE model would be tailored to approximate the landfill-specific features and operating practices of the C-746-U Landfill. Disposal facility workers considered to be at greatest risk of exposure to radioactive materials during the active disposal of the proposed waste stream may include personnel involved in transfer of the waste from staging or generation areas at the Paducah Site, placement of waste in the C-746-U disposal cell, and leachate collection operations.

Estimates of dose to hypothetical future workers at the disposal facility following closure and other potential future occupants of the landfill typically would be developed using models such as the RESRAD computer code (Yu 1993a, 1993b) based on the cumulative inventory of disposed radioactive materials at the facility. To assess the potential exposure of future workers at the facility following placement of the cumulative waste inventory in the landfill, the assessment would typically consider a hypothetical future worker employed at the landfill for landfill maintenance and surveillance. In addition to the post-closure maintenance worker, residential or other potential land use scenarios also may be evaluated, even though such land use scenarios for this landfill are considered highly unlikely. In each case, potential doses to hypothetical receptors would be estimated assuming that the facility cover system remains intact, in accordance with RCRA closure and post-closure requirements, and also for a scenario assuming complete loss of integrity of the cover system immediately following the 30-year period of active post-closure care. It is noted, however, that permanent land use controls are anticipated for the C-746-U Landfill. Potential exposure pathways that would typically be evaluated for landfill workers include inhalation, incidental ingestion of material, and direct external exposure. Potential exposure of the offsite public could

occur only as a result of the transport of radionuclides in airborne dust or groundwater. In principle, several exposure pathways for offsite individuals involving contaminated groundwater could occur. These include direct ingestion of contaminated groundwater (drinking water pathway), ingestion of vegetables obtained from a garden which would be irrigated with contaminated water, and ingestion of milk and meat obtained from livestock which drink contaminated water or consume pasture irrigated with contaminated water. However, previous analyses of exposure pathways for the offsite public (Lee et al. 1995; MMES 1994) concluded that the dose from the drinking water pathway would be most limiting for the radionuclides of concern and that the dose from other potential exposure pathways would be negligible by comparison. Therefore, only the drinking water pathway normally would be considered for the offsite receptor.

Scenarios used to evaluate the potential radiological impacts are designed to be conservative (i.e., more likely to overestimate than underestimate potential doses). It seems unlikely, for example, that a future resident would actually build a house and accidentally drill a well through the landfill cap. Post-closure requirements for monitoring and maintenance at landfill sites and the use of deed restrictions and notifications that would be required, should any land transfer or leasing occur, would normally mitigate potential exposure opportunities. Nevertheless, these estimates provide an indication of the upper bound on potential exposures that would be identified using the authorized limits process.

Potential radiological effects to biota, water quality, or air quality would not be anticipated during routine operations because normal landfill operating procedures provide for dust suppression so any airborne release of material would be minimized, and the liner and leachate collection systems prevent releases to surface and groundwater (Section 3.1). The Biological Assessment included in Appendix A provides additional details of this analysis. Results of a sitewide monitoring program are published annually, and potential radiological doses to the public and to biota are estimated in this report (BJC 2000b). The majority of these estimated doses originate from contamination caused by past activities and operations at the PGDP. Implementation of Alternative 2 - Implement Authorized Limits Process would not be expected to add to these doses.

4.2.2 Other Environmental Consequences under Alternative 2 - Implement Authorized Limits Process

No environmental consequences, other than the potential for radiological exposures, have been identified under Alternative 2 - Implement Authorized Limits Process. The *Environmental Assessment for the Construction, Operation, and Closure of the Solid Waste Landfill at the Paducah Gaseous Diffusion Plant* (DOE-ORO 1995) identified no unacceptable impacts that would result from the C-746-U Landfill with respect to biota, air quality, water quality, or other resources. No effects have been identified in this EA that would alter the conclusions of that study.

4.3 ENVIRONMENTAL CONSEQUENCES FROM NON-ROUTINE OPERATIONS - ACCIDENT SCENARIO

Previous sections address potential consequences from routine operations of the C-746-U Landfill. It is also useful to consider potential consequences from non-routine operations of the facility, particularly that from an accidental release of waste containing residual radioactive materials below authorized limits. As mentioned in Chapter 4.0, potential effects that would result from an action may be evaluated qualitatively or quantitatively. DOE guidance on the implementation of NEPA states "...address environmental impacts in proportion to their potential significance," and "quantify impacts to the extent practicable consistent with the sliding scale approach" (DOE 1993). Since this assessment evaluates the use of the authorized limits process, rather than specific numerical values, the detailed characteristics of wastes that may ultimately be

disposed at the C-746-U Landfill are not yet known. Therefore, only analysis of effects from a hypothetical accident would be possible.

DOE guidance further states "Do not attempt to quantify impacts on environmental resources when it is clear from the context that any impacts would be virtually absent" (DOE 1993). As described previously, requirements for approval of authorized limits for the disposal of waste at the C-746-U Landfill would constrain the potential dose to 1 mrem/year or less. While it may be possible to postulate an accident scenario where the dose to a hypothetical individual may exceed 1 mrem/year, the anticipated risks would still be below appreciable levels and the likelihood of such an occurrence would be low. Thus, only a qualitative discussion of potential effects that could result from an accident is presented here.

Perhaps the most plausible accident scenario would be the uncontrolled release of a truck-load of a waste stream containing residual radioactive materials below authorized limits due to an accident while delivering the waste to the landfill. Exposure of biota, as well as humans, to the waste could potentially occur in this event. Based on historical precedent, if an uncontrolled release of waste being transported for disposal in the C-746-U Landfill did occur, it would be quickly cleaned up with little or no measurable exposure of the public or the environment to radioactivity (Fuchs 1996).

One potential scenario for a non-routine release of materials from the landfill might involve a catastrophic failure of the landfill containment system, perhaps due to a seismic event (e.g., an earthquake). As noted in Section 3.4.3, the Paducah Site is located in an area of high seismic risk. As discussed in Section 3.1, individual components of the landfill liner and leachate collection system provide redundancy for containing the landfill leachate and reducing potential for migration of contaminants in the event of failure of one component of the composite system.

The integrity of the composite liner system could be damaged as a result of a seismic or other type of catastrophic event. In such a case, the potential for migration into the environment could be increased. Additionally, in the unlikely event the liner and leachate collection system totally failed, the physical characteristics of the waste in the landfill (e.g., soils, construction debris) would generally preclude rapid release and transport of contaminants into environmental media. Also, as described in Section 4.2.1 above, the dose assessment conducted for each potential waste stream considered for disposal at the C-746-U Landfill would include an analysis of the potential dose to hypothetical future receptors from the cumulative waste inventory. This analysis would also evaluate the unlikely case where containment of the disposed waste may be lost (e.g., the cover system and/or liner system may be breached). The authorized limits resulting from this analysis would be protective of ecological receptors (Appendix A, Biological Assessment) as well as human receptors (Section 2.2.2, page 7). Results of this analysis would provide an upper bound on the potential impacts from a hypothetical seismic accident, and authorized limits would be approved only if no unacceptable impacts would be anticipated in the event of an accidental release.

5.0 CUMULATIVE IMPACTS

Cumulative impacts are the effects on the environment that could result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions. Cumulative impacts could result from individually minor, but collectively significant actions taking place over a period of time (40 CFR 1508.7). Such impacts should be considered over the "lifetime" of the impacts, rather than the duration of the proposed action. The no-action alternative serves as the baseline against which cumulative impacts are evaluated.

The original EA (DOE-ORO 1995) for the construction and operation of the C-746-U Landfill evaluated the potential cumulative impacts of the proposed facility with respect to land use, wetlands and floodplains, water resources, soils, air quality, noise, biological resources, social and economic impacts, and health and safety. However, since the previous analysis did not specifically address radiological impacts or the potential disposition of CERCLA-derived material, the potential cumulative radiological impact of the proposed action and the potential cumulative impact of CERCLA-derived materials in conjunction with other PGDP activities is considered here.

The potential radiological impacts from the proposed action and the no action alternative are estimated to be similar [i.e., in both cases, the potential radiation dose to the public attributable to the operation of the C-746-U Landfill would be a negligible fraction (less than 0.3 percent) of that from background sources of radiation exposure]. Under the proposed action, potential doses would not exceed 1 mrem/year, while the incremental dose under the no-action alternative may be even lower. As discussed, in Section 4.2.1, the NCRP has identified a dose of 1 mrem/year as a "negligible" level of exposure to radioactivity. These doses would be added to those from other potential sources of radiation exposure, including other projects that might occur at the Paducah Site. Other potential actions that could result in exposures to radioactivity at the Paducah Site include: continuing uranium enrichment operations; disposal of radioactive waste in a potential, CERCLA disposal facility; and the presence of residual radioactivity below clean-up levels that will be established for contaminated media such as soil and buildings.

Active uranium enrichment operations at the PGDP are continuing under USEC. The potential release of radioactive effluents from these operations and any resulting radiation exposure of workers or members of the public are regulated by the NRC. The dose to a member of the public from site operations may not exceed 100 mrem/year (10 CFR 20.1301) and must be maintained ALARA. Results of the comprehensive site-wide environmental monitoring program, which are published annually in the *Paducah Site Annual Site Environmental Report for 1999*, indicate that any actual exposures are far lower, with a maximum dose to a hypothetical maximally exposed receptor estimated at 0.69 mrem/year for Calendar Year (CY) 1999. Similarly, doses to workers may not exceed 5,000 mrem/year (10 CFR 20.1201), but occupational dosimetry records indicate far lower doses. A single worker received a dose in the 250 to 5,000 mrem range in CY 1999, but the average dose for all workers at the Paducah Site was 75 mrem in CY 1999 (DOE 2000c).

The potential development of an on-site facility for disposal of waste generated from remediation activities at the Paducah Site is one of the alternatives currently being evaluated under CERCLA. If such a facility were constructed, some waste that may be radioactively contaminated and would otherwise need to be shipped off-site for disposal might be dispositioned at the facility. This would contribute to the impacts resulting from potential exposures to radioactivity. For CERCLA activities, NEPA values are incorporated into CERCLA documents in accordance with *DOE's 1994 Secretarial policy on NEPA*. Such a facility would require approval of DOE, the EPA, and the Commonwealth of Kentucky before it could be initiated. DOE Order 435.1, which regulates the management of radioactive waste, would require development of a performance assessment and composite analysis to demonstrate that the radiation dose to the public would not exceed 25 mrem/year during normal operations.

Clean-up levels for contaminated environmental media at the Paducah Site will be established under the remediation process. These clean-up criteria will be selected and approved by DOE, EPA and the Commonwealth of Kentucky under applicable or relevant and appropriate requirements of Federal or state environmental standards. Residual levels of radionuclides remaining at the Paducah Site after clean-up actions have been conducted would contribute to cumulative radiological impacts under either alternative. Once clean-up levels have been established for the site, these levels would be formally taken into consideration during the development of authorized limits in accordance with the requirements of DOE Order 5400.5 and associated guidance.

As discussed above, implementation of either Alternative 1 - No Action or Alternative 2 - Implement Authorized Limits Process would result in negligible levels of exposure to radioactivity that would be difficult to differentiate from the risks from other exposure sources (Section 4.2.1). Accordingly, neither alternative would result in unacceptable cumulative effect to humans, biota, water quality or air quality. The conclusion that no unacceptable cumulative effects would occur as a result of implementation of Alternative 2 is further supported by: (1) the fact that no off-site releases of residual radioactivity would be anticipated as a result of routine landfill operations; (2) the fact that clean-up criteria established through the on-going PGDP remediation processes (which consider both human and ecological receptors at the Paducah Site) must be taken into consideration in developing authorized limit requests; and (3) the cognizant DOE office has established an administrative limit constraint of 1 mrem/year EDE for waste stream acceptability at the C-746-U Landfill.

In addition to the radiation exposure information discussed above, this cumulative impacts analysis also considers the impacts associated with the potential placement of CERCLA-derived materials in the C-746-U Landfill. It is not a foregone conclusion that CERCLA-derived materials will be disposed in the C-746-U Landfill. Decisions pertaining to the potential disposal of such materials will be addressed through future CERCLA decision documents and in accordance with applicable permit, regulatory, and statutory requirements and are beyond the scope of the proposed action discussed in this assessment. However, while the determination of whether to place CERCLA-derived materials in the landfill is beyond the scope of the proposed action, potential impacts associated with the potential disposition of CERCLA-derived materials are properly considered within the scope of this cumulative impacts analysis since such disposition may in fact occur.

The potential cumulative impacts from the proposed action and the no action alternative are estimated to be the same. It is assumed that the potential disposition of CERCLA-derived materials will be constrained by permit, regulatory, and statutory requirements that will ensure that only solid waste is placed in the landfill. This would be the case under either the proposed action or the no action alternative. Based on this assumption, cumulative impacts associated with the potential disposition of CERCLA-derived materials under either alternative would be no different than the cumulative impacts associated with the construction and operation of the landfill as discussed in the original EA (i.e., the landfill's operations remain the same, and only solid waste is eligible for placement in the landfill). Additionally, since determinations with respect to the placement of specific CERCLA-derived materials in the landfill will be made in the context of future CERCLA decision documents, it is assumed that the potential disposition of those materials would be limited only to those materials that would not exceed EPA's acceptable risk range and that any disposition would take place in accordance with all applicable and relevant and appropriate statutory and regulatory requirements.

In summary, ongoing site operations and the presence of residual radioactive materials in environmental media at the Paducah Site, both before and after the completion of site-wide remedial actions, may be considered to define a "baseline" for radiation exposure related to the site. The proposed action would not be expected to result in any radiation dose to workers or the public, or to biota that would be distinguishable

from this baseline. Potential radiation dose from all sources would be expected to remain within applicable radiation protection standards and potential health risks are expected to be within the CERCLA target risk range. Finally, under the proposed action, the disposition of any CERCLA-derived materials would not result in cumulative impacts differing from either the no action alternative or the cumulative impacts as discussed in the original EA and also would not be expected to exceed the CERCLA target risk range.

6.0 REFERENCES

- ANSI 1999 American National Standards Institute (ANSI) and Health Physics Society (HPS), *Surface and Volume Radioactivity Standards for Clearance*, ANSI/HPS N13.12-1999, August 1999.
- BEA 2000 Bureau of Economic Analysis (BEA), *Regional Accounts Data*, updated June 15, 2000, accessed on the Internet on November 2, 2000.
- BJC 1999 Bechtel Jacobs Company LLC (BJC), *Waste Acceptance Criteria for the Department of Energy Treatment, Storage, and Disposal Units at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, BJC/PAD-11 (Revision 2)(formerly KY/EM-96), May 1999.
- BJC 2000a Bechtel Jacobs Company LLC, *Data on Historical Radiation Exposures of C-746-U Landfill Workers*, an information package provided by Sam Leone of Bechtel Jacobs Company to Anne Dickie of Tetra Tech, Inc., September 7, 2000.
- BJC 2000b Bechtel Jacobs Company LLC, *Paducah Site Annual Site Environmental Report for 1999*, BJC/PAD-206, October 2000.
- CDM 2000a CDM Federal Services (CDM), *C-746-S&T and C-746-U Landfills Monitoring Wells Camera Inspections Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, BJC/PAD-186, May 2000.
- CDM 2000b CDM, *C-746-U Solid Waste Landfill Second Quarter Calendar Year 2000 Operating Report, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, BJC/PAD-163/V2, July 2000.
- DOE 1988 Department of Energy (DOE), *Internal Dose Conversion Factors for Calculation of Dose to the Public*, DOE/EH-0071, July 1988.
- DOE 1990 DOE, *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, Washington, D.C., February 8, 1990.
- DOE 1991 DOE, *DOE Guidance on the Procedures in Applying the ALARA Process for Compliance with DOE Order 5400.5*, Office of Environmental Guidance, March 8, 1991.
- DOE 1995 DOE, *Application of DOE Order 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material*, Memorandum from R.F. Pelletier to Distribution, November 17, 1995.
- DOE 1997a DOE, *Establishment and Coordination of Authorized Limits for Release of Hazardous Waste Containing Residual Radioactive Material*, Memorandum from Mark W. Frei to Distribution, January 7, 1997.
- DOE 1997b DOE, *Groundwater Protection Program Management Plan for the Paducah Gaseous Diffusion Plant (Draft)*, April 1997.

- DOE 1999 DOE, Office of Oversight Environmental, Safety and Health, 1999, *Phase I Investigation of the Paducah Gaseous Diffusion Plant Paducah, Kentucky, Environment, Safety, and Health Issues*, October, 1999.
- DOE 2000 DOE, *Release of Surplus and Scrap Material*, Memorandum from the Secretary of Energy, W. Richardson, to Distribution, July 13, 2000.
- DOE-ORO 1995 DOE Oak Ridge Operations Office (ORO), *Environmental Assessment for the Construction, Operation, and Closure of the Solid Waste Landfill at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/EA-1046, March, 1995.
- DOE-ORO 1997 DOE-ORO, *Background Levels of Selected Radionuclides and Metals in Soils and Geologic Media at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/OR/07-1586&D2, July, 1997.
- FWS 2001 FWS (U. S. Fish and Wildlife Service, Department of Interior). Letter from Dr. Lee A. Barclay, FWS, to Dr. James L. Elmore, DOE, June 13, 2001.
- Fuchs 1996 Fuchs, R. L., *State-by-State Assessment of Low-Level Radioactive Wastes Received at Commercial Disposal Sites*, DOE/LLW-237, National Low-Level Waste Management Program, Idaho Falls, ID, 1996.
- KDFWR 2000 Kentucky Department of Fish and Wildlife Resources (KDFWR). James S. Lane, Jr., Author. "Mist Net Surveys for the Indiana Bat (*Myotis sodalis*) at West Kentucky Wildlife Management Area Paducah, Kentucky." February 2000.
- KNREPC 1995 Kentucky Natural Resources and Environmental Protection Cabinet (KNREPC), *Fiscal Year (FY) 1997 Environmental Management Budget Recommendations*, Memorandum from Phillip J. Sheperd to Thomas Grumbly, June 23, 1995.
- KNREPC 1997a KNREPC, Department for Environmental Protection, *U.S. DOE Paducah Gaseous Diffusion Plant; Modification of Construction/Operation Permit for Contained Landfill McCracken County 073-00045*, Memorandum from Robert H. Daniell to Jimmie Hodges and Jimmy Massey, January 3 1997.
- KNREPC 1997b KNREPC, *U.S. Department of Energy Paducah Gaseous Diffusion Plant Solid Waste Disposal Facility Permit 073-00045*, Department for Environmental Protection, Division of Waste Management, January 3 1997.
- Kornegay et al. 1991 Kornegay, F.C., D.C. West, T.G. Jett, and J.W. Turner, *Paducah Gaseous Diffusion Plant Environmental Report 1990*, Martin Marietta Energy Systems, Inc. Report No. ES/ESH-13/V3, 1991.
- KSNPC 2000 Kentucky State Nature Preserves Commission (KSNPC). "Monitored Species of McCracken County Kentucky". Online reports at <http://www.kynaturepreserves.org> accessed June 25, 2001.
- Lee et al. 1995 Lee, D.W., J. C. Wang, and D.C. Kocher, *Authorized limit Study for the Proposed Solid Waste Landfill at Paducah Gaseous Diffusion Plant*, ORNL/TM-13008, June 1995.

MMES 1994 Martin Marietta Energy Systems (MMES), *Technical Site Information Paducah Gaseous Diffusion Plant*, KY/EN/SFP-4, September 1994.

NCRP 1993 National Council on Radiation Protection and Measurement (NCRP), *Limitation of Exposure to Ionizing Radiation*, Recommendations of the National Council on Radiation protection and Measurement, Publication No. 116, Bethesda, MD, March 31, 1993.

ORISE 1992 Oak Ridge Institute of Science and Education (ORISE), *Radiological Survey of Selected Outdoor Areas, Paducah Gaseous Diffusion Plant, Paducah, KY*, Volumes 1 & 2, April 1992.

Pfingston et al. 1998 Pfingston, M., J. Arnish, D. LePoire, and S.Y. Chen, *TSD-DOSE: A Radiological Dose Assessment Model for Treatment, Storage, and Disposal Facilities*, ANL/EAD/LD-4 (Revision 1), September 1998.

Yu et al. 1993a *Manual for Implementing Residual Radioactive Material Guidelines Using RESRAD Version 5.0, Working Draft for Comment, September*, ANL/EAD/LD-2, Argonne National Laboratory, Argonne, Illinois, September, 1993.

Yu et al. 1993b *Data Collection Handbook to Support Modeling the Impacts of Radioactive Material in Soil*, ANL/EAIS-8, Argonne National Laboratory, Argonne, Illinois, April 1993.

7.0 LIST OF AGENCIES AND PERSONS CONTACTED

The following entities were contacted with respect to this EA, and a public meeting was held during the comment period for the Draft EA to provide opportunities for stakeholder involvement.

Federal Agencies

Dr. Lee Barclay
Field Supervisor
Fish and Wildlife Service
U.S. Department of the Interior
446 Neal Street
Cookeville, Tennessee 38501

Carl Froede Jr., Remedial Project Manager
U.S. Environmental Protection Agency, Region 4
61 Forsythe Street
Atlanta, Georgia 30303

Commonwealth of Kentucky

Mr. Alex Barber
Kentucky Division for Environmental Protection
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Mr. James E. Bickford, Secretary
Kentucky Cabinet for Natural Resources and Environmental Protection
Capitol Plaza Tower, Fifth Floor
Frankfort, KY 40601

Wayne L. Davis
Kentucky Department of Fish and Wildlife Resources
#1 Game Farm Road
Frankfort, KY 40601

Ms. Sara Hines
Data Manager
Kentucky State Nature Preserves Commission
801 Schenkel Lane
Frankfort, KY 40601

Mr. Bob Logan, Commissioner
Department for Environmental Protection
14 Reilly Road
Frankfort, KY 40601

The Honorable Paul E. Patton
Governor of Kentucky
State Capitol
700 Capitol Avenue
Frankfort, KY 40601

Tuss Taylor
Kentucky Division for Waste Management
14 Reilly Road, Frankfort Office Park
Frankfort, KY 40601

Dr. John A. Volpe
Radiation Control Branch, Cabinet for Human Resources
275 East Main Street, Mail Stop HS2E-D
Frankfort, KY 40621

Keith Wethington
Kentucky Department of Fish and Wildlife Resources
Arnold L. Mitchell Bldg.
#1 Game Farm Road
Frankfort, KY 40601

PUBLIC DISTRIBUTION

David Fuller
670 Springwell Lane
Paducah, KY 42001

Tim Kreher
West Kentucky Wildlife Management Area
10535 Ogden Landing Road
Kevil, KY 42053

Judge Danny Orazine
301 South 6th
Paducah, Ky 42003

Paducah Citizen's Advisory Board
Information Age Park
2000 McCracken Blvd.
Paducah, KY 42001

Mayor Bill Paxton
PO Box 2267
Paducah, Ky 42002

8.0 GLOSSARY

The descriptions of terms in this glossary are taken from definitions provided in either DOE Order 5400.5 or DOE Order 435.1. Terms defined in DOE Order 435.1 may reference another source.

as low as reasonably achievable (ALARA): used to describe an approach to radiation protection to control or manage exposures (both individual and collective to the work force and the general public) and releases of radioactive material to the environment as low as social, technical, economic, practical, and public policy considerations permit. ALARA is not a dose limit, but rather it is a process that has as its objective the attainment of dose levels as far below the applicable limits of the Order (DOE Order 5400.5) as practicable.

authorized limit: a level of residual radioactive material that shall not be exceeded if the remedial action is to be considered completed and the property is to be released without restrictions on the use due to residual radioactive material (DOE Order 5400.5).

background radiation: ionizing radiation present in the environment from cosmic rays and natural sources in the Earth; background radiation varies considerably with location.

collective dose equivalent (and Collective Effective Dose Equivalent): sums of the dose equivalents or effective dose equivalents of all individuals in an exposed population within an 80-km radius, and they are expressed in units of person-rem, (or person-sievert). When the collective dose equivalent of interest is for a specific organ, the units would be organ-rem (or organ-sievert). The 80-km distance shall be measured from a point located centrally with respect to major facilities or DOE program activities.

members of the public: persons who are not occupationally associated with the DOE facility or operations; persons whose assigned occupational duties do not require them to enter the DOE site. (Also see Dose Terms: Public Dose.)

public dose: the dose received by member(s) of the public from exposure to radiation and to radioactive material released by a DOE facility or operation, whether the exposure is within a DOE site boundary or off-site. It does not include dose received from occupational exposures, doses received from naturally occurring "background" radiation, doses received as a patient from medical practices, or doses received from consumer products.

radioactive waste: any garbage, refuse, sludges, and other discarded material, including solid, liquid, semisolid, or contained gaseous material that must be managed for its radioactive content. (See 40 CFR Part 240)

radioactivity: the property or characteristic of radioactive material to spontaneously "disintegrate" with the emission of energy in the form of radiation. The unit of radioactivity is the curie (or becquerel).

release of property: the exercising of DOE's authority to release property from its control after confirming that residual radioactive material (over which DOE has authority) on the property has been determined to meet the guidelines for residual radioactive material in (DOE Order 5400.5) Chapter IV or any other applicable radiological requirements. There may be instances in which DOE or other authority will impose restrictions on the management and/or use of the property if the residual radioactive material guidelines of Chapter IV are not met or if other applicable Federal, State, or local requirements cause the imposition of such restrictions.

residual radioactive material or residual radioactivity: any radioactive material which is in or on soil, air, equipment, or structures as a consequence of past operations or activities.

release of waste: the exercising of DOE's authority to release property that has been declared waste from its control after confirming that residual radioactive material on the waste has been determined to meet the guidelines for residual radioactive material in accordance with DOE 5400.5, *Radiation Protection of the Public and the Environment*, and other applicable radiological requirements. (See DOE 5400.5)

waste acceptance criteria (WAC): the technical and administrative requirements that a waste must meet in order for it to be accepted at a storage, treatment, or disposal facility. (See DOE 5820.2A)

waste certification: a process by which a waste generator affirms that a given waste or waste stream meets the waste acceptance criteria of the facility to which the generator intends to transfer waste for treatment, storage, or disposal. (See DOE 5820.2A)

waste characterization: the identification of waste composition and properties, by review of acceptable knowledge (which includes process knowledge), or by nondestructive examination, nondestructive assay, or sampling and analysis, to comply with applicable storage, treatment, handling, transportation, and disposal requirements. [See DOE Glossary ("Characterization" definition) and Federal Register, Vol.62, No. 224]

waste stream: A waste or group of wastes from a process or a facility with similar physical, chemical, or radiological properties. (See DOE 5820.2A)

APPENDIX A:
CONSULTATIONS AND BIOLOGICAL
ASSESSMENT



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

May 29, 2001

Mr. Keith Wethington
Kentucky Department of Fish
and Wildlife Resources
#1 Game Farm Road
Frankfort, Kentucky 40601

Dear Mr. Wethington:

CONSULTATION CONCERNING STATE-LISTED SPECIES FOR THE PROPOSED IMPLEMENTATION OF THE AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL, PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

The Department of Energy (DOE) proposes to implement the authorized limits process for determining the acceptability of waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE control, consistent with radiation protection standards for general employees, members of the public, and the environment. Authorized limits determinations would be made in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific. Waste streams containing residual radioactive materials below approved authorized limits would not require radiological control under the *Atomic Energy Act* (AEA) and would not be considered radioactive waste.

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The proposed action would not affect designation of the landfill as a

Mr. Keith Wethington

2

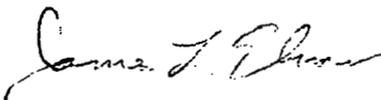
sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over clean cover over the remainder of the landfill site. Waste streams placed in the landfill have low levels of organic content, and standard dust control practices are routinely followed. Thus, opportunities for local biota to come into contact with the waste, either directly or indirectly, are minimal.

This letter is intended to serve as a request for an updated list of state-protected species that may occur on or in the vicinity of the proposed action and to solicit your recommendations and comments about the potential effects of this action. Your input will be used in the preparation of an Environmental Assessment of the proposed action. A prompt reply would be appreciated.

If you need any further information on this request, please do not hesitate to call me at (865) 576-0938.

Sincerely,



James L. Elmore, Ph. D.
Alternate NEPA Compliance Officer

FISH & WILDLIFE COMMISSION

Mike Boatwright, Paducah
Tom Baker, Bowling Green, Chairman
Allen K. Gailor, Louisville
Charles E. Bale, Hodgenville
Dr. James R. Rich, Taylor Mill
Ben Frank Brown, Richmond
Doug Hensley, Hazard
Dr. Robert C. Webb, Grayson
David H. Godby, Somerset



COMMONWEALTH OF KENTUCKY
DEPARTMENT OF FISH AND WILDLIFE RESOURCES
C. THOMAS BENNETT, COMMISSIONER

June 12, 2001

James L. Elmore, Ph.D.
Alternate NEPA Compliance Officer
U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, TN 37381

Re: Consultation concerning state-listed species for the proposed implementation of the authorized limits process at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Dear Mr. Elmore:

The Kentucky Department of Fish and Wildlife Resources (KDFWR) has received your above-referenced request for information. Accordingly, KDFWR provides the following comments.

A search of the Kentucky Fish and Wildlife Information System (KFWIS) indicates that the following state-listed threatened and/or endangered species (some are also federally listed) are potentially found in close proximity to the referenced project.

<u>Common Name</u>	<u>Scientific Name</u>
alligator gar	<i>Atractosteus spatula</i>
Alabama shad	<i>Alosa alabamae</i>
cypress minnow	<i>Hybognathus hayi</i>
taillight shiner	<i>Notropis maculatus</i>
spotted sunfish	<i>Lepomis punctatus</i>
Johnny darter	<i>Etheostoma nigrum susanae</i>
yellow-crowned night-heron	<i>Nyctanassa violaceus</i>
blue-winged teal	<i>Anas discors</i>
hooded merganser	<i>Lophodytes cucullatus</i>
Indiana bat	<i>Myotis sodalis</i>
ring pink	<i>Obovaria retusa</i>

If the proposed action stays within the current boundaries of the C-746-U landfill (i.e., will not involve utilization of adjacent land that is currently part of West Kentucky Wildlife Management Area), KDFWR does not anticipate any negative impacts to the above-listed species.

KDFWR appreciates the opportunity to comment. If you have any questions or comments, please contact me at 502/564-7109, ext. 366 or via e-mail at jim.lane@mail.state.ky.us.

Sincerely,

James S. Lane, Jr.
Wildlife Biologist III

cc: Environmental Section File



Arnold L. Mitchell Bldg. #1 Game Farm Road Frankfort, Ky 40601
An Equal Opportunity Employer M/F/D



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

May 29, 2001

Ms. Sara Hines
Data Manager
Kentucky State Nature Preserves Commission
801 Schenkel Lane
Frankfort, Kentucky 40601

Dear Ms. Hines:

CONSULTATION CONCERNING STATE-LISTED SPECIES FOR THE PROPOSED IMPLEMENTATION OF THE AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL, PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

The Department of Energy (DOE) proposes to implement the authorized limits process for determining the acceptability of waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE control, consistent with radiation protection standards for general employees, members of the public, and the environment. Authorized limits determinations would be made in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific. Waste streams containing residual radioactive materials below approved authorized limits would not require radiological control under the *Atomic Energy Act* (AEA) and would not be considered radioactive waste.

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

Ms. Sara Hines

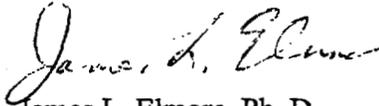
2

The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over clean cover over the remainder of the landfill site. Waste streams placed in the landfill have low levels of organic content, and standard dust control practices are routinely followed. Thus, opportunities for local biota to come into contact with the waste, either directly or indirectly, are minimal.

This letter is intended to serve as a request for an updated list of state-protected species that may occur on or in the vicinity of the proposed action and to solicit your recommendations and comments about the potential effects of this action. Your input will be used in the preparation of an Environmental Assessment of the proposed action. A prompt reply would be appreciated.

If you need any further information on this request, please do not hesitate to call me at (865) 576-0938.

Sincerely,



James L. Elmore, Ph. D.

Alternate NEPA Compliance Officer



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

May 29, 2001

Dr. Lee Barclay
Field Supervisor
Fish and Wildlife Service
U.S. Department of the Interior
446 Neal Street
Cookeville, Tennessee 38501

Dear Dr. Barclay:

INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT FOR THE PROPOSED IMPLEMENTATION OF THE AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL, PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY

The Department of Energy (DOE) proposes to implement the authorized limits process for determining the acceptability of waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE control, consistent with radiation protection standards for general employees, members of the public, and the environment. Authorized limits determinations would be made in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific. Waste streams containing residual radioactive materials below approved authorized limits would not require radiological control under the *Atomic Energy Act* (AEA) and would not be considered radioactive waste.

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline

Dr. Lee Barclay

2

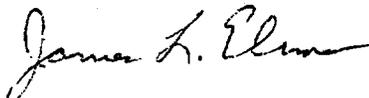
batteries, and metals]. The proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over clean cover over the remainder of the landfill site. Waste streams placed in the landfill have low levels of organic content, and standard dust control practices are routinely followed. Thus, opportunities for local biota to come into contact with the waste, either directly or indirectly, are minimal.

This letter serves as informal consultation under Section 7 of the Endangered Species Act. In this regard, DOE requests an updated list of protected species that might be at, or near, the site of the proposed action and solicits your recommendations and comments about the potential effects of this action. Your input will be used in the preparation of an Environmental Assessment of the proposed action.

If you need any further information on this request, please do not hesitate to call me at (865) 576-0938.

Sincerely,



James L. Elmore, Ph. D.
Alternate NEPA Compliance Officer



United States Department of the Interior

FISH AND WILDLIFE SERVICE

446 Neal Street
Cookeville, TN 38501

June 13, 2001

Mr. James L. Elmore, Ph.D.
U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dear Dr. Elmore:

Thank you for your letter of May 29, 2001, regarding the preparation of an Environmental Assessment (EA) for the implementation of the authorized limits process at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant in McCracken County, Kentucky. U.S. Fish and Wildlife Service (Service) personnel have reviewed the information submitted and offer the following comments for consideration.

According to our records, the Federally endangered Indiana bat (*Myotis sodalis*) may occur near the C-746-U landfill. Qualified biologists should assess potential impacts and determine if the proposed project may affect the species. Please submit a copy of your assessment and finding to this office for review and concurrence. A finding of "may affect" could require the initiation of formal consultation procedures.

These constitute the comments of the U.S. Department of the Interior in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.). We appreciate the opportunity to comment. Should you have any questions or need further assistance, please contact Steve Alexander of my staff at 931/528-6481, ext. 210, or via e-mail at steven_alexander@fws.gov.

Sincerely,

Lee A. Barclay, Ph.D.
Field Supervisor

xc: Laila Lienesch, FWS, Frankfort



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

July 19, 2001

Dr. Lee A. Barclay, Ph.D.
Field Supervisor
Fish and Wildlife Service
446 Neal Street
Cookeville, Tennessee 38501

Dear Dr. Barclay:

**ADDITIONAL INFORMAL CONSULTATION UNDER SECTION 7 OF THE
ENDANGERED SPECIES ACT FOR THE PROPOSED IMPLEMENTATION OF
AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL IN PADUCAH,
KENTUCKY**

Thank you for your prompt reply to my letter of May 29, 2001, concerning the implementation of the authorized limits process for waste acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky. As you requested, the Department of Energy (DOE) has prepared a Biological Assessment (BA) for the federally listed species, *Myotis sodalis*, identified in your June 13, 2001 letter.

The enclosed BA is submitted for your review and concurrence. Based on the BA, DOE has determined that the proposed implementation of the authorized limits process at the C-746-U Landfill at the PGDP is not likely to adversely affect the listed species. Results of the BA will be summarized in the text of the Environmental Assessment (EA) for the project, and the BA will be appended to the EA.

Following your review of the BA, please check the appropriate concurrence block and sign below. Please fax your comments to me at (865) 576-0746 as soon as possible, so that we may expeditiously complete the EA. If you need further information or wish to discuss the BA, please call me at (865) 576-0938. Thank you in advance for your prompt reply.

Sincerely,

A handwritten signature in cursive script that reads "James L. Elmore".

James L. Elmore, Ph.D.
Alternate NEPA Compliance Officer

Enclosure

cc:
David Tidwell, EM-34
Harvey Rice, EM-34

Subject: **ADDITIONAL INFORMAL CONSULTATION UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT FOR THE PROPOSED IMPLEMENTATION OF AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL IN PADUCAH, KENTUCKY**

- This Biological Assessment supports the conclusion that the implementation of the authorized limits process at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, would not adversely impact federally listed protected species and/or habitat. With this BA, DOE has satisfied consultation requirements of Section 7 of the Endangered Species Act.

- This Biological Assessment does not support the conclusion that the implementation of the authorized limits process at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, would not adversely impact federally listed protected species and/or habitat. DOE has not satisfied consultation requirements of Section 7 of the Endangered Species Act.

Signature

Date

Endangered Species Act

BIOLOGICAL ASSESSMENT

Paducah C-746-U Landfill

Implementation of the Authorized Limits Process

Paducah Gaseous Diffusion Plant

McCracken County, Kentucky

Prepared by

Anne Dickie, M.S.

Senior Scientist, Tetra Tech, Inc.

June 2001

U. S. Department of Energy

Oak Ridge Operations Office

Oak Ridge, TN

June 2001

**BIOLOGICAL ASSESSMENT FOR
THREATENED AND ENDANGERED SPECIES
UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT
FOR AN EXISTING SOLID WASTE LANDFILL**

SUMMARY

This biological assessment (BA) evaluates potential impacts on federally listed plant and animal species that could result from the implementation of the authorized limits process at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant (PGDP) in McCracken County, Kentucky. The species considered in this BA is the endangered Indiana bat as identified in a letter from the U.S. Fish and Wildlife Service (FWS) to the U.S. Department of Energy (DOE), dated June 13, 2001 (FWS 2001).

DOE concludes, for the reasons described in the main text of this BA, that the project is not likely to adversely affect this species. Also, since no proposed or designated critical habitats are present on, or near, the locations where activities would occur, none would be affected.

INTRODUCTION AND PROJECT DESCRIPTION

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. The landfill is lined, has a leachate collection system, and will have a multi-layer cap when closed.

Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, and other nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

Operation of the C-746-U facility is regulated by DOE under the authority of the Atomic Energy Act (AEA) and the Commonwealth of Kentucky under authority delegated by the U.S. Environmental Protection Agency (EPA) to enforce implementing regulations for RCRA through provisions in regulations for solid waste landfills by the Commonwealth of Kentucky (401 KAR 48). Under the AEA, DOE has the responsibility and authority to establish radiological limits for protection of the public and the environment, either in the form of release criteria for off-site disposition of waste it generates or for waste acceptance criteria for disposal of materials in a DOE-owned on-site landfill.

The following brief description is extracted from the draft Environmental Assessment (EA) for the project (DOE 2001). Of the two alternatives considered in the EA, one is No Action, and the second is implementation of the authorized limits process at the existing landfill. Alternative 1 - No Action would not affect wildlife, including listed species; thus, it is not considered further. The remaining alternative is briefly described below.

Alternative 2 in the EA (DOE 2001) is to implement the authorized limits process for determining the acceptability of solid waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE radiological control, consistent with radiation protection standards for general employees, members of the public, and the environment. Authorized limits determinations would be evaluated in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific.

Under Alternative 2, the Preferred Alternative, DOE would implement the authorized limits process per DOE Order 5400.5 to determine the acceptability of waste streams containing small amounts of residual radioactive materials in mass or volume for disposal at the C-746-U Landfill on a waste stream-specific basis. These authorized limits would differ from the operating limits or waste acceptance criteria historically used at this landfill as these limits would be developed on a waste stream-specific basis and formally approved in accordance with the requirements of DOE Order 5400.5 (or successor documents) and associated guidance. Waste streams containing residual amounts of surface radioactivity would be accepted for disposal if below the generic authorized limits enumerated in DOE Order 5400.5 (Table IV-1); however, any other authorized limits for surface radioactivity would have to be formally evaluated and approved by DOE on a waste stream-specific basis in accordance with DOE Order 5400.5 requirements. The Waste Acceptance Criteria (WAC) for the landfill would be revised to specify that the authorized limits process must be used where appropriate to determine and document the acceptability of waste for disposal. As before, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted.

DOE Order 5400.5 and its associated guidance allow for local approval of authorized limits which would result in an effective dose equivalent (EDE) to humans of 1 mrem/year or less. Authorized limits resulting in an annual EDE between 1 mrem and 25 mrem require additional approval by DOE Headquarters. The cognizant DOE field office has chosen to use a 1 mrem/year dose level in developing authorized limits for any wastes to be disposed at the C-746-U Landfill. Approval of authorized limits for waste streams to be disposed of at the C-746-U Landfill would be based on a dose assessment to demonstrate that the levels of residual radioactive materials in a given waste stream would satisfy criteria specified in DOE Order 5400.5 and associated guidance as well as to satisfy the DOE-ORO dose level of 1 mrem/yr EDE to the public for the C-746-U Landfill.

The dose assessment would evaluate the potential dose to both workers and the public under current and potential future scenarios. Each analysis would be modeled for specific waste streams at the landfill

using conservative assumptions to estimate the potential doses. Only those waste streams estimated to result in doses of 1 mrem/yr EDE or less would be eligible for disposal at the landfill. Waste streams containing residual radioactive materials below approved authorized limits do not require radiological control under the *Atomic Energy Act* (AEA) and are not be considered radioactive waste.

Specific exposure limits for biota would not be designated as part of the proposed action because no such limits have been formally established by DOE or by other regulatory agencies, and potential pathways for exposure as a result of this action are very limited. The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over clean cover over the remainder of the landfill site. Waste streams placed in the landfill have low levels of organic content, and standard dust control practices are routinely followed. Thus, opportunities for local biota to come into contact with the waste, either directly or indirectly, are minimal. This is discussed in greater detail in the impacts section of this BA.

ECOLOGICAL DESCRIPTION OF THE SITES

The following brief description is taken from DOE (2001), verified with field reconnaissance by the author (A. Dickie, Tetra Tech, Inc., personal observations, August, 2001). The C-746-U Landfill occurs within existing industrialized areas of the Paducah Gaseous Diffusion Plant and is near the West Kentucky Wildlife Management Area (WKWMA) on the landfill site's western side. The landfill site has been cleared and, where vegetative cover is present, is maintained by mowing. Two intermittent tributaries of Little Bayou Creek, an intermittent stream, flow approximately 100 ft and 50 ft from the eastern and northwestern boundaries of the landfill site respectively. Trees, when present in close proximity to the landfill site, mainly along the two tributaries, are generally less than 20 cm diameter at breast height (dbh) and do not have loose bark as required by roosting Indiana bats.

Vegetation on the landfill site, is limited to grasses and other herbaceous ground cover. The nearby tributaries are partially bordered by a thin riparian zone of plants. The nearby WKWMA consists primarily of stands of bottomland hardwoods interspersed with upland hardwoods and old fields. Potential summer roosting and foraging habitats for the Indiana bat are present in the WKWMA, although most trees are less than 20 cm diameter (see reported sighting below). The Bayou Creek (formerly known as Big Bayou Creek) is the nearest blue-line stream in the area; the nearest of its tributaries to the landfill are on the western side of the WKWMA.

STATUS AND BIOLOGY OF THE LISTED SPECIES

The U. S. Fish & Wildlife Service has identified the Indiana bat (*Myotis sodalis*) as a federally-endangered species that could potentially occur near the landfill site (FWS 2001). The Indiana bat is also a listed species by the Commonwealth of Kentucky. There has been one reported occurrence of the Indiana bat in McCracken County (Kentucky State Nature Preserves Commission 2000), but no reported occurrences at the PGDP site (DOE 2000). The reported occurrence in McCracken County, a result of

mist netting, was made in June 1991 and was on WKWMA land in the Joppa Quadrangle near the Shawnee Steam Plant and to the north (upstream) of the landfill site (Hines 2001). There have been no other reports of the Indiana bat within an 8 km (5 mi) radius of the PGDP (Hines 2001). The general ecology of the Indiana bat is summarized below. Unless otherwise noted, or referenced, general biological information on the species is derived from Harvey (1992) and Webb (2000).

Indiana bat (*Myotis sodalis*)

The range of the endangered Indiana bat is the eastern U.S. from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. Distribution is associated with major cave regions and areas north of cave regions. The present total population is estimated at ca. 352,000 with more than 85% hibernating at only nine locations - two caves and a mine in Missouri, three caves in Indiana, and three caves in Kentucky.

Indiana bats hibernate in limestone caves from October to April, depending upon climatic conditions. Indiana bats usually hibernate in large, dense clusters of up to several thousand individuals in sections of the hibernation cave where temperatures average 38 - 43 F and with relative humidities of 66 to 95 percent. Bat clusters may contain 300 - 384 bats per square foot. The bats leave the caves and migrate to summer roosts mid-spring.

Summer roosting-habitat criteria for Indiana bats are frequently revised as more is discovered about this species' habits. The most recent information applicable for the region is available from the FWS Cookeville Office ("Components of Suitable Habitat for the Endangered Indiana Bat"). In general, Indiana bats establish summer maternity and sometimes male night roosts or bachelor colonies under the loose bark of large, usually hardwood trees (> 20 cm diameter). Indiana bats have been observed to return to the same roosting and foraging habitat year-after-year. Indiana bats are nocturnal, foraging at night and feeding on insects.

Female Indiana bats depart the caves before the males and arrive at summer maternity roosts in mid-May. A single off-spring, born in June, is raised by the mother under loose tree bark, primarily in wooded streamside habitat. Mothers and babies reside in maternity colonies that use multiple, primary roost trees throughout most of the summer. Secondary roosts are used intermittently by some of the bats, particularly during periods of extreme precipitation or extreme temperatures. Thus, there may be more than a dozen roosts used by some Indiana bat colonies (FWS 1999a). Kurta et al. (1996) found that female Indiana bats may change roosts about every three days, and a group of these bats may use more than 17 different trees in a single maternity season. They depart the summer roosts for hibernation caves in September. The summer roost of the adult males is often near the maternity roost, although a few males do stay in caves over the summer.

The first maternity colony was discovered in 1974 under the loose bark on a dead butternut hickory tree in east-central Indiana. The colony numbered about 50 individuals and also used an alternate roost under the bark of a living shagbark hickory tree. The total foraging range of the colony consisted of a linear strip along approximately 0.5 mi. of creek. Foraging habitat was confined to air space from 6 ft to ca. 95 ft high near the foliage of streamside and floodplain trees. Two additional colonies were discovered

June 2001

during subsequent summers, also in east-central Indiana. These had estimated populations of 100 and 91 individuals, including females and pups. Habitat and foraging area were similar to the first colony discovered. Evidence gathered during recent years indicates that, during summer, Indiana bats are widely dispersed in suitable habitat throughout large portion of their range. Additional maternity colonies have been discovered using radiotelemetry techniques in more recent years. Data thus far reinforces the belief that floodplain forest is important habitat for Indiana bat summer populations. However, colonies have been located in upland and in coniferous habitats as well.

The bats arrive near their hibernation caves between August and September and begin swarming and mating activities. Swarming at the cave entrances continues into mid- or late October. The bats continue feeding during this time building a store of fat reserves for hibernation. It is thought that Indiana bats feed primarily on moths. Open riparian corridors along streams are required for foraging habitat. A longevity record of 13 years and 10 months has been recorded for the Indiana bat. Hibernating bats leave little evidence of their past numbers, thus, it is difficult to calculate a realistic estimate of the population decline for this species. However, population estimates at major hibernacula indicated a 34% decline in the total Indiana bat population from 1983 to 1989.

Although the C-746-U Landfill site has no hibernating, roosting, or foraging habitat as described above, the creeks within an expanded area around the landfill site do provide Indiana bat summer roosting and foraging habitat. No maternity roosts have been located on the WKWMA and the only record of Indiana bats in the area is from a single specimen from the 1991 survey (Kentucky State Nature Preserves Commission 2000).

POTENTIAL IMPACTS OF THE PROJECT

The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for disease vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over uncontaminated soil on the remainder of the landfill site. Waste streams placed in the landfill typically have low levels of organic content, and standard dust control practices are routinely followed. Opportunities for bats to come into contact with the waste, either directly or indirectly, are minimal. Although no thresholds for exposure to radioactivity have been established for bats, a hypothetical scenario where bats could have routine unrestricted access to waste disposed at the 746-U Landfill, could be evaluated for potential radiological impact as follows.

DOE (DOE Order 5400.5 II.3.a(5), DOE 1990) and the National Council on Radiation Protection and Measurements (NCRP Report No. 109, 1991) have established a limit on the maximum acceptable dose rate to natural populations of aquatic biota at 1 rad/day (10 mGy/day). This dose limit was intended to apply to the most radiosensitive populations of aquatic organisms. Invertebrates are much more resistant to radiation induced damage than are vertebrates (e.g., fish). For example, a dose rate of 24 rad/day delivered during the life cycle of a snail did not significantly reduce reproduction (NCRP 1991).

June 2001

No exposure limits for terrestrial biota have been formally established by DOE or by other regulatory agencies to date. However, DOE has issued an interim DOE Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (ENVR-0011, July 2000). DOE guidance recommends the use of this interim technical standard for evaluating potential impacts to both aquatic and terrestrial biota in the Annual Site Environmental Reports (ASERs) for all DOE sites. The interim technical standard specifies the following dose limits:

- the absorbed dose to aquatic animals should not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material;
- the absorbed dose to terrestrial plants should not exceed 1 rad/day (10 mGy/day) from exposure to radiation or radioactive material; and
- the absorbed dose to terrestrial animals should not exceed 0.1 rad/day (1 mGy/day) from exposure to radiation or radioactive materials.

The recommended limits for terrestrial biota are based on recommendations of the International Atomic Energy Agency (IAEA).

This recommended dose limit to terrestrial fauna of 0.1 rad/day may be compared with the dose limit established for the proposed action at the C-746-U landfill of 1 mrem/year to humans. The limit of 0.1 rad/day equates to 36,500 to 730,000 mrem/year, or more than 4 to 5 orders of magnitude greater than the 1 mrem/year dose limit established for the proposed action. Thus, attainment of the dose limit of 1 mrem/year for humans would also provide protection for terrestrial biota, with a substantial margin of safety.

The interim technical standard also tabulates values of the Biota Concentration Guide (BCG), which is defined as the limiting concentration of a radionuclide in soil, sediment or water, that would not cause dose limits for protection of populations of aquatic or terrestrial biota to be exceeded. These BCG values are much higher than concentrations of radionuclides in waste that would be considered for disposal at the C-746-U Landfill. For example, the BCG screening values for radioisotopes of uranium in soil are 2000 to 5000 pCi/g. These guidelines would indicate that terrestrial biota must be routinely exposed to concentrations greater than these levels before adverse impact would be expected.

These observations support the conclusions of the NCRP and IAEA for aquatic biota and the IAEA for terrestrial biota that the following statement by the International Commission on Radiological Protection (ICRP Publication 60, 1991) is reasonable: "...if man is adequately protected, then other living things are also likely to be sufficiently protected." It should also be noted that the metric used by these agencies to monitor protection of humans is the dose limit of 100 mrem/year rather than the constraint of 1 mrem/year selected for the proposed action at the C-746-U landfill, thereby adding an additional hundred-fold margin of safety for biota at this site.

The above analysis considers hypothetical bats that are directly exposed to waste streams potentially containing residual radioactivity. In relating this analysis to Indiana Bats that are potentially present near

June 2001

the C-746-U Landfill, consideration of the potential exposure pathway is highly relevant. The bats are unlikely to come into direct contact with the waste streams. The most likely scenario for indirect exposure would be if an Indiana bat used one of the tributaries of Little Bayou Creek near the landfill as its riparian foraging zone. If the moths or other insects ingested by the bat had been in contact with the waste streams at the landfill through external contact with the waste or through ingestion of the waste, they could be carriers of residual radioactivity. Since moths and other insects are generally short-lived, there would be little opportunity for the radioactivity to bioaccumulate within individual insects through ingestion. Moreover, the waste streams disposed at the C-746-U Landfill are not generally attractive to insects because of their low organic content. Finally, normal operating practices minimize ways for insects to come into external contact with the waste.

CONCLUSION

The project as proposed would be unlikely to adversely affect the Indiana bat because:

- the Indiana bat is rare in the area;
- no habitat alteration or destruction would occur as a result of the proposed action;
- no bat habitat of any kind is present on the site of the proposed action;
- minimal foraging habitat (riparian vegetation along intermittent tributaries) is present near the site of the proposed action;
- routine landfill operating procedures would leave minimal opportunity for exposure of local biota, including any Indiana bats, to residual radioactivity; and
- if exposure did occur, it would be orders of magnitude below any available guidance related to dose limits for terrestrial fauna.

June 2001

REFERENCES:

- DOE (U.S. Department of Energy). 2001. *Draft Environmental Assessment on the Implementation of the Authorized limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. March 2001.
- DOE. 2000. *Paducah Annual Site Environmental Report for 1999*.
- DOE. 2000. DOE Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" ENVR-0011, July 2000.
- FWS (U. S. Fish and Wildlife Service, Department of Interior). 2001. Letter from Dr. Lee A. Barclay, FWS, to Dr. James L. Elmore, DOE, June 13, 2001.
- Harvey, Michael J. 1992. *Bats of the Eastern United States*. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service. 46 pp. February 1992.
- Harvey, M. J., J. S. Altenbach, and T. L. Best. 1999. *Bats of the United States*. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service. 64 pp.
- Hines, Sarah. 2001. Personal communication regarding a reported sighting of *Myotis sodalis* between Sarah Hines, Data Specialist, Kentucky State Nature Preserves Commission and Anne Dickie, Scientist, Tetra Tech, Inc. July 9, 2001.
- ICRP (International Council on Radiation Protection). 1991. Publication 60.
- Kentucky State Nature Preserves Commission. June 2000. "Monitored Species of McCracken County Kentucky". Online reports at <http://www.kynaturepreserves.org> accessed June 25, 2001.
- Kurta, A., K. J. Williams, and R. Mies. 1996. "Ecological, behavioural, and thermal observations of a peripheral population of Indiana bats (*Myotis sodalis*)". Pages 102-117, in R. M. R. Barclay and R. M. Brigham, editors. *Bats and Forests Symposium*. Research Branch, Ministry of Forests, Province of British Columbia, Victoria, British Columbia.
- Webb, Warren. 2000. *Biological Assessment NABIR Project, Selection and Operation of the Proposed Field Research Center on the Oak Ridge Reservation*. February 2000.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

446 Neal Street
Cookeville, TN 38501

September 18, 2001

Mr. James L. Elmore, Ph.D.
U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dear Dr. Elmore:

Thank you for your July 19, 2001, letter and enclosure (received on August 1, 2001) transmitting the Biological Assessment (BA) for the implementation of the authorized limits process for waste acceptance for the C-746-U Landfill at the Paducah Gaseous Diffusion Plant (PGDP), in McCracken County, Kentucky. The preferred Alternative 2 involves the acceptance of low levels of residual radioactive materials on a waste stream-specific and facility-specific basis at the C-746-U landfill. It should be noted that no new concentration-specific waste acceptance criteria (WAC) have been proposed for the C-746-U landfill. We are not aware that the existing WAC for the landfill address Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-derived waste disposal. The disposal of CERCLA-derived waste was not specifically mentioned in the BA or precluded by implementation of the preferred alternative. This BA included an evaluation of potential effects to the Federally endangered Indiana bat (*Myotis sodalis*). U.S. Fish and Wildlife Service (Service) personnel have reviewed the BA and offer the following comments for consideration.

The BA recognizes a 1991 collection record for the Indiana bat in McCracken County. The Kentucky Department of Fish and Wildlife Resources conducted mist-netting surveys on the West Kentucky Wildlife management Area (WKWMA) during the summers of 1999 and 2000. Those efforts resulted in the collection of five Indiana bats, including juvenile specimens, on the WKWMA. This information likely indicates the presence of a maternity colony somewhere near the PGDP. We have provided your office with a copy of the report detailing that investigation. The BA should be revised to reflect that information.

Since exposure pathways for humans and terrestrial biota differ significantly, we believe that the comparison of potential external absorbed radiation dose does not provide definitive information to support specific conclusions contained in the BA. While the BA suggests that specific radiological exposure limits for biota do not exist in current guidance or regulation, and would not be designated

as part of the proposed action, these facts should not preclude risk evaluations of sensitive receptors which may reside or forage near the project area. Any evaluation should consider a range of concentrations associated with waste stream-specific and facility-specific waste.

The BA suggests that since invertebrates are short-lived, the potential for bioaccumulation in an individual specimen is low. We believe that bioaccumulation over a short time period is quite possible. An evaluation which includes consideration of the potential for bioaccumulation of contaminants by terrestrial and aquatic invertebrates, as well as the foraging behavior of the Indiana bat would provide supporting documentation to this BA.

Service personnel are participating on the PGDP Ecological Risk Assessment Working Group (ERAWG) and recent discussions by this group and others have been held to define the scope of work necessary to characterize potential risks associated with the C-746-U landfill. We believe it is prudent that WAC are identified and that performance and risk evaluations for the C-746-U landfill completed prior to our concurrence with your "not likely to adversely affect" finding. Therefore, informal consultation pursuant to Section 7 of the Endangered Species Act should be continued until all uncertainties associated with this action are thoroughly evaluated.

These constitute the comments of the U.S. Department of the Interior in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.). We appreciate the opportunity to comment. Should you have any questions or need further assistance, please contact Steve Alexander of my staff at 931/528-6481, ext. 210, or via e-mail at steven_alexander@fws.gov.

Sincerely,



Lee A. Barclay
Lee A. Barclay, Ph.D.
Field Supervisor

xc: Joe Johnston, FWS, Atlanta
Laila Lienesch, FWS, Frankfort
Don Seaborg, DOE, Paducah
Wayne Davis, KDFWR, Frankfort
Jeff Crane, EPA, Atlanta
Tuss Taylor, KDWM, Frankfort



Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

November 7, 2001

Dr. Lee A. Barclay, Ph.D.
Field Supervisor
Fish and Wildlife Service
446 Neal Street
Cookeville, Tennessee 38501

Dear Dr. Barclay:

**ADDITIONAL INFORMAL CONSULTATION UNDER SECTION 7 OF THE
ENDANGERED SPECIES ACT FOR THE PROPOSED IMPLEMENTATION OF
AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL IN PADUCAH,
KENTUCKY**

Thank you for meeting with us on October 15, 2001 to discuss comments of September 18, 2001 from your office on a Biological Assessment (BA) regarding the proposed implementation of the authorized limits process for waste acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant (PGDP), Paducah, Kentucky. This BA considered the federally listed species *Myotis sodalis* and was prepared as requested in your letter of June 13, 2001 and submitted to you on July 19, 2001.

The Department of Energy (DOE) has revised the BA in accordance with the comments and subsequent discussions and is submitting the Final BA for your review and concurrence. Based on the Final BA, DOE has determined that the proposed implementation of the authorized limits process at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant (PGDP) is not likely to adversely affect the listed species, *Myotis sodalis*. Results of the BA will be summarized in the text of the Environmental Assessment (EA) for the project, and the Final BA will be appended to the Final EA when it is published.

Following your review of the Final BA, please check the appropriate concurrence block and sign below. Please fax your comments to me at (865) 576-0746 as soon as possible, so that we may expeditiously complete the Final EA. If you need further information or wish to discuss the Final BA, please call me at (865) 576-0938. Thank you in advance for your prompt reply.

Sincerely,

A handwritten signature in cursive script that reads "James L. Elmore".

James L. Elmore, Ph.D.
Alternate NEPA Compliance Officer

Enclosure

cc: David Tidwell, EM-34
Harvey Rice, EM-34

Letter to Dr. Lee A. Barclay, Ph.D.

Dated November 6, 2001

Subject: **ADDITIONAL INFORMAL CONSULTATION UNDER SECTION 7 OF THE
ENDANGERED SPECIES ACT FOR THE PROPOSED IMPLEMENTATION
OF AUTHORIZED LIMITS PROCESS AT THE C-746-U LANDFILL IN
PADUCAH, KENTUCKY**

- This Biological Assessment supports the conclusion that the implementation of the authorized limits process at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, would not adversely impact federally listed protected species and/or habitat. With this BA, DOE has satisfied consultation requirements of Section 7 of the Endangered Species Act.

- This Biological Assessment does not support the conclusion that the implementation of the authorized limits process at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, would not adversely impact federally listed protected species and/or habitat. DOE has not satisfied consultation requirements of Section 7 of the Endangered Species Act.

Signature

Date

Endangered Species Act

BIOLOGICAL ASSESSMENT

Paducah C-746-U Landfill

Implementation of the Authorized Limits Process

Paducah Gaseous Diffusion Plant

McCracken County, Kentucky

Prepared by

Anne Dickie, M.S.

Senior Scientist, Tetra Tech, Inc.

October 2001

U. S. Department of Energy

Oak Ridge Operations Office

Oak Ridge, TN

**BIOLOGICAL ASSESSMENT FOR
THREATENED AND ENDANGERED SPECIES
UNDER SECTION 7 OF THE ENDANGERED SPECIES ACT
FOR AN EXISTING SOLID WASTE LANDFILL**

SUMMARY

This biological assessment (BA) evaluates potential impacts on federally listed species that could result from the implementation of the authorized limits process at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant (PGDP) in McCracken County, Kentucky. The species considered in this BA is the endangered Indiana bat as identified in a letter from the U.S. Fish and Wildlife Service to the U.S. Department of Energy, dated June 13, 2001 (FWS 2001a).

DOE concludes, for the reasons described in the main text of this BA, that the project is not likely to adversely affect this species. Also, since no proposed or designated critical habitats are present on, or near, the locations where activities would occur, none would be affected.

INTRODUCTION AND PROJECT DESCRIPTION

The C-746-U Landfill is an existing, sanitary/industrial landfill that was constructed from 1995 to 1997 by DOE for disposal of solid wastes that are not regulated as hazardous waste under *Resource Conservation and Recovery Act* (RCRA) Subtitle C or as waste containing polychlorinated biphenyls (PCBs) under the *Toxic Substances Control Act* (TSCA). The C-746-U Landfill is located north of DOE Paducah's main plant area and is permitted by the Commonwealth of Kentucky in accordance with the requirements of Kentucky solid waste regulations [401 Kentucky Administrative Regulations (KAR) 48, *Standards for Solid Waste Facilities*] and Subtitle D of RCRA. The landfill is lined, has a leachate collection system, and will have a multi-layer cap when closed.

Waste streams that may be acceptable for disposal at the C-746-U Landfill are generated from activities at the Paducah Site and include soils, wood, concrete, roofing and construction debris, and other

nonhazardous sanitary and industrial wastes [e.g., paper, fly ash, treated medical waste, asbestos, cardboard, tires, animal carcasses, detectable PCB (less than 50 ppm) waste, personal protective equipment, plastic, alkaline batteries, and metals]. The proposed action would not affect designation of the landfill as a sanitary/industrial landfill that does not accept RCRA-hazardous, TSCA-regulated, or radioactive waste.

Operation of the C-746-U facility is regulated by DOE under the authority of the *Atomic Energy Act* (AEA) and the Commonwealth of Kentucky under authority delegated by the U.S. Environmental Protection Agency (EPA) to enforce implementing regulations for RCRA through provisions in regulations for solid waste landfills by the Commonwealth of Kentucky (401 KAR 48). Under the AEA, DOE has the responsibility and authority to establish radiological limits for protection of the public and the environment, either in the form of release criteria for off-site disposition of waste it generates or for waste acceptance criteria for disposal of materials in a DOE-owned onsite landfill.

The following brief description is extracted from the draft Environmental Assessment (EA) for the project (DOE 2001). Of the two alternatives considered in the EA, one is No Action, and the second is implementation of the authorized limits process at the existing landfill. Alternative 1 - No Action would not affect wildlife, including listed species; thus, it is not considered further. The remaining alternative is briefly described below.

Alternative 2, the preferred alternative, in the EA (DOE 2001) is to implement the authorized limits process for determining the acceptability of solid waste containing low levels of residual radioactive materials on both a surface-contaminated and a volumetric basis in accordance with established DOE requirements for disposal at the C-746-U Landfill. Authorized limits are described in DOE Order 5400.5 Chapter IV, *Residual Radioactive Materials*, and are limits approved by DOE to permit the release of property from DOE radiological control, consistent with radiation protection standards for general employees, members of the public, and the environment. Authorized limits determinations would be evaluated in accordance with DOE Order 5400.5 and its associated guidance and would be both waste stream-specific and facility-specific.

Under Alternative 2, DOE would implement the authorized limits process per DOE Order 5400.5 to determine the acceptability of waste streams containing small amounts of residual radioactive materials in mass or volume for disposal at the C-746-U Landfill on a waste stream-specific basis. These authorized limits would differ from the operating limits or waste acceptance criteria historically used at this landfill for the acceptance of materials containing residual radioactivity as these limits would be developed on a waste stream-specific basis and formally approved in accordance with the requirements of DOE Order 5400.5 (or successor documents) and associated guidance. Waste streams containing residual amounts of surface radioactivity would be accepted for disposal if below the generic authorized limits enumerated in DOE Order 5400.5 (Table IV-1); however, any other authorized limits for surface radioactivity would have to be formally evaluated and approved by DOE on a waste stream-specific basis in accordance with DOE Order 5400.5 requirements. The WAC for the landfill would be revised to specify that the authorized limits process must be used where appropriate to determine and document the acceptability of waste for disposal. As before, RCRA-hazardous, TSCA-regulated, and radioactive waste would not be accepted.

DOE Order 5400.5 and its associated guidance allow for local approval of authorized limits which would result in an effective dose equivalent (EDE) to humans of 1 mrem/year or less. Authorized limits resulting in an annual EDE between 1 mrem and 25 mrem require additional approval by DOE Headquarters. The cognizant DOE field office has chosen to use a 1 mrem/year dose level in developing authorized limits for any wastes to be disposed at the C-746-U Landfill. Approval of authorized limits for waste streams to be disposed of at the C-746-U Landfill would be based on a dose assessment to demonstrate that the levels of residual radioactive materials in a given waste stream would satisfy criteria specified in DOE Order 5400.5 and associated guidance as well as to satisfy the DOE-ORO dose level of 1 mrem/yr EDE to the public for the C-746-U Landfill.

The dose assessment would evaluate the potential dose to both workers and the public under current and potential future scenarios. Each analysis would be modeled for specific waste streams at the landfill using conservative assumptions to estimate the potential doses. Only those waste streams estimated to result in doses of 1 mrem/yr EDE or less would be eligible for disposal at the landfill. Waste streams

containing residual radioactive materials below approved authorized limits do not require radiological control under the AEA and are not considered radioactive waste.

Specific exposure limits for biota would not be designated as part of the proposed action because no such limits have been formally established by DOE or by other regulatory agencies, and potential pathways for exposure as a result of this action are very limited. The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for vector and erosion control require daily placement of cover on the working face and maintenance of a vegetative cover over clean cover over the remainder of the landfill site. Waste streams placed in the landfill have low levels of organic content, and standard dust control practices are routinely followed. Thus, opportunities for local biota to come into contact with the waste, either directly or indirectly, are minimal. This is discussed in greater detail in the impacts section of this BA.

STATUS AND BIOLOGY OF THE LISTED SPECIES

Informal consultations were conducted in May 2001 with the USFWS, KDFWR, and the Kentucky State Nature Preserves Commission (KSNPC) to ascertain the potential presence of any listed species near the landfill. The U. S. Fish & Wildlife Service identified the Indiana bat (*Myotis sodalis*) as a federally-endangered species that could potentially occur near the landfill site (FWS 2001a). The Indiana bat is also a listed species by the Commonwealth of Kentucky. The Kentucky State Nature Preserves Commission reported an occurrence of the Indiana bat in McCracken County (KSNPC 2000), but not at the PGDP site (DOE 2000a). This reported occurrence in McCracken County, a result of mist netting, was made in June 1991 and was on West Kentucky Wildlife Management Area (WKWMA) land in the Joppa Quadrangle near the Shawnee Steam Plant and to the north of the landfill site (Hines 2001). More recently, five individuals of the Indiana bat were captured at two mist netting sites in riparian hardwood habitat near the lower downstream reaches of Bayou Creek in the WKWMA during surveys in 1999 (KDFWS, 2000). These locations were also to the north and approximately 2 mi (3.3 km) from the C-746-U Landfill. As a result of these sightings, the DOE has prepared this biological assessment considering potential impacts of the proposed action to the Indiana bat based on the presumption that the bat could be present near the landfill. The general ecology of the Indiana bat is summarized below.

Unless otherwise noted or referenced, general biological information on the species is derived from Harvey (1992 and 1999) and Webb (2000).

Indiana bat (*Myotis sodalis*)

The range of the endangered Indiana bat is the eastern U.S. from Oklahoma, Iowa, and Wisconsin east to Vermont and south to northwestern Florida. Distribution is associated with major cave regions and areas north of cave regions. The present total population is estimated at ca. 352,000 with more than 85% hibernating at only nine locations - two caves and a mine in Missouri, three caves in Indiana, and three caves in Kentucky.

Indiana bats hibernate in limestone caves from October to April, depending upon climatic conditions. Indiana bats usually hibernate in large, dense clusters of up to several thousand individuals in sections of the hibernation cave where temperatures average 38 - 43 F and with relative humidities of 66 to 95 percent. Bat clusters may contain 300 - 384 bats per square foot. The bats leave the caves and migrate to summer roosts in mid-spring.

Summer roosting-habitat criteria for Indiana bats are frequently revised as more is discovered about this species' habits. The most recent information applicable for the region is available from the FWS Cookeville Office (FWS 2001b). In general, Indiana bats establish summer maternity and sometimes male night roosts or bachelor colonies under the loose bark of large, usually hardwood trees [typically > 12.2 in (31 cm) diameter at breast height (dbh)]. Indiana bats have been observed to return to the same roosting and foraging habitat year-after-year. Indiana bats forage at night and feed on insects.

Female Indiana bats depart the caves before the males and arrive at summer maternity roosts in mid-May. A single off-spring, born in June, is raised by the mother under loose tree bark, primarily in wooded streamside habitat. Mothers and babies reside in maternity colonies that use multiple, primary roost trees throughout most of the summer. Secondary roosts are used intermittently by some of the bats, particularly during periods of extreme precipitation or extreme temperatures. Thus, there may be more than a dozen roosts used by some Indiana bat colonies (FWS 1999). Kurta et al. (1996) found that

female Indiana bats may change roosts about every three days, and a group of these bats may use more than 17 different trees in a single maternity season. They depart the summer roosts for hibernation caves in September. The summer roost of the adult males is often near the maternity roost, although a few males do stay in caves over the summer.

The first maternity colony was discovered in 1974 under the loose bark on a dead butternut hickory tree in east-central Indiana. The colony numbered about 50 individuals and also used an alternate roost under the bark of a living shagbark hickory tree. The total foraging range of the colony consisted of a linear strip along approximately 0.5 mi. of creek. Foraging habitat was confined to air space from 6 ft to ca. 95 ft high near the foliage of streamside and floodplain trees. Two additional colonies were discovered during subsequent summers, also in east-central Indiana. These had estimated populations of 100 and 91 respectively, including females and pups. Habitat and foraging area were similar to the first colony discovered. Evidence gathered during recent years indicates that, during summer, Indiana bats are widely dispersed in suitable habitat throughout a large portion of their range. Additional maternity colonies have been discovered using radiotelemetry techniques in more recent years. Data thus far reinforce the belief that floodplain forest is important habitat for Indiana bat summer populations. However, colonies have been located in upland and in coniferous habitats as well.

The bats arrive near their hibernation caves between August and September and begin swarming and mating activities. Swarming at the cave entrances continues into mid- or late October. The bats continue feeding during this time building a store of fat reserves for hibernation. It is thought that Indiana bats feed primarily on moths. Open riparian corridors along streams are required for foraging habitat. A longevity record of 13 years and 10 months has been recorded for the Indiana bat. Hibernating bats leave little evidence of their past numbers; thus, it is difficult to calculate a realistic estimate of the population decline for this species. However, population estimates at major hibernacula indicated a 34% decline in the total Indiana bat population from 1983 to 1989.

Although the C-746-U Landfill site has no hibernating or roosting habitat as described above, the creeks within an expanded area around the landfill site do provide Indiana bat summer foraging habitat. No maternity roosts have been verified on the WKWMA, but five individuals, including three juveniles,

were captured in the WKWMA during mist netting surveys in 1999 (KDFWS 2000) and a single specimen was reported in 1991 (KSNPC 2000).

ECOLOGICAL DESCRIPTION OF THE SITES

The following brief description taken from the draft EA for the project (DOE 2001) was verified through field reconnaissance by the author (A. Dickie, Tetra Tech, Inc., August, 2000). The C-746-U Landfill occurs within existing industrialized areas, but outside the fenced area, of the Paducah Gaseous Diffusion Plant. The WKWMA is to the landfill site's western side. The landfill site has been cleared and, where vegetative cover is present, is maintained by mowing. Vegetation on the landfill site consists of shallow-rooted grasses and other herbaceous ground cover and could provide a small amount of minimally suitable foraging habitat, but no roosting habitat for the Indiana bat.

Two intermittent tributaries of Little Bayou Creek, an intermittent stream, flow approximately 100 ft and 50 ft from the eastern and northwestern boundaries of the landfill site respectively. These tributaries are partially bordered by a thin riparian zone of plants. Trees, when present in close proximity to the landfill site, mainly along the two tributaries, are generally less than 12.2 in (30 cm) dbh and do not have loose bark as required by roosting Indiana bats. This riparian area near the landfill site could provide a small amount of potential foraging habitat but, no roosting habitat for the Indiana bat.

The nearby WKWMA consists primarily of stands of bottomland hardwoods interspersed with upland hardwoods and old fields. Potential summer roosting and foraging habitats for the Indiana bat are present in the WKWMA, although most trees are less than 12.2 in (30 cm) dbh. The Bayou Creek (formerly known as Big Bayou Creek) is the nearest blue-line stream in the area; the nearest of its tributaries to the landfill are on the western side of the WKWMA.

POTENTIAL IMPACTS OF THE PROJECT

The proposed action would not entail alteration or loss of habitat because it would take place at an existing landfill. Landfill procedures for disease vector and erosion control require daily placement of

cover on the working face and maintenance of a vegetative cover over uncontaminated soil on the remainder of the landfill site. Historically, waste streams placed in the landfill have had low levels of organic content, and standard dust control practices are routinely followed. Opportunities for bats to come into contact with the waste, either directly or indirectly, are minimal. Although no thresholds for exposure to radioactivity have been established for bats, a hypothetical scenario where bats could have routine unrestricted access to waste disposed at the C-746-U Landfill, is qualitatively evaluated for potential radiological impact as follows.

DOE (DOE Order 5400.5 II.3.a(5), DOE 1990) and the National Council on Radiation Protection and Measurements (NCRP 1991) have established a limit on the maximum acceptable dose rate to natural populations of aquatic biota at 1 rad/day. This dose limit was intended to apply to the most radiosensitive populations of aquatic organisms. Invertebrates are much more resistant to radiation induced damage than are vertebrates (e.g., fish). For example, a dose rate of 24 rad/day delivered during the life cycle of a snail did not significantly reduce reproduction (NCRP 1991).

No exposure limits for terrestrial biota have been formally established by DOE or by other regulatory agencies to date. However, DOE has issued an interim DOE Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (ENVR-0011) (DOE 2000b). DOE guidance recommends the use of this interim technical standard for evaluating potential impacts to both aquatic and terrestrial biota in the Annual Site Environmental Reports (ASERs) for all DOE sites. The interim technical standard specifies the following dose limits:

- the absorbed dose to aquatic animals should not exceed 1 rad/day from exposure to radiation or radioactive material;
- the absorbed dose to terrestrial plants should not exceed 1 rad/day from exposure to radiation or radioactive material; and
- the absorbed dose to terrestrial animals should not exceed 0.1 rad/day from exposure to radiation or radioactive materials.

These recommended limits for terrestrial biota are based on recommendations of the International Atomic Energy Agency (IAEA).

The generic dose limits listed above were developed using conservative assumptions, but were not specifically developed for individual species or organisms. The radiological dose absorbed by individual species or organisms in the same environment could vary depending upon the physiology, habitat, and resource utilization of the species or individual. Additionally, organisms may differ in their sensitivity to similar doses of absorbed radiation depending upon species, age, gender, or size. Since the absorbed doses experienced by different species or organisms could vary at any given location, the application of these generic dose limits to individual organisms must be approached with caution.

Some complexities of developing and applying generic dose limits to individual species may be illustrated by recent studies to validate models for dose estimation and on ecological risk assessment (Congdon 2001, Hinton 1993a, 1993b, 1998, and 1999). This is especially true when studying animals in their natural environment where multiple factors may cause and compound adverse effects to the animal. Identification of species-specific thresholds for observable effects as well as actual mortality thresholds that are attributable to exposures to radionuclides can be complicated by the potential presence of other contaminants in the environment. For example, many scientists believe that the declines in Indiana bat populations may be caused both directly and indirectly by pesticide use. Pesticides can affect bat populations by decreasing the quantity of insects available, by contaminating their food and water, or through direct exposure to chemicals when feeding in areas that have been recently treated (FWS 1998).

The seasonal nature of the Indiana bat's foraging habits and metabolism illustrates another type of consideration that would be involved in developing species-specific dose limits. The Indiana bat is insectivorous and will ingest as much as possible while active in the spring and summer in order to build up fat reserves for the winter (FWS 1999). Thus, although bats may have relatively low metabolic rates (Neuhasuer 1969 and YDRR 2001), they could potentially accrue relatively high radiological doses from the ingestion of contaminated insects over the foraging season. However, there are no empirical data to support the development of a radiological dose limit specifically for bats.

In the absence of specific data or dose limits for an individual species or type of animal (e.g., the Indiana bat), dose limits may be discussed on a screening basis. The recommended dose limit for terrestrial fauna is 0.1 rad/day, and the dose limit established for the proposed action at the C-746-U landfill is 1 mrem/year to humans. Using the generic dose limits provided above, the limit of 0.1 rad/day for terrestrial biota would equate to 36,500 to 730,000 mrem/year, a limit more than 4 to 5 orders of magnitude greater than the 1 mrem/year dose limit established for the proposed action. From this screening perspective, an individual species would have to absorb radiation on a mass equivalent (energy absorbed per gram of tissue) basis at a rate of 1×10^4 or 1×10^5 greater than humans to receive unacceptable doses of radiation from residual radiation in waste streams that might be accepted at the C-746-U Landfill under the proposed action. Thus, a dose limit of 1 mrem/year for humans should also provide protection for terrestrial biota in general.

The interim technical standard also tabulates values of the Biota Concentration Guide (BCG), which is defined as the limiting concentration of a radionuclide in soil, sediment or water that would not cause dose limits for protection of populations of aquatic or terrestrial biota to be exceeded. These BCG values are much higher than concentrations of radionuclides in waste that would be considered for disposal at the C-746-U Landfill. For example, the BCG screening values for radioisotopes of uranium in soil are 2000 to 5000 pCi/g. These guidelines would indicate that terrestrial biota must be routinely exposed to concentrations greater than these levels before adverse impacts would be expected.

These observations support the conclusions of the NCRP and IAEA for aquatic biota and the IAEA for terrestrial biota that the following statement by the International Commission on Radiological Protection (ICRP 1991) is reasonable: "...if man is adequately protected, then other living things are also likely to be sufficiently protected." It should also be noted that the metric used by these agencies to monitor protection of humans is the dose limit of 100 mrem/year rather than the constraint of 1 mrem/year selected for the proposed action at the C-746-U landfill, thereby adding an additional hundred-fold margin of safety for biota at this site.

The above discussion considers hypothetical bats that are directly exposed to waste streams potentially containing residual radioactivity. As noted above, direct correlations between radiological doses

absorbed by human and radiological doses absorbed by bats must be approached with caution. In relating this analysis to Indiana bats that are potentially present near the C-746-U Landfill, consideration of the potential exposure pathway and likelihood of exposure for the bats is highly relevant. The waste would be exposed only during daytime operating hours when the bats are generally not active and are under cover. Regulations for solid waste landfills require that waste be covered at least daily, and that dust generation be minimized as a part of normal operating procedures. Thus, the bats are unlikely to come into direct contact with the waste streams.

Although unlikely, it is possible that an Indiana bat foraging over the riparian area along the tributaries of Little Bayou Creek near the landfill (or over the grass cover at the landfill site) might ingest insects containing residual radioactivity from C-746-U Landfill waste. For example, if the moths or other insects ingested by the bat had been in contact with waste streams at the landfill through external contact with the waste or through ingestion of the waste, they could be carriers of residual radioactivity. Normal operating practices minimize ways for either the insects or the bats to come into external contact with the waste. Routine dust control measures and daily cover practices at the landfill minimize the potential for radiological contamination of nearby surfaces, including vegetation, on an ongoing basis. A multi-layer cover system topped by a surface layer of shallow-rooted vegetation for the purposes of erosion control is placed over segments of the landfill as waste disposal is completed. This vegetation would not be expected to penetrate below the clean soil cover layer of the landfill and would not accumulate residual radioactivity via uptake through the root system. The cover system is also designed to discourage any burrowing animals. Thus, it is unlikely that insects, or other organisms, would ingest or come into contact with waste disposed of at the C-746-U Landfill. As a result, it is unlikely that residual radioactivity from the waste would enter the food chain of the Indiana bat.

CONCLUSION

It is not necessary to conduct a quantitative estimate and assess a radiological absorbed dose for bats as a result of the proposed action, and the project as proposed would be unlikely to adversely affect the Indiana bat because:

- while a potential for exposure of the bats to the waste as a result of the proposed action cannot be ruled out, there is nothing to indicate that such exposure would be more likely than the potential for exposures of humans working at the landfill;
 - minimal foraging habitat for the bats is present on the site for the proposed action;
 - foraging habitat (riparian vegetation along intermittent tributaries) present near the site of the proposed action is unlikely to become contaminated by residual radioactivity from waste disposed of at the C-746-U Landfill;
 - routine landfill operating procedures would allow minimal opportunity for direct exposure of local biota, including Indiana bats, to residual radioactivity;
 - routine landfill operating procedures would allow minimal opportunity for residual radioactivity from the waste to enter the food chain of local biota, or otherwise lead to indirect exposure of Indiana bats to radioactivity;
- a margin of safety of at least 1×10^4 for the bats inherent to the dose limits set for humans under the proposed action is assumed;
 - if exposure did occur, it would be orders of magnitude below any available guidance related to dose limits for terrestrial fauna; and
- no habitat alteration or destruction would occur as a result of the proposed action.

REFERENCES:

- Congdon 2001. Congdon, J. D., A. E. Dunham, W. A. Hopkins, C. L. Rowe, and T. G. Hinton. Resource allocation-based life histories: A conceptual basis for studies of ecological toxicology. *Environmental Toxicology and Chemistry* 20:1698-1703.
- DOE 1990 DOE, *Radiation Protection of the Public and the Environment*, DOE Order 5400.5, Washington, D.C., February 8, 1990.
- DOE 2001 DOE (U.S. Department of Energy). *Draft Environmental Assessment on the Implementation of the Authorized limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*. March 2001.
- DOE. 2000a DOE. *Paducah Annual Site Environmental Report for 1999*.
- DOE. 2000b DOE. DOE Draft Technical Standard, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (Project No. ENVR-0011), July 2000.
- FWS 2001a FWS (U. S. Fish and Wildlife Service, Department of Interior). Letter from Dr. Lee A. Barclay, FWS, to Dr. James L. Elmore, DOE, June 13, 2001.
- FWS 2001b FWS. "Components of Suitable Habitat for the Endangered Indiana Bat." Paper provided by Steven Alexander of the FWS, Cookeville, TN Office via e-mail on October 22, 2001.
- FWS 1999 FWS, Region 3. *Agency Draft, Indiana Bat (Myotis sodalis) Revised Recovery Plan*. Original approved: October 14, 1983. Technical draft of revised plan completed October 1996. This version prepared by the Indiana Bat Recovery Team March 1999. Accessed May 2001 at <http://midwest.fws.gov/pdf/inbat.pdf>.
- FWS 1998 FWS. *Endangered Species Facts, Indiana Bat*. August 1998. Accessed May 2001 at http://midwest.fws.gov/Endangered/mammals/ibat_fctsht.htm.
- Harvey 1999 Harvey, M. J., J. S. Altenbach, and T. L. Best. *Bats of the United States*. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service. 64 pp.
- Harvey 1992 Harvey, Michael J. *Bats of the Eastern United States*. Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service. 46 pp. February 1992.
- Hines 2001 Hines, Sarah. Personal communication regarding a reported sighting of *Myotis sodalis* between Sarah Hines, Data Specialist, Kentucky State Nature Preserves Commission and Anne Dickie, Scientist, Tetra Tech, Inc. July 9, 2001.

- Hinton 1993a Hinton, T.G. "Variation among model predictions within an IAEA validation exercise. p. 138-143." In *Proceedings of the Topical Meeting on Environmental Transport and Dosimetry*, American Nuclear Society, Inc. Charleston, SC. 1993
- Hinton 1993b Hinton, T.G. "Sensitivity analysis of ecosys-87: an emphasis on the ingestion pathway as a function of a radionuclide and type of disposition." *Health Physics* 66:513-531. 1993.
- Hinton 1998 Hinton, T.G. 1998. "Estimating human and ecological risks from exposure to radiation. p. 143-166." In *Risk Assessment: Logic and Measurement*, edited by M. Newman and C. Strojan. Ann Arbor Press, Inc. Chelsea.
- Hinton 1999 Hinton, T.G. "Risks from exposure to radiation." p. 251-278. In *Fundamentals of Ecotoxicology* 1999.
- ICRP 1991 ICRP (International Commission on Radiological Protection). "1990 Recommendations of the International Commission on Radiological Protection". Publication No. 60. Pergamon Press. 1991.
- KDFWR 2000 Kentucky Department of Fish and Wildlife Resources (KDFWR). James S. Lane, Jr., Author. "Mist Net Surveys for the Indiana Bat (*Myotis sodalis*) at West Kentucky Wildlife Management Area Paducah, Kentucky." February 2000.
- KSNPC 2000 Kentucky State Nature Preserves Commission (KSNPC). "Monitored Species of McCracken County Kentucky". Online reports at <http://www.kynaturepreserves.org> accessed June 25, 2001.
- Kurta 1996 Kurta, A., K. J. Williams, and R. Mies. "Ecological, Behavioural, and Thermal Observations of a Peripheral Population of Indiana Bats (*Myotis sodalis*)". Pages 102-117, in R. M. R. Barclay and R. M. Brigham, editors. *Bats and Forests Symposium*. Research Branch, Ministry of Forests, Province of British Columbia, Victoria, British Columbia, 1996.
- NCRP 1991 National Council on Radiation Protection and Measurements (NCRP). "Effects of Ionizing Radiation on Aquatic Organisms, Recommendations of the National Council on Radiation Protection and Measurements". Publication No. 109. Bethesda, MD. August 30, 1991.
- Neuhauser 1969 Neuhauser, H.N. and I.L. Brisbin Jr. 1969. "Energy utilization in a captive silver-haired bat." *Bat Research News* 10:30-31.
- Webb 2000 Webb, J. Warren. *Biological Assessment NABIR Project, Selection and Operation of the Proposed Field Research Center on the Oak Ridge Reservation*. February 2000.
- YDRR 2001 Yukon Department of Renewable Resources (YDRR). *Yukon Mammal Series, Little Brown Bat*. Accessed October 17, 2001 at <http://www.renres.gov.yk.ca/wildlife/bat.htm>.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

446 Neal Street
Cookeville, TN 38501

December 4, 2001

Mr. James L. Elmore, Ph.D.
U.S. Department of Energy
Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831

Dear Dr. Elmore:

Thank you for your letter and enclosure of November 7, 2001, transmitting the revised Biological Assessment (BA) for the implementation of the authorized limits process at the C-746-U Landfill at the Paducah Gaseous Diffusion Plant in McCracken County, Kentucky. This revised BA includes an evaluation of potential effects to the Federally endangered Indiana bat (*Myotis sodalis*). U.S. Fish and Wildlife Service (Service) personnel have reviewed the revised BA and offer the following comments for consideration.

The BA is adequate and supports the conclusion of not likely to adversely affect, with which we concur. In view of this, we believe that the requirements of Section 7 of the Endangered Species Act (Act) have been fulfilled and that no further consultation is needed at this time. However, obligations under Section 7 of the Act must be reconsidered if: (1) new information reveals that the proposed action may affect listed species in a manner or to an extent not previously considered, (2) the proposed action is subsequently modified to include activities which were not considered in this biological assessment, or (3) new species are listed or critical habitat designated that might be affected by the proposed action.

These constitute the comments of the U.S. Department of the Interior in accordance with provisions of the Endangered Species Act (87 Stat. 884, as amended: 16 U.S.C. 1531 et seq.). We appreciate the opportunity to comment. Should you have any questions or need further assistance, please contact Steve Alexander of my staff at 931/528-6481, ext. 210, or via e-mail at steven_alexander@fws.gov.

Sincerely,

Lee A. Barclay, Ph.D.
Field Supervisor

xc: Joe Johnston, FWS, Atlanta
Wayne Davis, KDFWR, Frankfort

APPENDIX B:
STAKEHOLDER COMMENTS AND
DOE RESPONSES

Title of Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
 Document number or other identifier: DOE/EA 1414
 Comments Received: April 23, 2001

Name of Commentor:	John Hamilton, Project Officer
Organization of Commentor:	U.S. Environmental Protection Agency, Office of Environmental Assessment (OEA), Region IV

Comment No.	Page/Reference	Comment	Response
<i>Comments</i>			
1	Site Ownership and Management, Section 1.1	Section 1.1 indicated that authorized limits are approved by DOE <i>to permit the release of property under DOE control</i> (italics added) consistent with radiation protect standards for general employees, members of the public, and the environment. Although this clause referencing releases of property does not appear elsewhere in the document, it is not clear if DOE intends to dispose of the C-746-U Landfill, operate it through the contractor-based management plan, or privatize the site for commercial uses, presumably as a landfill. The document should clearly indicate DOE's future ownership/management plans for the site.	DOE has no current plans to either transfer, or privatize, the landfill for commercial use. DOE's current plans are to continue to operate the C-746-U Landfill as a DOE-owned contractor-operated facility indefinitely. The proposed action to implement the authorized limits process presumes continued DOE ownership of the facility. The authorized limits process may be applied to the release of real or non-real property (including waste) that contains low levels of residual radioactive materials. Release may be unrestricted or may be restricted to a specified disposition (e.g., disposal at an onsite DOE landfill, disposal at a non-DOE offsite landfill). Under the proposed action, each waste stream would be released specifically for disposal at the C-746-U Landfill.

Comment No.	Page/Reference	Comment	Response
2	Waste Material Sources and Volumes Page 4, Section 2.2	The Preferred Alternative discussion indicated that "... [O]nly off-site waste generated as a result of PDGP operations and activities would be accepted from off-site for disposal in the C-746-U Landfill (e.g., concrete rubble from Wag 17)." This statement requires clarification, for it is unclear at how many waste streams are generated in the process from mining, transport, and enrichment "operations and activities" might entail. The average citizen reading this EA has no way to determine how and where off-site wastes might be generated requiring transportation to and disposal in the C-746-U Landfill. The document should clarify potential materials and volumes of wastes that are generated off-site, and to what extent other off-site waste streams will be disposed in the landfill.	<p>The statement has been clarified to indicate that only waste at the PGDP and generated as a result of cleanup activities in the immediate vicinity of the PGDP would be disposed of at the C-746-U Landfill.</p> <p>This EA does not consider disposition of specific waste streams. Rather, it considers implementation of the authorized limits process at the C-746-U Landfill.</p>
3	Geologic Features Section 4.3	Accident scenario describes potential damage of the composite liner as a result of seismic event and that the Paducah Site is in an area of high seismic risk, such as earth tremors. We are aware of other seismic events: portions of Kentucky are underlain with karst formations - subterranean fissures, sinkholes, caves, and discontinuities created by eroding limestone - that may collapse or subside due to groundwater erosion of the sub-surface limestone. The collapse of a karst feature beneath the landfill - assuming one were to exist - could place radioactive materials in contact with groundwater and thereby spread to surface waters. The document should indicate if the site were examined for potential karst features and evaluate the risk for collapse.	The accident scenario described in the EA was considered a worst case scenario, i.e., complete failure of the landfill containment. No additional seismic evaluations were included because the worst case "catastrophic failure of the landfill containment system" is an upper bound of the worst case event, seismic or otherwise.

03

Comment No.	Page/Reference	Comment	Response
4	NEPA Process	The distribution of the EA to the public was minimal to unsatisfactory. Other than federal and state agencies, it appears that only five persons - the mayor of Paducah, the wildlife manager, a citizen's board and two citizens - were provided with a copy of the document. It is suggested that the document achieve a much wider distribution and be submitted to libraries, environmental interest groups, and local news print press more thoroughly meet the intent of NEPA to disclose to the public a government action.	The document was more widely distributed than described in this comment. The general public was informed about the issuance and availability of the draft EA through local press announcements, specifically in the Paducah Sun. Additionally copies of the draft EA were distributed to the McCracken County Public Library in Paducah, KY; the Environmental Information Center in Kevil, KY ; the DOE Reading Room in Oak Ridge, TN; individuals who have requested to be included on the PGDP mailing list; and also was available to download from the internet.

91

Title of Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
 Document number or other identifier: DOE/EA 1414
 Received: April 23, 2001

Name of Commentor:	Jon Richards, Regional Radiation Expert
Organization of Commentor:	U.S. Environmental Protection Agency, Office of Technical Services, Region IV

Comment No.	Page/Reference	Comment	Response
<i>General Comment</i>			
1		... concern for DOE not being completely "open" or clear about levels of residual radioactivity being below their levels of concern without acknowledging CERCLA risk ranges of concern. And, applying their DOE orders as the criteria for decision making for DOE operated activity, yet on an NPL site, is not discussed clearly either.	<p>Germane risk levels are presented in Section 4.2.1, page 22 of the EA. CERCLA risk ranges are not relevant for purposes of the EA since the C-746-U Landfill is not the subject of a CERCLA action.</p> <p>A major purpose of this EA is to ensure openness and clarity about the process used to evaluate what levels of residual radioactive materials are acceptable for disposal at the C-746-U landfill. The process for this evaluation is the authorized limit process prescribed in DOE Order 5400.5 and associated guidance.</p>

26

Comment No.	Page/Reference	Comment	Response
<i>Specific Comments</i>			
1	Page 1, Section 1.1	"for the purposes of AEA" - need AEA reference for what's considered "below authorized limits." Is this specific to each site, or general or what? Page 33 - What about for purposes of CERCLA? What does this level compare to the risk range, e.g., 1 mrem/yr ~ 10 ⁻⁵ risk?	<p>As the EA discusses the standards for determining what is considered below authorized limits are set forth in DOE Order 5400.5. The EA discusses the requirements for the application of those standards.</p> <p>By definition, levels of residual radioactive materials below authorized limits for a specified waste stream and disposition do not require control as radioactive waste under the AEA. The authorized limits must be established for each waste stream and disposition, in this case the C-746-U landfill. While the CERCLA target risk range is not directly pertinent to the authorized limits process, the dose constraint selected for the C-746-U landfill of 1 mrem/yr is well within this target risk range as noted in Section 4.2.1.</p>
2	Page 2, 2d paragraph	Understanding the limitations given in Sec. 2.2.1, ignoring the volumetric levels of non-uranium radionuclides, like ⁹⁹ Tc can severely underestimate the source term potential for the performance of the landfill, for e.g., ~1000 yrs. It will be crucial to analyze the waste removed from the N-S ditch, for e.g., to get an accurate estimate of the future source term put in it.	As discussed in the EA, implementation of the authorized limits process would include limits for all applicable radionuclides, not just uranium. The evaluation of future specific waste streams would take into consideration specific radionuclides contained in those waste streams.

Comment No.	Page/Reference	Comment	Response
3	Page 3, Section 1.3	Don't understand why Alt. 2 is the only option, and not one that might consider performance of a low-level or residual radioactive waste landfill, like 10 CFR 61 or KY's equivalent? Oak Ridge is using 1 ⁻⁵ for first 1,000 yrs, and 1 ⁻⁴ for post-1,000 yrs. Have you considered being consistent with their CERCLA landfill?	The current EA considers only the operation of the C-746-U Landfill, which is a permitted solid waste contained landfill. Specifically, this EA considers the implementation of the authorized limits process for evaluating wastes for potential disposal at this facility. Criteria for approval of authorized limits are specified in DOE Order 5400.5 and associated guidance. The Oak Ridge facility referenced in the comment is dissimilar from the C-746-U landfill in that it is designed for disposal of radioactive and/or hazardous wastes.
4	Page 4, Section 2.2	<p>Who's the "local approval?" KY? Need to be specific on who has the authorization and who's determining levels below levels of DOE, EPA, and KY's concern.</p> <p>Also, where this dose is to be applied is questionable: worst case scenarios of several waste streams being close to the 1 mrem/yr limit vs what is calculated at the "compliance point" vs MCLs, for e.g., need to be discussed here.</p>	<p>Local approval refers to the DOE Field Office. DOE is authorized to make this determination under the AEA as discussed in Section 1.2 of the EA.</p> <p>The meaning of this portion of the comment is unclear.</p>
5	Page 6, Section 2.2.2	"The applicable Federal and state requirements" need to be at least referenced here, as well it would be appropriate to include here the primary driver, i.e., MCLs [40 CFR 141].	<p>Comment Noted:</p> <p>Applicable laws and regulations include 401 KAR 48:300, "Surface and Groundwater Monitoring and Corrective Action." This regulatory requirement addresses standards for solid waste facilities requiring a groundwater monitoring plan and design requirements for groundwater monitoring systems.</p> <p>This is the regulatory driver for groundwater monitoring at the C-746-U contained Landfill. Applicable MCLs are referenced in the above referenced regulations. Reference to KAR 48:300 has been added to the EA.</p>

Comment No.	Page/Reference	Comment	Response
6	Page 7, top sentence	To avoid future "unnecessary" surveys or remediation of this landfill, precaution and examples from other DOE sites should be followed, whether other low-level radioactive waste disposal sites or other remediation burial sites under CERCLA.	Any remediation levels ultimately developed for the Paducah site and other similar sites would be considered in the evaluation of authorized limits for a specific waste stream.
7	Page 20, Section 4.1.1	This discussion on relative radiation doses to the public should be included separately in an appendix or the glossary, not here under the alternatives. This is inappropriate to the discussion of the alternatives and the actions proposed. Also, the dose/risk discussion in Section 4.2.1 similarly should be moved to the back.	Comment noted.
8	Page 33, Glossary	Need to add definitions for "residual radioactivity" and "radioactive contamination." Also, the definition for "radioactive waste" should not be from a RCRA CFR reference. Use a DOE or NRC definition/reference.	"Residual radioactivity" has been added to the Glossary. No definition for was added for "radioactive contamination."

95

Title of Reviewed Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Document number or other identifier: DOE/EA 1414

Comments Received: April 23, 2001

Name of Commentor:	Jeffery Crane, Senior
Organization of Commentor:	U.S. Environmental Protection Agency, Federal Facilities Branch, Region IV

Comment No.	Page/Reference	Comment	Response
<i>Comments</i>			
1	Section 1.2	This section should provide a more thorough description of the expected waste streams. Specifically, describe whether the landfill expects to receive wastes from CERCLA response actions and RCRA corrective actions. A more thorough description of anticipated waste streams, volumes, hazardous substances, waste form, etc., should be provided.	The scope of the EA is appropriate for the proposed action, which is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill. Any effects that would result from the disposition of future waste streams would be bounded by the 1 mrem/yr effective dose equivalent (EDE) standard that is proposed for determining authorized limits at the C-746-U Landfill. It is not a foregone conclusion that CERCLA-derived materials will be disposed in the C-746-U Landfill. Decisions pertaining to the potential disposal of such materials will be addressed through future CERCLA decision documents and in accordance with applicable permit, regulatory, and statutory requirements and are beyond the scope of the proposed action discussed in this assessment. However, while the determination of whether to place CERCLA-derived materials in the landfill is beyond the scope of the proposed action, potential impacts associated with

96

Comment No.	Page/Reference	Comment	Response
1 (continued)			the potential disposition of CERCLA-derived materials are properly considered within the scope of the cumulative impacts analysis since such disposition may in fact occur. Thus, potential for disposal of CERCLA-derived materials is considered in the Cumulative Impacts portion of this EA.
2	Sections 1.1 and 1.4	The purpose of DOE Order 5400.5, as stated in Section 1.1 is to "... establish standards and requirements for operation of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation." The purpose of the proposed action is to implement the Authorized Limits Process to demonstrate the C-746-U Landfill operations are protective of human health and the environment for "residual" radioactivity. This process appears to be consistent with the intent of the performance assessment process being conducted for the CERCLA repository for radionuclides and would be a necessary evaluation to demonstrate the long-term protectiveness of the landfill operations, specifically for radionuclides.	Performance assessments are conducted for disposal facilities that accept radioactive waste. DOE is not proposing that the C-746-U Landfill accept radioactive waste (see pp 1 and 4 in the EA).

97

Comment No.	Page/Reference	Comment	Response
2 (continued)		<p>The Authorized Limits Process does not address non-radioactive hazardous substances. If DOE confirms its intent to use the C-746-U Landfill for disposal of wastes derived from CERCLA remedial actions and RCRA corrective actions in response to Comment 1 above, DOE should agree to assess the long-term protectiveness of the C-746-U Landfill operations for hazardous substances and not limit the technical evaluation to radionuclides. EPA believes that any consideration for programmatic use of the C-746-U Landfill for on-site disposal of CERCLA and RCRA cleanup wastes must be defended with a performance assessment that demonstrates the long-term protectiveness of the landfill operations for key hazardous substances, including both radionuclides and chemicals. Fortunately, the level of effort to conduct this assessment can be reduced by coordinating a C-746-U Landfill performance assessment with the performance assessment for the CERCLA Repository. The C-746-U Landfill operations and waste streams that differ from the CERCLA Repository design and waste inventory can be accounted for in the model assumptions (e.g., single liner, geologic setting, waste source concentrations, etc.).</p>	<p>The scope of the EA is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill. The waste streams that would be accepted at the C-746-U Landfill would be non-hazardous under RCRA (page 4 of the EA). Accordingly, the EA addresses residual radioactivity that could be present in non-hazardous and in waste that is not classified as radioactive waste.</p> <p>As noted in the response to the previous comment, performance assessments (PAs) are conducted for radioactive waste disposal facilities, under the requirements of DOE Order 435.1. Since the C-746-U landfill does not accept radioactive waste, no PA is required for this facility. However, please note that the analysis conducted under the authorized limits process is similar in many respects to the PA process.</p>

86

Title of Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
 Document number or other identifier: DOE/EA-1414
 Comments Received: April 27, 2001

Name of Commentor:	Tuss Taylor for Robert H. Daniell
Organization of Commentor:	Division of Waste Management for the Kentucky Natural Resources and Environmental Protection Cabinet, Comments for the Solid and Hazardous Waste Branches

Comment No.	Page/Reference	Comment	Response
<i>General Comments</i>			
GC-1		This document, along with the 1995 Environmental Assessment (EA) for the C-746-U Landfill, fails to provide an adequate assessment for the proposed disposition of site remediation wastes. The scope of the document should be expanded to assess the environmental consequences caused by disposition of site remediation wastes in the U-Landfill.	<p>The scope of the EA is appropriate for the proposed action, which is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill.</p> <p>Decisions pertaining to the potential disposal of CERCLA-derived materials will be addressed through future CERCLA decision documents and in accordance with applicable permit, regulatory, and statutory requirements and are beyond the scope of the proposed action discussed in this assessment. However, while the determination of whether to place CERCLA-derived materials in the landfill is beyond the scope of the proposed action, potential impacts associated with the potential disposition of CERCLA-derived materials are properly considered within the scope of the cumulative impacts analysis since such disposition may in fact occur.</p>

69

Comment No.	Page/Reference	Comment	Response
<i>Specific Comments</i>			
Hazardous Waste Branch			
HW-1	Page 3, Section 1.3	<p>The Kentucky Division of Waste Management does not agree with DOE's approach to the evaluation and assessment of the C-746-U Landfill under the NEPA process. Specifically, the Department does not believe that "tiering under and supplementing" (as DOE describes this assessment on page 3) a fundamentally flawed 1995 EA for the C-746-U Landfill accomplishes the intent of NEPA. The 1995 EA for the C-746-U Landfill did not adequately address the remediation wastes that DOE, according to recent draft decision and budget planning documents, intends to place in this landfill. This assessment fails to even attempt to quantify the contaminated material associated with this proposed action or the potential environmental releases associated with such an action.</p>	<p>Please see response to GC-1. DOE believes that the document is NEPA compliant.</p>
HW-2	Page 3, Section 1.4	<p>The statement of purpose and need does not relate to the broad requirement of DOE action, instead it relates only to one specific proposal, (the authorized limits process). Expand this section and, for that matter, the entire document to address the wastes proposed for disposal in the C-746-U Landfill and the environmental impact of this proposed action.</p>	<p>The statement of purpose accurately reflects the proposed action, which is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill.</p> <p>Decisions pertaining to the potential disposal of CERCLA-derived materials will be addressed through future CERCLA decision documents and in accordance with applicable permit, regulatory, and statutory requirements and are beyond the scope of the proposed action discussed in this assessment. However, while the determination of whether to place CERCLA-derived materials in the landfill is beyond the scope of the proposed action, potential impacts associated with the potential disposition of CERCLA-derived materials are properly considered within the scope of the cumulative impacts analysis since such disposition may in fact occur.</p>

001

Comment No.	Page/Reference	Comment	Response
HW-3	Page 4, Section 2.2	This alternative should be expanded to fully address the wastes proposed for disposal in the C-746-U Landfill.	The discussion of the alternatives properly reflects scope of the proposed action, which is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill. See also responses to GC-1 and HW-2.
HW-4	Page 19, Section 4.0	This section should be expanded to include the potential for releases from all hazardous substances associated with the planned disposition of remediation wastes in the C-746-U Landfill.	This EA properly addresses potential effects, given the alternatives presented in the EA. Specifically, the EA discusses: potential effects to workers, the public, biota, water quality and air quality resulting from radiological exposures; potential for radiological releases to surface and groundwater and air, and potential indirect effects related to cost-effectiveness of landfill operations. See also responses to General Comment 1 and Specific Comment 2.

101

Comment No.	Page/Reference	Comment	Response
<i>Solid Waste Branch Comments</i>			
SW-1		The C-746-U Landfill is permitted and regulated under numerous statutes and regulations in addition to 401 KAR Chapter 48, which was the only solid waste regulation cited in the subject document (see Page 2, Paragraph 4). Applicable statutes and regulations include (but are not limited to) KRS Chapter 224 and 401 KAR Chapters 30, 40, 47, 48, and 49.	Comment noted.
SW-2		According to the Environmental Assessment, DOE Order 5400.5 applies to the "establishment of authorized limits for the disposal of DOE waste streams containing residual radioactive materials at DOE on-site landfills and <i>at non-DOE off-site landfills.</i> " If this is so, can this waste be taken to any contained landfill?	The proposed action only addresses implementation of DOE Order 5400.5's authorized limits process for waste potentially destined for disposal at the onsite C-746-U Landfill. Authorized limits must be developed and approved for the specific waste stream and disposal facility, and in this case would be specific to the C-746-U landfill.
SW-3		The C-746-U Landfill's liner may not be ideal for the emplacement of conventional municipal solid waste, much less low level radioactive waste and/or CERCLA cleanup waste. The liner design of the C-746-U Landfill was determined to meet the generic minimum requirements of the Kentucky Administrative Regulations at the time the initial construction permit was issued. However, meeting the generic minimum of the requirements of the regulations is not necessarily equivalent to being protective of human health and the environment. The design inadequacies include: (1) Subgrade instability and lack of underdrain, (2) Seismic hazards, (3) Frost penetration of the primary clay liner, and (4) Waste-specificity of the design. A discussion of each of these factors follows.	As noted, the Commonwealth has determined that the C-746-U Landfill was constructed in compliance with the regulatory requirements pertaining to solid waste landfills that were in effect at the time the C-746-U Landfill was built. No low-level radiological waste would be placed in the landfill. Any CERCLA cleanup waste destined for the C-746-U Landfill would have to be properly addressed in appropriate CERCLA documentation, meet CERCLA's requirement to comply with ARARs, and would also have to meet the C-746-U Landfill waste acceptance criteria and permit requirements. The Commonwealth's comments regarding perceived potential "design inadequacies" are addressed below.

Comment No.	Page/Reference	Comment	Response
a	Page 14, Paragraph 7	<p>Subgrade instability and lack of underdrain: The C-746-U Landfill subgrade repeatedly failed proofroll tests because of high groundwater table in the Upper Continental Recharge System (UCRS) beneath the site. (The seasonal high groundwater level in the UCRS is approximately five feet beneath the bottom of the excavation). A "bridge lift" of granular material (i.e., gravel) had to be emplaced to enhance the subgrade to meet minimum regulatory requirements. Ideally, although not required by regulation, an underdrain system should have been installed. First, an underdrain system would have allowed dewatering of the shallow subsurface materials under the landfill, increasing the structural stability of the liner. Second, the underdrain system would have provided an additional groundwater monitoring point beneath the landfill in a geologic medium that has groundwater flow with a strong downward gradient. An underdrain system would effectively rectify the difficulty of monitoring groundwater in the UCRS that was noted in Page 14, Paragraph 7 of the EA. Finally, the underdrain system would have aided in the remediation of any potential releases of contaminants from the landfill by providing an additional pump-and-treat contaminant extraction source.</p>	<p>The Commonwealth has determined that the C-746-U Landfill was constructed in compliance with the regulatory requirements pertaining to solid waste landfills that were in effect at the time the C-746-U Landfill was built. As noted by the commentor, an underdrain system is not required by regulations.</p>

123

Comment No.	Page/Reference	Comment	Response
b	Page 13, paragraph 2	<p>Seismic Hazards: In the EA , DOE states that “the potential for releases of contaminants from the Paducah site resulting from potential seismic events have not been quantified to date.” Such an evaluation is critical to the WAC development process. The C-746-U Landfill is located approximately twenty miles from the northern segment of the New Madrid Seismic Zone, and has the greatest seismic hazard of any contained landfill in the Commonwealth of Kentucky. The seismic hazards at PGDP are so severe that landfill liner and leachate collection system damage due to earthquakes is possible, if not probable. As presently constructed, this landfill probably does not meet the present seismic design standards for contained landfills in 401 KAR 48:070 and 40 CFR Chapter 1 (258.14). The present USGS seismic hazard maps indicate a three-fold increase in the Peak Ground Acceleration (PGA) at the site compared to the maps used in the original design of the C-746-U Landfill. Furthermore, the effects of local seismicity and faulting have been largely ignored. At a minimum, the seismic hazards to the C-746-U Landfill should be reevaluated using methods presently employed to evaluate the seismic hazards to the potential CERCLA cell.</p>	<p>The language quoted in this comment appears in the Affected Environment section of the EA. The Environmental Consequences section of the EA specifically addresses and considers seismic issues potentially associated with the proposed action. The proposed action does not include development of waste acceptance criteria (WAC) for the C-746-U Landfill. The purpose of the proposed action is to implement the authorized limits process at the C-746-U Landfill on a waste stream specific basis. Finally, the DOE notes that the Commonwealth’s concerns regarding seismic issues at the C-746-U Landfill are currently being discussed in the context of a modification to the C-746-U Landfill operating permit.</p>
c		<p>Frost penetration of the primary liner: The construction contractor for the C-746-U Landfill allowed the primary clay liner in construction phases 1 and 2 to undergo frost penetration over the winter, in violation of approved plans and best engineering practices. The clay had to be dug up, recompacted, and retested.</p>	<p>As noted in the comment, the clay liner was dug up, reinstalled, and retested to ensure that it was structurally sound. Any concerns regarding the landfill’s clay liner were addressed in consultation with the Commonwealth at the time the landfill was constructed.</p>

141

Comment No.	Page/Reference	Comment	Response
d		<p>Waste-specificity of design: The C-746-U Landfill was designed and constructed on anticipation of its use for the emplacement of conventional municipal solid waste and specific types of industrial waste. The waste now intended for the landfill do not possess the same properties that the original waste streams possessed. The density, fluid content, chemical composition, organic content, porosity, permeability, compaction potential, and seismic response could differ considerably from those of the original waste streams. Permit modification will be necessary to change waste types and volumes intended for this landfill, and construction/operation modifications may be necessary.</p>	<p>The scope of the EA is the implementation of the authorized limits process per DOE Order 5400.5 at the C-746-U Landfill. The physical and chemical characteristics of the waste to be placed in the landfill are not expected to be affected by the proposed action.</p>
No comments numbered 4, 5, or 6 were submitted by the Division of Solid Waste			
SW-7		<p>The C-746-U Landfill is in groundwater contamination assessment as required by 401 KAR 48:300 Section 8 for both MCL and statistical exceedences of volatile organic compounds, metals, and radionuclides. Because of the total failure of the groundwater monitoring system at this landfill, we cannot assume that the samples collected from these wells accurately reflect aquifer conditions at the site. Therefore, it is effectively impossible to determine whether the landfill leachate containment systems (i.e., the liner and leachate collection systems) at the C-746-U Landfill have failed. Before an accurate understanding of the groundwater contamination situation at this landfill may be achieved, it will be necessary to install new monitoring wells constructed of the proper materials, and to collect a statistically significant amount of groundwater data from the new wells (i.e., one initial sampling event plus eight quarterly samples). Thus, it may be as much as three years before we actually know if the leachate containment systems at the C-746-U Landfill have failed. However, when a landfill is in groundwater contamination assessment, the general assumption is that the leachate containment systems have failed, and that the</p>	<p>DOE does not agree with the Commonwealth's statement that "the landfill has a failed monitoring system" and the suggestion that "the landfill may already be leaking". No evidence of failure of the liner or leachate collection system has been observed to date, and activities are underway to improve the groundwater monitoring system in compliance with Commonwealth requirements. Individual components of the landfill liner and leachate collection system provide redundancy for containing the landfill leachate and reducing potential for migration of contaminants in the event of failure of one component of the composite system. Even in the unlikely case where containment of the disposed waste may be lost, the physical characteristics of the waste in the landfill (e.g., soils, construction debris) would generally preclude rapid release and transport of contaminants into environmental media.</p>

105

Comment No.	Page/Reference	Comment	Response
SW-7 (continued)		contaminants from the landfill will be released into the groundwater and surface water. It is difficult to understand how DOE could determine that the increased radioactive WAC would have no significant impact on the environment when the landfill has a failed monitoring system, and the landfill may already be leaking.	The proposed action under this EA is to implement the authorized limits process under DOE Order 5400.5 in the evaluation of wastes for disposal at the C-746-U landfill. Authorized limits for wastes to be managed at this landfill would be established such that no member of the public would be exposed to a radiation dose in excess of 1 mrem/ year. This evaluation includes the estimation of potential radiation doses under various scenarios for future land use at the C-746-U Landfill site. Potential impacts from use of groundwater at both onsite and offsite locations is considered in this analysis. DOE's determination that the implementation of the authorized limits process as discussed in the EA would not be expected to have an impact on the environment is based on these considerations, as well as the other considerations discussed in Sections 4.2.1, 4.2.2, and 5.0 of the EA. (See also to response to Comment 8)
SW-8		The implementation of the Authorized Limits process and the limits obtained through this process appear to be based largely upon hypothetical doses to humans either working at or visiting the landfill site. The effects of potential releases from the landfill upon the terrestrial and aquatic biota have not been adequately evaluated in the EA. A proper evaluation of the environmental effects is critical in developing a WAC for the C-746-U Landfill.	Informal consultations for threatened and endangered species were conducted with respect to the proposed action. Both the Commonwealth of Kentucky Department of Fish and the Wildlife Resources and the U.S. Fish & Wildlife Service (FWS) have concurred that adverse effects to Threatened and Endangered species would be unlikely to result from taking the proposed action. A Biological Assessment that considered any potential impacts to the Indiana bat was prepared as a part of the consultations with the FWS (Appendix A of the EA).

Comment No.	Page/Reference	Comment	Response
SW-8 (continued)			<p>The proposed action is not expected to have an adverse impact on biota at the C-746-U landfill. Radiological standards for biota have not been established. DOE (DOE Order 5400.5) and the NCRP (NCRP Report No. 109) specify a limit on the maximum acceptable dose rate to natural populations of aquatic biota at 1 rad/day. While no similar limits for terrestrial biota have been formally established to date, DOE has issued an interim technical standard, based on recommendations of the International Atomic Energy Agency (IAEA), which specifies the following dose limits for exposure to radiation or radioactive material: 1 rad/day to aquatic animals, 1 rad/day to terrestrial plants, and 0.1 rad/day to terrestrial animals.</p> <p>This recommended dose limit to terrestrial fauna of 0.1 rad/day may be compared with the dose limit established for the proposed action at the C-746-U landfill of 1 mrem/year to humans. The limit of 0.1 rad/day equates to 36,500 to 730,000 mrem/year, or more than 4 to 5 orders of magnitude greater than the 1 mrem/year dose limit established for the proposed action. Thus, attainment of the dose limit of 1 mrem/year for humans would also provide protection for terrestrial biota, with a substantial margin of safety. The International Commission on Radiological Protection (ICRP Publication 60) also has reached a similar conclusion: "...if man is adequately protected, then other living things are also likely to be sufficiently protected." Appropriate language will be added to the EA.</p>

Comment No.	Page/Reference	Comment	Response
SW-9	Page 17, paragraph 6	In the EA, DOE asserts that "no federally-listed" endangered or threatened species were identified in the original EA for the C-746-U Landfill. The Identification and Screening of Candidate Sites for a Potential Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Waste Disposal Facility at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (Report DOE/OR/07 1939 & D1) states that five Indiana Bats were captured near the PGDP in 1999. Potential exposure pathways, doses, and effects upon all threatened and endangered species must be considered.	The EA was amended to include these sightings. Consultations for threatened and endangered species were conducted, and a Biological Assessment that considered any potential impacts to the Indiana bat was prepared (Appendix A of the EA).

801

Title of Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Document number or other identifier: DOE/EA 1414

Comments Received: April 23, 2001

Name of Commentor:	Kristi Hanson
Organization of Commentor:	private citizen

Comment No.	Page/Reference	Comment	Response
<i>General Comments</i>			
1		I oppose DOE allowing the C-746-U Landfill acceptance of residual radioactive waste.	Comment noted.
2		There should not be a landfill in this location in the first place, and adding residual radioactive waste is even worse in the event of an earthquake which is inevitable. It is in an area with a seismic risk rating of 3, the most severe earthquake potential, and as stated on pg 13 of the draft EA "the potential for release of contaminates from the Paducah site has not been quantified to date." The potential is horrifying . The determination is obvious. The earthquake that is inevitable will rip, crack, and swallow up this landfill and send it down the Ohio River.	As stated in Section 2.1 of the EA, no radioactive waste would be placed in the landfill as a result of the proposed action. The language quoted in this comment appears in the Affected Environment section of the EA. The Environmental Consequences section of the EA specifically addresses and considers seismic issues potentially associated with the proposed action. Seismic issues are also currently being discussed in the context of a modification to the C-746-U Landfill operating permit.
3		In the event of an earthquake, much if not all of the infrastructure will be destroyed. Roads, bridges, electricity, and phones will be gone. There will be no way to get to the landfill much less find out what's going on or fixing any damage.	As explained in Section 4.3 of the EA, the potential radiological exposures that might result from a release of materials disposed of at the C-746-U Landfill would be within acceptable levels even in the event of an earthquake.

109

Comment No.	Page/Reference	Comment	Response
4		The site itself is terrible being so near little Bayou Creek. The EA even states it is in its drainage basin. PGDP has already destroyed the creek by dumping into it. This is unacceptable. It is not PGDP's sewer.	The term "drainage basin" refers to the natural direction of un-intercepted surface water flow given the surface topography and other factors of any site. The term is commonly used to describe surface water resources and watersheds. It does not refer to a likelihood that any liquids from the landfill site would reach the tributary through either surface or sub-surface flow. The C-746-U Landfill does not discharge any liquids to any surface waters, including the Little Bayou Creek.
5		All waste at PGDP should be contained in above ground buildings that can be monitored above, inside, and underneath.	Comment noted.
6		Our future as well as those coming after us is at stake. Please do not expand this landfill and up the radioactive waste to be accepted.	As stated in Section 2.1 of the EA, no radioactive waste would be placed in the landfill as a result of the proposed action.
<i>Specific Comments</i>			
1	Page 3	The 1995 EA did not address the acceptance of materials containing residual radioactivity when sited. This leaves doubts of the site to handle the residual radioactive material.	The current EA has been prepared specifically to address the potential consequences of disposing of materials containing residual radioactivity.

Comment No.	Page/Reference	Comment	Response
2	Page 14	The EA states on pg.14 that "the sands in the UCD near the landfill typically do not offer potential for groundwater monitoring..... groundwater monitoring would not detect a release from the landfill base.....monitoring from these wells could not be relied upon" This landfill may presently be leaking and we have no way of knowing.	The landfill's leachate collection system provides a mechanism for detecting leaks before any leachate is released to the environment. Individual components of the liner and leachate collection system provide redundancy for containing the landfill leachate and reducing potential for migration of contaminants in the event of failure of a component within the composite system. No evidence of failure of the liner or leachate collection system has been observed to date. Even in the unlikely case where containment of the disposed waste may be lost, the physical characteristics of the waste in the landfill (e.g., soils, construction debris) would generally preclude rapid release and transport of contaminants into environmental media. Activities are also underway to improve the groundwater monitoring system in compliance with Commonwealth requirements.
3	Page 27	The cumulative impact statement in the draft EA is wrong. Everyone knows an earthquake is in our future. The statement in the draft EA pg 27 does not consider the release of residual radioactivity as well as the other pollutants that are in the landfill from an earthquake.	The potential consequences that could result from an earthquake are discussed in Section 4.3.

Title of Document: *Environmental Assessment on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Document number or other identifier: DOE/EA-1414

Comments Received: April 23, 2001

Name of Commentor:	Mark Donham Kristi Hanson
Organization of Commentor:	Regional Association of Concerned Environmentalists (RACE)/Heartwood Coalition for Nuclear Justice,(CNJ) a project of RACE

Comment No.	Page/Reference	Comment	Response
<i>General Comments</i>			
1		The proposed action, according to the proposal, would allow the Paducah site to dispose of certain substances within the C-746U sanitary landfill, which it currently is not allowed to do under the current regulatory scheme.	As explained in Section 1.2 of the EA the current regulatory scheme at the C-746-U Landfill includes state solid waste requirements and Atomic Energy Act (AEA) requirements. The EA in no way proposes or authorizes deviation from those requirements. The C-746-U Landfill must continue to operate in accordance with the above requirements, regardless of the proposed action. DOE Order 5400.5 requires the use of the authorized limits process for release of materials containing residual radioactive materials.
2		First, we don't believe the EA can be adequate if it doesn't disclose and analyze the effects of each individual waste stream "authorized limit." As of now, the only disclosure and analysis which the agency purports to have to disclose and analyze is the sum standard of all the individual standards.	As the EA discusses in Section 2.2, the standard against which any limits for future individual waste streams at the C-746-U Landfill would be evaluated is 1 mrem/yr effective dose equivalent (EDE). Not all future, individual waste streams are known at this time. However, any effects from waste streams proposed for disposal in the C-746-U Landfill would be bounded by the 1 mrem/yr EDE for the collective waste streams that would be used when developing approved, authorized limits on a waste stream-specific basis at the landfill.

1/2

Comment No.	Page/Reference	Comment	Response
3		We don't believe this complies with the site-specific requirement of NEPA, and it does not make environmental information available to the public and to decision makers prior to the decision. This simply does not meet NEPA's requirements	DOE believes that the EA meets NEPA requirements.
4		We have an ongoing concern about the lack of a real NEPA cumulative impacts analysis at the site. Right now there are at least 2 if not more NEPA analysis ongoing which affect this very same issue. The same wastes are being looked at supposedly in this EA and in the Waste Disposition EA. Yet different alternatives for the waste are being looked at in two separate EAs, and this was admitted by the agency at the public meeting. This is the classic example of NEPA segmentation. We one more time call for a site-wide EIS to help the agency and the public understand and get a grip upon the whole site-wide situation.	No segmentation of action is occurring. The comment incorrectly characterizes the scope of the two EAs referenced. The EA on the Implementation of the Authorized Limits Process for Waste Acceptance at the C-746-U Landfill does not address wastes being addressed under the EA "Waste Disposition Activities at the Paducah Gaseous Diffusion Plant." The EA for Authorized Limits address implementation of DOE Order 5400.5 Authorized Limits process as it relates to solid waste disposal activities at the C-746-U Landfill. The Waste Disposition EA addresses hazardous and radioactive wastes.
5		We believe that there should be formal consultation with the Fish and Wildlife Service pursuant to the Endangered Species Act, as this clearly is taking place within an area where Indiana bats have been found to be present. There could be direct and indirect effects upon the species which are adverse and which would require an incidental take permit or statement to authorize such taking.	Consultations for threatened and endangered species were conducted, and a Biological Assessment that considered any potential impacts to the Indiana bat was prepared (Appendix A of the EA).
6		There were concerns raised in the public meeting which we would like addressed involving some of the proposed predisposal treatments and how they might affect the determination and measurement of whether or not a batch of waste actually meets or exceeds "authorized limits." The example given was the grinding of surface contaminated concrete chunks and then measuring the residual radioactivity in the power to determine whether or not the batch exceeds authorized limits. We would like to have a statutory or regulatory citation to your authority for doing this.	All waste management activities will be conducted in compliance with applicable regulatory and statutory requirements.

Comment No.	Page/Reference	Comment	Response
7		We are concerned about the lack of a sound monitoring program. A comprehensive monitoring program, both for the incoming waste and for the environment around the facility, is necessary to insure that impacts are kept to a minimal level. This clearly would constitute a mitigation measure, and this, and all mitigation measures must be supported in the record as to their efficiency of they cannot be relied upon to support a FONSI. We see no such support for mitigation in the draft EA.	The comment's reference to monitoring is unclear. A comprehensive groundwater monitoring program exists at the landfill site in accordance with the requirements of 401 KAR 48:300; installation of replacement wells is in the planning phase and is expected to be completed in the fall of 2001. In addition, operating procedures at the landfill require that all incoming wastes must be adequately characterized by the waste generator and certified to meet waste acceptance criteria; landfill personnel monitoring incoming wastes to ensure that waste certification documentation is complete using a detailed checklist. Moreover, since the scope of the proposed action is limited to the implementation of the authorized limits process at the C-746-U landfill, only monitoring to confirm that incoming wastes meet authorized limits would be potentially pertinent to this action; this activity is one component of the waste certification program for the landfill. In each case, these monitoring activities are designed to meet regulatory and operational requirements, and are not considered mitigation measures in support of this EA. No mitigation measures are required for the proposed action.
8		We question whether establishing these "authorized limits" meets the ALARA requirements in the DOE order 5400.4. Especially considering that the agency is studying an alternative which must be feasible to ship them off site.	Meeting ALARA requirements is an intrinsic component of the authorized limits process in DOE Order 5400.5. The ALARA requirements must be met for the authorized limits to be approved. ALARA requirements under DOE Order 5400.5 are discussed in Sections 2.2.1 and 2.2.2 of the EA.
9		Finally, we are concerned about the process in general to establish these limits. The NRC has been trying to establish "de minimis" levels of radioactivity in materials for many years, and has not had the public support to do so. What is different between this proposal and the NRC attempted rulemakings to do the same thing - rulemakings which have not been able to establish de minimis levels.	Authorized limits established under DOE Order 5400.5 guidelines do not constitute rulemaking processes to establish generic "de minimis" values. The process for establishing authorized limits set forth in DOE Order 5400.5 requires site-specific and waste-stream-specific determinations taking into consideration those standards set forth in the order.

Comment No.	Page/Reference	Comment	Response
10		We urge you to hold off on this until you prepare a site-wide EIS and look at the cumulative impacts and the alternatives for cleaning up the entire site, and not just continue to piecemeal this cleanup a little at a time, without ever completely informing yourself or the public about the true scope of the problems at the Paducah site.	No sitewide EIS is required.

15