DOE/EIS-0305-D

DRAFT
ENVIRONMENTAL IMPACT STATEMENT (DEIS)
FOR TREATING
TRANSURANIC (TRU)/ALPHA LOW-LEVEL WASTE
AT THE OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

February 2000

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE)

TITLE: Draft Environmental Impact Statement (EIS) for Treating Transuranic (TRU)/Alpha Low-Level Waste at the Oak Ridge National Laboratory, Oak Ridge, Tennessee

CONTACT: For further information on this document, write or call:

Dr. Clayton Gist, Waste Management Integration Team Leader
U.S. Department of Energy
Oak Ridge Operations
55 Jefferson Avenue
P. O. Box 2001
Oak Ridge, TN 37831
Telephone: (865) 241-3498 • Facsimile: (865) 576-5333 • E-Mail: gistcs@oro.doe.gov

For general information on DOE's National Environmental Policy Act (NEPA) process, contact:

Ms. Carol M. Borgstrom, Director
Office of NEPA Policy and Assistance (EH-42)
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585
Telephone: (202) 586-4600, or leave a message at (800) 472-2756

ABSTRACT: DOE proposes to construct, operate, and decontaminate/decommission a TRU Waste Treatment Facility in Oak Ridge, Tennessee. The four waste types that would be treated at the proposed facility would be remote-handled TRU mixed waste sludge, liquid low-level waste associated with the sludge, contact-handled TRU/alpha low-level waste solids, and remote-handled TRU/alpha low-level waste solids. The mixed sludge and some of the solid waste contain metals regulated under the Resource Conservation and Recovery Act and may be classified as mixed waste.

This document analyzes the potential environmental impacts associated with five alternatives—No Action, the Low-Temperature Drying Alternative (Preferred Alternative), the Vitrification Alternative, the Cementation Alternative, and Treatment and Waste Storage at Oak Ridge National Laboratory Alternative.

PUBLIC COMMENTS: Comments on this Draft Environmental Impact Statement (EIS) may be submitted to Dr. Clayton Gist (see address above) through the end of the 45-day comment period, which will begin with the issuance of a Notice of Availability by the U.S. Environmental Protection Agency. Comments received after the end of the comment period will be addressed to the extent practicable. Comments may be submitted in writing to the above address, or by facsimile or e-mail. Oral and written comments may also be submitted at the public hearing(s), which will be held during the comment period on dates and locations to be announced via other public media shortly after issuance of the Draft EIS.

CONTENTS

SUMMARY S-1
S1.1 INTRODUCTION S-1
S1.2 BACKGROUND S-2
S1.2.1 Waste Types S-2
S1.2.2 Waste Storage at ORNL S-3
S1.2.3 PUBLIC SCOPING AND PARTICIPATION S-4
S1.3 PURPOSE AND NEED FOR AGENCY ACTION S-4
S1.4 PROPOSED ACTION AND ALTERNATIVES S-5
S1.4.1 Proposed Action S-5
S1.4.2 Alternatives S-8
S1.4.3 Vitrification Alternative S-13
S1.4.4 Cementation Alternative S-15
S1.4.5 Treatment and Waste Storage at ORNL Alternative S-16
S1.5 ALTERNATIVES CONSIDERED BUT NOT EVALUATED IN DETAIL S-18
S1.5.1 Off-site Waste Treatment S-18
S1.5.2 Alternate On-site Treatment Facility Locations S-19
S1.5.3 Alternative Disposal Locations S-19
S1.5.4 Alternative Treatment Technologies S-20
S1.6 AFFECTED ENVIRONMENT S-20
S1.6.1 Land Use S-20
S1.6.2 Cultural Resources S-20
S1.6.3 Ecological Resources S-20
S1.6.4 Geology and Seismicity S-21
S1.6.5 Water and Water Quality S-21
S1.6.6 Waste Management S-21
S1.6.7 Climate and Air Quality S-22
S1.6.8 Transportation S-22
S1.6.9 Utility Requirements S-22
S1.6.10 Human Health S-22
S1.6.11 Accidents S-23
S1.6.12 Noise S-23
S1.6.13 Socioeconomics S-23
S1.6.14 Minority and Low-Income Populations S-23
S1.7 ENVIRONMENTAL CONSEQUENCES S-23
S1.8 CUMULATIVE IMPACTS S-33
S1.9 MITIGATION S-34
S1.10 UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES S-34
S1.11 APPLICABLE LAWS AND REGULATIONS S-34
S1.12 REFERENCES S-36

1. INTRODUCTION AND BACKGROUND 1-1
1.1 INTRODUCTION 1-1
1.2 BACKGROUND 1-2
1.2.1 Waste Types 1-2
1.2.2 Waste Storage at ORNL 1-3
1.3 PURPOSE AND NEED FOR DOE ACTION 1-5

1.4 SCOPE OF ENVIRONMENTAL IMPACT STATEMENT 1-7
1.5 PUBLIC SCOPING AND PARTICIPATION 1-8
1.6 RELATIONSHIP TO OTHER NEPA DOCUMENTS 1-9
1.7 REFERENCES 1-9

2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES 2-1
2.1 PROPOSED ACTION 2-1
2.2 CONSIDERATION OF ALTERNATIVES 2-5
2.3 NO ACTION ALTERNATIVE 2-5
2.3.1 Facility Description 2-5
2.3.2 Treatment Description 2-6
2.3.3 Schedule of Activities 2-7
2.4 LOW-TEMPERATURE DRYING ALTERNATIVE (PREFERRED ALTERNATIVE) 2-7
2.4.1 Facility Description 2-7
2.4.2 Waste Treatment Description 2-10
2.4.3 Schedule of Activities 2-14
2.5 VITRIFICATION ALTERNATIVE 2-16
2.5.1 Facility Description 2-16
2.5.2 Waste Treatment Description 2-16
2.5.3 Schedule of Activities 2-21
2.6 CEMENTATION ALTERNATIVE 2-23
2.1.1 Facility Description 2-23
2.6.1 Waste Treatment Description 2-23
2.6.2 Schedule of Activities 2-26
2.7 TREATMENT AND WASTE STORAGE AT ORNL ALTERNATIVE 2-28
2.7.1 Facility Description 2-28
2.7.2 Waste Treatment Description 2-30
2.7.3 Schedule of Activities 2-30
2.8 ALTERNATIVES CONSIDERED BUT NOT EVALUATED IN DETAIL 2-31
2.8.1 Off-site Waste Treatment 2-31
2.8.2 Alternate On-site Treatment Facility Locations 2-31
2.8.3 Alternative Disposal Locations 2-31
2.8.4 Alternative Treatment Technologies 2-32
2.9 SUMMARY OF ENVIRONMENTAL IMPACTS 2-34
2.10 REFERENCES 2-44

3. AFFECTED ENVIRONMENT 3-1
3.1 LAND USE 3-1
3.1.1 Past Land Use 3-1
3.1.2 Current Land Use 3-1
3.1.3 Planned Land Use 3-2
3.1.4 Parks, Preserves, and Recreational Resources 3-2
3.1.5 Scenic Resources 3-3
3.2 CULTURAL AND HISTORIC RESOURCES 3-3
3.3 ECOLOGICAL RESOURCES 3-4
3.3.1 Terrestrial Resources 3-4
3.3.2 Terrestrial Threatened and Endangered Species 3-6
3.3.3 Aquatic Resources 3-7
3.3.4 Aquatic Threatened and Endangered Species 3-9
3.4 GEOLOGY AND SEISMICITY 3-9
3.4.1 Stratigraphy 3-12

3.4.2 Structure 3-15
3.4.3 Soils 3-15
3.4.4 Site Stability 3-18
3.5 WATER AND WATER QUALITY 3-23
3.5.1 Surface Water 3-23
3.5.2 Groundwater 3-31
3.5.3 Wetlands and Floodplains 3-39
3.6 WASTE MANAGEMENT 3-41
3.7 CLIMATE AND AIR QUALITY 3-42
3.7.1 Climate 3-42
3.7.2 Air Quality 3-43
3.8 TRANSPORTATION 3-46
3.8.1 Local Transportation 3-46
3.8.2 National Transportation 3-47
3.9 UTILITY REQUIREMENTS 3-50
3.10 HUMAN HEALTH 3-51
3.10.1 Exposure Pathways 3-51
3.10.2 Pathway Modeling 3-52
3.10.3 Radionuclides 3-52
3.10.4 Chemicals 3-57
3.11 ACCIDENTS 3-59
3.12 NOISE 3-60
3.13 SOCIOECONOMIC AND DEMOGRAPHIC ENVIRONMENT 3-60
3.13.1 Demographic Characteristics 3-60
3.13.2 Housing 3-65
3.13.3 Infrastructure 3-65
3.13.4 Local Economy 3-66
3.14 ENVIRONMENTAL JUSTICE 3-69
3.15 REFERENCES 3-72

4. ENVIRONMENTAL CONSEQUENCES 4-1
4.1 LAND USE IMPACTS 4-1
4.1.1 Methodology 4-1
4.1.2 No Action Alternative 4-2
4.1.3 Low-Temperature Drying Alternative 4-2
4.1.4 Vitrification Alternative 4-2
4.1.5 Cementation Alternative 4-2
4.1.6 Treatment and Waste Storage at ORNL Alternative 4-3
4.1.7 Land Use Impacts Summary 4-3
4.2 CULTURAL AND HISTORIC RESOURCES 4-4
4.2.1 Methodology 4-4
4.2.2 No Action Alternative 4-4
4.2.3 Low-Temperature Drying Alternative 4-4
4.2.4 Vitrification Alternative 4-4
4.2.5 Cementation Alternative 4-5
4.2.6 Treatment and Waste Storage at ORNL Alternative 4-5
4.2.7 Cultural and Historic Resource Impacts Summary 4-5
4.3 ECOLOGICAL RESOURCES 4-5
4.3.1 Methodology 4-6
4.3.2 No Action Alternative 4-6
4.3.3 Low-Temperature Drying Alternative 4-6

4.3.4 Vitrification Alternative 4-7
4.3.5 Cementation Alternative 4-7
4.3.6 Treatment and Waste Storage at ORNL Alternative 4-8
4.3.7 Ecological Impacts Summary 4-8
4.4 GEOLOGY AND SEISMICITY IMPACTS 4-9
4.4.1 Methodology 4-9
4.4.2 No Action Alternative 4-9
4.4.3 Low-Temperature Drying Alternative 4-9
4.4.4 Vitrification Alternative 4-10
4.4.5 Cementation Alternative 4-10
4.4.6 Treatment and Waste Storage at ORNL Alternative 4-11
4.4.7 Geology and Seismicity Impacts Summary 4-11
4.5 WATER AND WATER QUALITY IMPACTS 4-11
4.5.1 Surface Water Impacts 4-11
4.5.2 Groundwater Impacts 4-16
4.5.3 Wetlands and Floodplains Impacts 4-18
4.5.4 Wetlands and Floodplains Impacts Summary 4-22
4.6 WASTE MANAGEMENT AT ORNL 4-22
4.6.1 Methodology 4-23
4.6.2 No Action Alternative 4-27
4.6.3 Low-Temperature Drying Alternative 4-28
4.6.4 Vitrification Alternative 4-29
4.6.5 Cementation Alternative 4-30
4.6.6 Treatment and Waste Storage at ORNL Alternative 4-31
4.6.7 Waste Management Impacts Summary 4-31
4.7 AIR QUALITY 4-33
4.7.1 Methodology 4-33
4.7.2 No Action Alternative 4-33
4.7.3 Low-Temperature Drying Alternative 4-33
4.7.4 Vitrification Alternative 4-35
4.7.5 Cementation Alternative 4-35
4.7.6 Treatment and Waste Storage at ORNL Alternative 4-36
4.7.7 Air Quality Impacts Summary 4-36
4.8 TRANSPORTATION IMPACTS 4-36
4.8.1 Methodology 4-36
4.8.2 No Action Alternative 4-38
4.8.3 Low-Temperature Drying Alternative 4-38
4.8.4 Vitrification Alternative 4-42
4.8.5 Cementation Alternative 4-45
4.8.6 Treatment and Waste Storage at ORNL Alternative 4-46
4.8.7 Transportation Impacts Summary 4-46
4.9 UTILITY REQUIREMENT IMPACTS 4-49
4.9.1 Methodology 4-49
4.9.2 No Action Alternative 4-49
4.9.3 Low-Temperature Drying Alternative 4-49
4.9.4 Vitrification Alternative 4-53
4.9.5 Cementation Alternative 4-53
4.9.6 Treatment and Waste Storage at ORNL Alternative 4-53
4.9.7 Utility Impacts Summary 4-53
4.10 HUMAN HEALTH IMPACTS 4-54
4.10.1 Methodology 4-54

4.10.2 Exposure pathways 4-55
4.10.3 No Action Alternative 4-56
4.10.4 Low-Temperature Drying Alternative 4-56
4.10.5 Vitrification Alternative 4-58
4.10.6 Cementation Alternative 4-59
4.10.7 Treatment and Waste Storage at ORNL Alternative 4-59
4.10.8 Human Health Impacts Summary 4-60
4.11 ACCIDENT IMPACTS 4-61
4.11.1 Methodology 4-61
4.11.2 Accidental Breach of the Melton Valley Storage Tanks 4-63
4.11.3 Breach of the Transfer Line Between the Melton Valley Storage Tanks and the Proposed TRU Waste Treatment Facility 4-66
4.11.4 A Slurry Line Failure Within the TRU Waste Treatment Facility 4-67
4.11.5 Failure of the Slurry Line and the HEPA Filters in the Proposed TRU Waste Treatment Facility 4-69
4.11.6 Failure of Contact-Handled or Remote-Handled Solid Waste Containers Before, During, and After Waste Treatment 4-70
4.11.7 Accidents Unique to An Alternative 4-74
4.11.8 Industrial Accidents 4-76
4.11.9 Summary of Accident Analysis Results 4-78
4.12 NOISE IMPACTS 4-83
4.12.1 Methodology 4-83
4.12.2 No Action Alternative 4-83
4.12.3 Low-Temperature Drying Alternative 4-83
4.12.4 Vitrification Alternative 4-83
4.12.5 Cementation Alternative 4-83
4.12.6 Treatment and Waste Storage at ORNL Alternative 4-83
4.12.7 Noise Impacts Summary 4-84
4.13 SOCIOECONOMIC IMPACTS 4-84
4.13.1 Methodology 4-84
4.13.2 No Action Alternative 4-85
4.13.3 Low-Temperature Drying Alternative 4-85
4.13.4 Vitrification Alternative 4-88
4.13.5 Cementation Alternative 4-88
4.13.6 Treatment and Waste Storage at ORNL Alternative 4-93
4.13.7 Summary of Socioeconomic Impacts 4-95
4.14 ENVIRONMENTAL JUSTICE 4-95
4.14.1 Methodology 4-95
4.14.2 No Action Alternative 4-95
4.14.3 Low-Temperature Drying Alternative 4-98
4.14.4 Vitrification Alternative 4-98
4.14.5 Cementation Alternative 4-98
4.14.6 Treatment and Waste Storage at ORNL Alternative 4-98
4.14.7 Summary of Environmental Justice Impacts 4-98
4.15 REFERENCES 4-99

5. CUMULATIVE IMPACTS 5-1
5.1 LAND USE 5-4
5.2 ECOLOGICAL RESOURCES 5-5
5.3 WATER RESOURCES 5-5
5.3.1 White Oak Creek Embayment Project 5-5

5.3.2 Old Melton Valley Access Road Upgrade 5-7
5.3.3 Waste Area Group 5 Seep C and D 5-7
5.3.4 Waste Area Group 4 Seeps 5-8
5.3.5 Other CERCLA Actions 5-8
5.3.6 Summary of Water Resource Impacts 5-8
5.4 WASTE MANAGEMENT 5-9
5.5 AIR QUALITY 5-9
5.6 TRANSPORTATION 5-10
5.7 HUMAN HEALTH 5-10
5.8 SOCIOECONOMICS 5-11
5.9 REFERENCES 5-11

6. MITIGATION MEASURES 6-1
REFERENCES 6-2

7. UNAVOIDABLE ADVERSE IMPACTS AND IRREVERSIBLE IRRETRIEVABLE COMMITMENT OF RESOURCES 7-1
7.1 UNAVOIDABLE ADVERSE IMPACTS 7-1
7.2 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES 7-1

8. APPLICABLE LAWS AND REGULATIONS 8-1
8.1 FEDERAL AND STATE ENVIRONMENTAL STATUTES AND REGULATIONS 8-1
8.2 OTHER PERTINENT REQUIREMENTS 8-3
8.3 REGULATORY COMPARISONS BETWEEN ALTERNATIVES 8-4

9. LIST OF PREPARERS 9-1

10. DISTRIBUTION 10-1

11. ORGANIZATIONAL CONFLICTS OF INTEREST STATEMENT 11-1

FIGURES

S-1 Location of Oak Ridge National Laboratory in relation to the City of Oak Ridge and other DOE facilities on the Oak Ridge Reservation, and in the State of Tennessee. S-1
S-2 Aerial view of the Melton Valley Storage Tanks–Capacity Increase Project during installation of the six 100,000-gallon tanks, which are located south of the eight 50,000-gallon Melton Valley Storage Tanks..... S-3
S-3 General site location of the proposed TRU Waste Treatment Project facility on the Oak Ridge Reservation..... S-5
S-4 DOE would lease the Melton Valley Storage Tanks facility and an adjacent area of land to construct the waste treatment facility. The location is isolated from ORNL by Haw Ridge. S-7
S-5 Tank waste treatment flow diagram for the Low-Temperature Drying Alternative. S-11
S-6 Solid waste treatment flow diagram for the Low-Temperature Drying Alternative. S-12
S-7 Treatment flow diagram for sludge, supernate, and solid waste smaller than the RCRA definition of debris for the Vitrification Alternative. S-13
S-8 Vitrification Alternative flow diagram for solid waste treatment. S-14
S-9 Flow diagram for tank waste treatment for the Cementation Alternative. S-15
1-1 Location of Oak Ridge National Laboratory in relation to the City of Oak Ridge, other DOE facilities in the area, and the State of Tennessee. 1-1
1-2 Aerial view of the Melton Valley Storage Tanks–Capacity Increase Project during installation of the six 100,000-gallon tanks located south of the Melton Valley Storage Tanks. 1-4
1-3 Stakeholder meetings have been held as part of the TRU Waste Treatment Project. 1-8
2-1 General site location of the proposed TRU Waste Treatment Project facility at Oak Ridge National Laboratory (ORNL) on the Oak Ridge Reservation (ORR). 2-1
2-2 DOE would lease the Melton Valley Storage Tanks facility and an adjacent area of land to construct the waste treatment facility. The location is isolated from ORNL by Haw Ridge. 2-3
2-4 Tank waste treatment flow diagram for the Low-Temperature Drying Alternative. 2-12
2-5 Solid waste treatment flow diagram for the Low-Temperature Drying Alternative. 2-13
2-6 The Low-Temperature Drying Alternative would take place over a period of approximately 11.5 years. 2-15
2-7 Waste treatment would be completed in approximately 3.5 years utilizing the Low-Temperature Drying Alternative..... 2-15
2-8 Treatment flow diagram for sludge, supernate, and solid waste smaller than the RCRA definition of debris for the Vitrification Alternative. 2-18
2-9 Vitrification Alternative flow diagram for solid waste treatment. 2-21
2-11 Vitrification Alternative waste treatment schedule. 2-22
2-12 Flow diagram for tank waste treatment for the Cementation Alternative. 2-25
2-14 The Cementation Alternative waste treatment schedule would take approximately 6 years. 2-27
3-1 Archeological sites near the proposed TRU Waste Treatment Project site at ORNL include the Jones Site and the Jenkins Site. 3-5
3-2. Locations of sightings of protected bird species on the ORR – 1995 survey. 3-10
3-3 Physiographic map of the Southern Appalachian Region. 3-11
3-4 Stratigraphic column for the Oak Ridge Reservation. 3-13
3-5 Geologic map for Melton Valley. 3-14
3-6 Geologic cross-section of the Oak Ridge Reservation. 3-16
3-7. Southeast region basement structures and major earthquakes. Depending on the method of measurements when the earthquake occurred, this graphic indicates the measurements as either intensity (Modified Mercalli Index) or magnitude (Richter Scale)..... 3-20

3-8 Peak ground acceleration and associated annual probability of exceedance for the Oak Ridge Reservation. 3-22
3-9 Map showing the location of the White Oak Creek Watershed in relation to the Oak Ridge Reservation and the proposed TRU Waste Treatment Project Site. 3-24
3-10 Map of surface water monitoring locations in White Oak Creek Watershed near the proposed TRU Waste Treatment Facility. 3-26
3-11 Discharge (in curies) of various radionuclides at White Oak Dam, 1993–97. 3-29
3-12 Distribution of geologic units in the Melton Valley Watershed Remedial Investigation Area that are assigned to two broad hydrologic groups: the Knox Aquifer and the ORR aquitards. 3-32
3-13. Near-surface hydrogeologic zones. 3-33
3-14 Average water table elevation in the Melton Valley Watershed. 3-37
3-15 Locations of the hydrofracture facility sites, contaminated brine area, injected waste/grout sheets, and groundwater wells. 3-38
3-16 Wetlands, 100-, and 500-year floodplains near the proposed TRU Waste Treatment Facility site. 3-40
3-17. Wind rose detected at the ORNL Tower MT2 (@ 100 m) for 1991–1995. 3-44
3-18 Transportation route from the ORNL in east Tennessee to the Waste Isolation Pilot Plant in southeast New Mexico. 3-48
3-19 Transportation route from the ORNL in east Tennessee to the Nevada Test Site. 3-49
3-20 Eleven noise monitoring stations were located on, or near the proposed TRU Waste Treatment Facility site boundary. 3-61
3-21 Region of Influence for the Oak Ridge Reservation. 3-63
3-22 Census tracts with a minority population greater than the national average of 24.1%. 3-70
3-23 Census tracts with a low-income population greater than the national average of 13.1%. 3-71
4-1 Wetlands near the proposed TRU Waste Treatment Facility site. 4-20
4-2 Location of additional power source. 4-50
4-3 Census tracts with a minority population greater than the national average of 24.2%. All residences are restricted to locations outside the ORR boundaries, even though the tract boundaries shown on this map include portions of the ORR. 4-96
4-4 Census tracts with a low-income population greater than the national average of 13.1%. All residences are restricted to locations outside the ORR boundaries, even though the tract boundaries shown on this map include portions of the ORR. 4-97
5-1 Melton Valley Watershed Remedial Investigation site map with proposed Treatment Site Location. 5-6

TABLES

S-1 Summary of the TRU, mixed low-level, remote-handled low-level, and low-level waste volumes, the resulting new storage space required for each treatment alternative, and the land area required for additional storage facilities S-18
S-2 Calculated effective dose equivalent to the maximally exposed off-site individual and the collective population effective dose equivalent from airborne releases of radionuclides in 1997 (ORNL 1998) S-22
S-3 Comparison of impacts among alternatives S-24
2-1 Summary of projected waste volumes for the Low-Temperature Drying Alternative 2-11
2-2 Summary of projected waste volumes for the Vitrification Alternative 2-17
2-3 Summary of projected waste volumes for the Cementation Alternative 2-24
2-4 Summary of the TRU, mixed low-level, remote-handled low-level, and low-level waste volumes, the resulting new storage space required for each treatment alternative, and the land area required for additional storage facilities 2-29

2-5 Summary of alternatives considered but not evaluated for sludge and supernate waste treatment ... 2-32
2-6 Comparison of impacts among alternatives ... 2-35
3-1 State-listed terrestrial plant species with compatible habitats exhibited in the proposed site ... 3-6
3-2 Tennessee State-listed "in need of management" terrestrial animal species with compatible habitats exhibited in the proposed site ... 3-7
3-3 Doses of radionuclides to aquatic receptors at ORNL surface water locations in 1997 ... 3-8
3-4 Select properties of soils at the proposed TRU Waste Treatment Facility site ... 3-17
3-5 Modified Mercalli Intensity Scale for earthquakes, developed 1931 ... 3-19
3-6 Richter Scale of earthquake magnitude ... 3-19
3-7 Maximum historical earthquakes and the maximum Modified Mercalli Intensity and their peak ground accelerations at the ORR ... 3-21
3-8 Seismic ground acceleration for soil-supported facilities ... 3-23
3-9 ORNL NPDES Permit TN0002941 permit limits and compliance statistics (1997) ... 3-27
3-10 Locations, frequency, and parameters for the Environmental Monitoring Plan surface water sampling at ORNL ... 3-30
3-11 Summary of radionuclide activities during the 1997 Environmental Monitoring Plan surface water sampling ... 3-30
3-12 Historical and projected remote-handled TRU and contact-handled TRU debris generation rates at ORNL ... 3-42
3-13 Summary of 1997 air monitoring data in the vicinity of the ORR ... 3-45
3-14 Radionuclide parameter concentrations and other parameters measured at ORNL air monitoring stations, 1997 ... 3-45
3-15 Calculated effective dose equivalent to the maximally exposed individual and the collective population effective dose equivalent from airborne releases in 1997 ... 3-53
3-16 Five-year trends in the total effective dose equivalent for selected pathways ... 3-56
3-17 Actual versus allowable[a] air emissions from ORNL steam production during 1997 ... 3-57
3-18 Chemical Hazard Quotients for metals in fish (ORNL 1997) ... 3-58
3-20 Noise monitoring data for Melton Valley proposed TRU waste facility ... 3-62
3-21 Regional population trends and projections in the Oak Ridge Region of Influence ... 3-64
3-22 Population for incorporated areas within the ORR region ... 3-64
3-23 1990 Population by race and ethnicity for the ORR region ... 3-64
3-24 Housing summary for the ORR region, 1990, by county ... 3-65
3-25 Public school statistics in the ORR region, 1996–97 school year ... 3-65
3-26 Hospital capacity and usage in the ORR region ... 3-66
3-27 Region of Influence employment data, 1991–96 ... 3-66
3-28 Distribution of DOE-related employment in Region of Influence, 1996 ... 3-67
3-29 Employment distribution by industry for the four-county Region of Influence ... 3-67
3-30 Per capita income data for the four-county Region of Influence and the State of Tennessee ... 3-68
3-31 Percent of individuals with incomes below poverty line in the four-county Region of Influence and the State of Tennessee, 1990 ... 3-68
3-32 Municipal and county general fund revenues in the ORR region, Fiscal Year 1997 ... 3-68
4-1 Comparison of waste volumes generated by the alternatives that include waste treatment ... 4-23
4-2 Summary of projected waste volumes for the Low-Temperature Drying Alternative (the total of each waste category is summarized in 4-1) ... 4-24
4-3. Summary of projected waste volumes for the Vitrification Alternative (the total of each waste category is summarized in 4-1) ... 4-25

4-4 Summary of projected waste volumes for the Cementation Alternative (the total of each waste category is summarized in 4-1) 4-26
4-5 Summary of the TRU, mixed low-level, remote-handled low-level, and low-level waste volumes, the resulting new storage space required for each treatment alternative, and the land area required for additional storage facilities 4-32
4-6 Estimated air emissions from the proposed Low-Temperature Drying treatment facility and State of Tennessee permit exemptions 4-34
4-7 Average concentrations of hazardous air pollutants measured at ORR and projected maximum concentrations from the Low-Temperature Drying Alternative 4-34
4-8 Estimated consequences for the most severe accidents involving shipments of low-level waste 4-38
4-9 Calculated non-accident radiological LCFs for the Low-Temperature Drying Alternative 4-39
4-10 Projected waste shipment schedule for the Low-Temperature Drying Alternative 4-41
4-11 Calculated non-accident radiological LCFs for the Vitrification Alternative 4-42
4-12 Projected shipment schedule for the Vitrification Alternative 4-44
4-13 Calculated non-accident radiological LCFs for the Cementation Alternative 4-45
4-14 Projected shipment schedule for the Cementation Alternative 4-47
4-15. Comparison of alternatives (calculated transportation accidents/fatalities based on total off-site shipments) 4-48
4-17 Utility requirements of the Low-Temperature Drying Alternative facility 4-52
4-18 Facility energy requirements (connected load) for the Low-Temperature Drying Alternative.. 4-52
4-19 Dose and risk due to radionuclide emissions from the Low-Temperature Drying Alternative.. 4-57
4-20 Summary of health effect endpoints 4-58
4-21 Dose and risk due to radionuclide emissions from the Vitrification Alternative 4-59
4-22 Dose and risk due to radionuclide emissions from the Cementation Alternative 4-59
4-23 Total probability of cancer fatality summary for the treatment alternatives 4-60
4-24 Frequencies and consequences of the No Action Alternative for Melton Valley Storage Tanks storage accidents 4-64
4-25 Estimated source terms for the No Action Alternative contact-handled and remote-handled waste storage accidents 4-71
4-26 Estimated frequencies and consequences for the No Action Alternative contact-handled and remote-handled waste storage accidents 4-72
4-27 Frequency and consequences of contact-handled and remote-handled solid waste treatment accidents for the Low-Temperature Drying Alternative 4-73
4-28 Summary of accident consequences and frequencies for the alternatives 4-78
4-29 Summary of total risks to the surrounding public and ETTP populations for the alternatives .. 4-80
4-30 Summary of risks for the public MEI and non-involved worker 4-81
4-31 Summary of the treatment alternatives accident frequencies and consequences 4-82
4-32 Manpower plan for the Low-Temperature Drying Alternative 4-86
4-33 Estimated region of influence employment impacts by year for the Low-Temperature Drying Alternative 4-87
4-34 Estimated region of influence earnings impacts by year for the Low-Temperature Drying Alternative 4-87
4-35 Manpower plan for the Vitrification Alternative 4-89
4-36 Estimated region of influence employment impacts by year for the Vitrification Alternative .. 4-90
4-37 Estimated region of influence earnings impacts by year for the Vitrification Alternative 4-90
4-38 Manpower plan for the Cementation Alternative[a] 4-91
4-39 Estimated region of influence employment impacts by year for the Cementation Alternative.. 4-92
4-40 Estimated region of influence earnings impacts by year for the Cementation Alternative 4-92
4-41 Estimated employment impacts by year for the Treatment and Waste Storage at ORNL Alternative for the region-of-influence 4-93

4-42 Manpower plan for the Treatment and Waste Storage at ORNL Alternative 4-94
4-43 Estimated earnings impacts by year for the Treatment and Waste Storage at ORNL Alternative for the region-of-influence 4-94

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS AND ABBREVIATIONS

ALARA	as low as reasonably achievable
CAA	Clean Air Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
D&D	decontamination and decommissioning
DOE	U.S Department of Energy
DOT	U.S. Department of Transportation
DSSI	Diversified Scientific Services, Inc.
EA	environmental assessment
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ETTP	East Tennessee Technology Park
FFA	Federal Facilities Agreement
Foster Wheeler	Foster Wheeler Environmental Corporation
FR	*Federal Register*
FSAR	Final Safety Analysis Report
HEME	high-efficiency mist eliminator
HEPA	high-efficiency particulate air
HVAC	heating, ventilation, and air conditioning
INEEL	Idaho National Engineering and Environmental Laboratory
ISCST3	Industrial Source Complex Modeling Code, Version 3
LCF	latent cancer fatality
LDR	Land Disposal Restriction
MEI	maximally exposed individual
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NFS	Nuclear Fuel Services
NPDES	National Pollutant Discharge Elimination System
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
PCB	polychlorinated biphenyl
PCF	probability of cancer fatality
PPE	personal protective equipment
PSD	prevention of significant deterioration
Rad-NESHAP	National Emission Standards for Hazardous Air Pollutants for Radionuclides
RCRA	Resource Conservation and Recovery Act
RIMS II	Regional Input-Output Modeling System II
SCR	selective catalytic reduction
SWSA	solid waste storage area
SWSA 5 North	Solid Waste Storage Area 5 North
TAAQS	Tennessee Ambient Air Quality Standards
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranic
TSCA	Toxic Substances Control Act

TVA	Tennessee Valley Authority
UBC	uniform building code
UTS	Universal Treatment Standard
WM PEIS	*Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste* (DOE/EIS-0200-F, May 1997)
WIPP SEIS-II	*Waste Isolation Pilot Plant Disposal Phase Supplemental Environmental Impact Statement* (DOE/EIS-0026-S-2)

UNITS OF MEASURE

Bq	becquerel
Bq/g	becquerels per gram
C	Celsius
Ci	curie
Ci/g	curies per gram
cm	centimeter
dscf	dry standard cubic foot
dscfm	dry standard cubic feet per minute
F	Fahrenheit
ft	feet
ft^2	square feet
ft^3	cubic feet
gal	gallon
gpd	gallons per day
gpm	gallons per minute
gr/dscf	grains per dry standard cubic foot
Gy/d	gray (absorbed dose, energy) per day
h	hour
ha	hectare
in	inch
km	kilometer
kV	kilovolt
kW	kilowatt
L	liter
lb	pound
lb/ft^3	pounds per cubic foot
lbs/h	pounds per hour
Leq	equivalent sound or noise level
m	meter
m^3	cubic meters
mg/L	milligrams per liter
mph	miles per hour
mrem	millirem (one thousandth of a rem)
mrem/h	millirem per hour
MW	megawatt
nCi/g	nanocuries per gram
ng/L	nanograms per liter

pCi/g	picocuries (one trillionth of a curie) per gram
ppm	parts per million
psig	pounds per square inch gauge
rad/d	rads per day
rem	roentgen equivalent man
rpm	revolutions per minute
wt %	weight percent
$\mu g/m^3$	micrograms per cubic meter
µR	microroentgen

THIS PAGE INTENTIONALLY LEFT BLANK