DOE/EA-1651

Final
Environmental Assessment for U-233 Material Downblending and Disposition Project at the Oak Ridge National Laboratory
Oak Ridge, Tennessee

U. S. Department of Energy
Oak Ridge Office
Oak Ridge, Tennessee

January 2010

FINDING OF NO SIGNIFICANT IMPACT
URANIUM-233 MATERIAL DOWNBLENDING AND DISPOSITION PROJECT
AT THE OAK RIDGE NATIONAL LABORATORY,
OAK RIDGE, TENNESSEE

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

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: DOE has completed the *Final Environmental Assessment for U-233 Material Downblending and Disposition Project at the Oak Ridge National Laboratory* [DOE/EA-1651]. This environmental assessment (EA) evaluates the impacts of planned activities to modify selected Oak Ridge National Laboratory (ORNL) facilities; process the ORNL inventory of uranium-233 (U-233); and transport the processed material to a long-term disposal facility. Small quantities of similar material currently stored at other DOE sites may also be included in this initiative. The project objectives are: to modify the Building 3019 Complex facilities to accommodate the necessary process equipment and operations; to process, downblend, and package the U-233 inventory for final disposal; to transport the downblended material to a licensed disposal facility; and to place the Building 3019 Complex in safe and stable shutdown for eventual decontamination and decommissioning (D&D). DOE has determined that there is no programmatic use for the U-233 inventory stored at ORNL.

DOE action is needed to: (1) address safeguards and security requirements; (2) eliminate long-term worker safety and criticality concerns; and (3) provide for final disposal of the U-233 inventory. Once the planned DOE actions have been completed, substantial landlord costs would be eliminated, and the U-233 safe storage requirements identified by the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 97-1 would be satisfied. Recommendation 97-1 describes actions that the DNFSB considers necessary to ensure the safe storage of U-233 materials in the interim and the longer term.

The EA was issued for public comment in September 2009 and was revised as appropriate based on public comments. The EA was issued final in December 2009. Based on the results of the analyses reported in the Final EA, 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 (NEPA) of 1969. Therefore, the preparation of an Environmental Impact Statement (EIS) is not required, and DOE is issuing this FONSI.

PUBLIC AVAILABILITY OF EA AND FONSI: The EA and FONSI may be reviewed at and copies of the documents obtained from:

U.S. Department of Energy
Information Center
475 Oak Ridge Turnpike
Oak Ridge, Tennessee 37830
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BACKGROUND: Recommendation 97-1 describes actions that the DNFSB considers necessary to ensure the safe storage of U-233 bearing material in the interim and the longer term. In response to Recommendation 97-1, DOE first initiated an inspection program to evaluate the integrity of the U-233 storage canisters. DOE then prepared and issued an EA (DOE/EA-1488) in 2004 on its proposal to process the U-233 material. DOE issued a FONSI for that project in December 2004.

In November 2005, Congress directed the termination of the planned medical isotope production project, which had been included in the proposed action evaluated in DOE/EA-1488, and the transfer of the project from the Office of Nuclear Energy to the Office of Environmental Management for disposition of the U-233. In response, DOE modified the original scope and prepared a new EA to evaluate the impacts associated with (1) the installation of new process equipment in Building 3019; (2) processing, packaging, and on-site interim storage of the U-233 material; and (3) placement of the Building 3019 Complex in safe and stable shutdown for eventual D&D. The EA (DOE/EA-1574) was issued for public comment, revised as appropriate based on public comments and was issued as final in February 2007. DOE issued a FONSI for these activities in March 2007.

Since that time, DOE has researched historical documents and has determined that the majority of the U-233 inventory can be processed to a matrix which meets the waste acceptance criteria for disposal at the Nevada Test Site (NTS). This determination resulted in a process design change to render the U-233 material in the form of stable uranium salt monoliths (Annex Option). The NTS determination has also allowed for the consideration of an option to process and package downblended U-233 material at the Transuranic Waste Processing Center (TWPC) at ORNL (TWPC Option). The waste form produced by the TWPC Option would be cementitious grout monoliths. If the TWPC Option is selected, the annex facility as currently conceptualized will not be constructed. The impacts associated with both options are evaluated in the EA. Additionally, DOE plans to dismantle the current 3020 Stack and replace it with a new emissions stack to support the Building 3019 Complex operations.

NEED FOR THE PROPOSED ACTION: DOE action is needed to: (1) satisfy the requirements of DNFSB Recommendation 97-1; (2) address safeguards and security requirements, (3) eliminate long-term worker safety and criticality concerns; and (4) provide for final disposal of the U-233 inventory.

DESCRIPTION OF PROPOSED ACTION: DOE proposes to: (1) modify the existing facility to accommodate new process equipment and support operations; (2) process and package the

U-233 stored at ORNL and other small quantities of similar material currently stored at other DOE sites; (3) transport the processed material to a disposal facility; and (4) place the Building 3019 Complex in safe and stable shutdown for eventual D&D. Isotek Systems, LLC, located in Oak Ridge, Tennessee, was awarded the U-233 disposition contract by DOE on October 9, 2003.

Several activities would be required to disposition the U-233 and prepare the Building 3019 Complex for eventual D&D. These activities are as follows:

- Transport depleted uranium oxide (DUO) from the DOE Savannah River Site; convert this material into depleted uranyl nitrate (DUN) form at a facility located in Erwin, Tennessee; and receive DUN at Building 3019A;
- Demolish the 3020 Stack and construct a replacement stack;
- Remove equipment from hot cells and laboratories within Building 3019A;
- Modify Building 3019A to enable dissolution and downblend of the U-233 material;
- Annex Option: Construct an annex facility to dry and package the downblended material;
- TWPC Option: Modify piping systems and storage facilities necessary to process downblended material at the TWPC;
- Retrieve and inspect the U-233 containers within Building 3019A;
- Dissolve and downblend the U-233 inventory;
- Dry and package the downblended material and package the material in containers suitable for transportation and disposal;
- Transport the downblended inventory to a suitable disposal facility such as NTS;
- Dispose secondary waste; and
- Stabilize the Building 3019 Complex in preparation for shutdown and eventual D&D.

Isotek Systems, LLC would be responsible for design and construction of modifications to Building 3019A and its associated facilities in order to implement the proposed action for DOE. Building 3019A would be modified and shielded workstations installed to facilitate high-radiation work. Criticality safety controls would be in place to prevent an inadvertent nuclear criticality.

ALTERNATIVES: In addition to the proposed action, impacts were evaluated for the no action alternative. If no action were taken, DOE would continue to have responsibility for the operation of the Building 3019 Complex, and the ORNL inventory of U-233 would remain stored within Building 3019A. Continued storage in Building 3019A would require major capital upgrades and retrofits to critical facility systems that have nearly reached the end of their effective design life, have deteriorated beyond cost-effective repair, or may not satisfy current standards. Significant annual costs would be incurred to operate the 3019A facility to handle and repackage about 400 containers to satisfy current DOE storage standards, and to provide continued protection against potential nuclear criticality accidents or theft of the material.

DOE dismissed from further analysis alternatives based on continued storage of the U-233 inventory at another location; the use of the material as a tag for Russian highly enriched uranium; development and test of a thorium fuel cycle; and use of the material in analytical safeguard procedures. DOE also dismissed the option to co-process the U-233 inventory with TRU waste and chemical dilution at the Savannah River Site. These alternatives were considered

but determined not to be reasonable as they fail to fully address the DOE purpose and need. DOE is aware there may be a need for small quantities of U-233 and would continue to cooperate with potential users for the safe transfer of material.

ENVIRONMENTAL IMPACTS: The EA assesses direct and indirect impacts of the proposed action on the following: land use, infrastructure, air quality, noise quality, geology and soils, water resources, ecological resources, cultural resources, socioeconomics, visual resources, waste management, human health, transportation, and accidents. Cumulative impacts were also assessed.

Under the proposed action, there would be no impact on land use immediately around the Building 3019 Complex. This area is currently used for industrial purposes and is part of the industrialized portion of ORNL. There would be no impact to undisturbed land (in the vicinity of the TWPC) if the TWPC Option is implemented. Interim storage of the downblended inventory would be temporary and would occur within the Building 3019 Complex. Off-site disposal would only occur at suitably permitted/licensed facilities. Previously disturbed areas outside of ORNL may be temporarily used as construction laydown areas and are not expected to exceed two acres in size; there would be no significant impact on land use at these locations.

Construction requirements would include around 725 cubic yards of concrete and 28 tons of steel. These are small quantities for an industrial construction project and could easily be provided by local suppliers without prior notification. Construction would also require modest quantities of water, electrical power, diesel fuel, and propane; however, these modest demands on infrastructure would pose effectively no impact on ORNL infrastructure.

Under the proposed action there would be insignificant air quality impacts. Emission levels from construction activities and vehicle/equipment operation would be very small compared to other emissions sources at ORNL, and the impact of these emissions would be small and temporary. Process emissions generated by the proposed action would pass through a charcoal filtration system and HEPA filtration system before discharge. The downblended inventory would be placed in containers equipped with a vent and HEPA filter to eliminate any pressure build-up, and technology to address the formation of radon-220 such as decay tubes, activated carbon filtration, or other suitable technology.

These containers would be placed inside robust over-pack containers to reduce the exposures to workers and provide secondary containment in the case of an accident. The estimated annual radiological emissions from the proposed action represent less than 0.2 percent of the radiological stack emissions at ORNL for year 2008. The radiological exposure to workers in all occupied on-site buildings would be less than 1.0 mrem per year and the radiological exposure to the off-site maximally exposed individual (member of the public) would not exceed 0.3 mrem per year. Isotek Systems, LLC would be required to maintain compliance with the terms and conditions of permits issued by the Tennessee Department of Environment and Conservation. Safe shutdown of the Building 3019 Complex would also reduce air emissions and have a positive long-term effect on air quality in the vicinity of ORNL.

The highest daily noise levels generated by the project would be produced during construction of the annex and replacement stack. Because the Building 3019 Complex is located within an active

industrialized area of ORNL and since no sensitive noise receptors are located in the immediate vicinity, no adverse noise impacts would occur.

Under the proposed action, no effects to geological resources would occur and soil disturbances would be temporary and occur within previously disturbed areas used for industrial applications. Standard soil retention and erosion practices would be applied throughout the construction process to minimize or eliminate soil destruction caused by erosion and surface water run-off.

The Building 3019 Complex and TWPC areas consist of primarily impervious surfaces that would not be appreciably altered. The present stormwater collection systems in these areas would continue to collect runoff from the project areas, and no new stormwater facilities would be required. Stormwater discharges would be controlled, if necessary, to remove soil and any contaminants before discharge to storm drains or surface waters. Concentrations of toxic and conventional pollutants and radionuclides would be expected to remain within current permit limits. The proposed action would not draw from or discharge to groundwater sources and would therefore have no impact on groundwater resources. The safe and secure shutdown of the Building 3019 Complex at the completion of the proposed action would not substantially change the amount of stormwater runoff generated and discharged, but would reduce the potential for a spill or release of contaminants into the stormwater collection system, which would be a net positive benefit. The proposed action would not result in any adverse impacts to ecological resources. Habitat in the vicinity of the Building 3019 Complex and TWPC is highly disturbed and mostly maintained by lawn equipment. This type of habitat also precludes the presence of rare, threatened, and endangered plant and animal species.

Building 3019A contributes to the ORNL Historic District and is eligible for listing in the National Register of Historic Places. DOE completed a Project Summary and Archaeological and Historical Review for the proposed modifications to the facility and determined that the proposed action would not have an adverse effect on the exterior physical structure or visual appearance of the building. As a result, DOE determined that no exterior archeological resources would be adversely affected by the proposed action. The Tennessee State Historic Preservation Officer has concurred with the DOE determination. In addition, the proposed action would have no adverse impacts on the adjacent Graphite Reactor which is designated as a National Historic Landmark. Implementation of the TWPC Option would have no impact on cultural resources.

Socioeconomic impacts are expected to be positive but small. Based on the small number of jobs created and the availability of qualified local workers, no impact on population size is anticipated. Likewise, no adverse health and environmental impacts would occur that could have a disproportionate effect on low-income or minority populations. Net jobs lost upon the completion of the project would have a negligible employment and income impact in the region.

Visual impacts associated with construction activities at the Building 3019 Complex would include construction materials and equipment and additional traffic from construction workers and material deliveries. These impacts would be minor, temporary, and consistent with those of an industrial area. Other visual impacts would be posed by construction of the 3166 Stack and the 3019 Annex. The 3166 Stack would be shorter and less prominent to the skyline than the 3020 Stack and the 3019 Annex would occupy the area occupied by two other buildings recently

removed; therefore, these changes would pose no appreciable difference in appearance to the area. Implementation of the TWPC Option would have no impact on visual resources.

The proposed action would generate primary and secondary wastes. Primary waste generated would include low-level waste (LLW) in the form of a dry monolithic uranium salt and liquid LLW (LLLW). The total volume of primary LLW waste is estimated at 3,667 55-gallon drums to be disposed of at NTS. If the TWPC Option is selected, the primary waste form would differ and may potentially result in a slightly larger primary waste volume over the Annex Option. The environmental impacts of the increased primary waste volume are expected to be roughly equivalent to the Annex Option. An estimated 211 gallons of LLLW condensate per week would be discharged to the ORNL LLLW treatment facility. Secondary wastes would be generated by construction and facility modifications associated with the proposed action and would generate an estimated 30,000 cubic feet of LLW mainly in the form of scrap metal, debris, and concrete. This material would be packaged and sent to NTS or other approved facility for disposal.

Uncontaminated debris generated from project activities would be sent to a local construction and demolition waste landfill for disposal. Solid, secondary waste materials would also be generated by the downblending and drying processes. These materials would include items such as U-233 package waste, hot cell debris waste, empty cans, failed equipment and components, decontamination waste, gas filtration media, personal protective equipment, maintenance waste, and DUO not consumed by the project. Small volumes of RCRA hazardous waste could be generated by laboratory activities. Small volumes of PCB waste could be generated from old paint/coatings and light ballasts during dismantlement activities. Secondary waste materials would be packaged in Type A containers and transported off-site to a licensed disposal facility. The volume of waste materials generated by construction, facility modifications, and process operations would be minimized through Best Management Practices and project waste management procedures. Local and off-site treatment and disposal facilities anticipated to be used have adequate capacity to accommodate all forms of waste generated by the proposed action. Waste management impacts would be small.

The proposed action would result in potential radiological and chemical exposure to workers and the public. Radiological worker exposures would vary by activity and by location within the Building 3019 Complex or the TWPC. As specified in the Isotek Radiation Protection Program Plan, the dose to each worker would be expected to remain below 500 mrem per year. This goal would be achieved through a combination of facility design features (radiation shields) and administrative controls (limited worker exposure times). Radiological emissions from downblending and drying operations would be filtered and exhausted such that radiological exposure to any member of the public would be expected to be no greater than 0.3 mrem. If the TWPC Option is selected, emissions systems would be modified to address emissions specific to the downblended U-233 material; after modification, radiological emissions are expected to be similar to historical levels at the TWPC. Radiological emissions from the Building 3019 Complex are expected to cease after the downblend operations are completed and D&D activities have been completed. Bulk chemicals used would include DUN, nitric acid, sodium hydroxide, iron sulfate, and magnesium hydroxide. Under normal operations, these chemicals would be confined within closed tanks and pipelines, and any chemical exhaust fumes would be captured in the ventilation system, HEPA filtered, exhausted out the 3166 Stack, and dispersed in the atmosphere. Project health and safety procedures would govern the receipt, storage, and use of

these chemicals to ensure worker safety. Under normal operations, the quantities and concentrations of the chemicals involved for either option would not pose any chemical exposure hazard to members of the public.

Transportation impacts that would occur as a result of the proposed action would be minimal. Compared to the traffic associated with daily material delivery trucks and the more than 4,000 workers who commute to ORNL, the increase in traffic from construction worker

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Isotek Systems, LLC
Under Contract DE-AC05-04OR22860
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U.S. DEPARTMENT OF ENERGY

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ACRONYMS

AERMOD	American Meteorological Society/Environmental Protection Agency Regulatory Model
ALARA	as low as reasonably achievable
BJC	Bechtel Jacobs LLC
BLM	Bureau of Land Management
CAA	Clean Air Act
CAP88	Clear Air Act Assessment Package 1988
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfm	cubic feet per minute
CFR	Code of Federal Regulations
COG	Cell off-gas
CRK	Clinch River kilometer
D&D	Decontamination and Decommissioning
dBA	A-weighted decibels
DNFSB	Defense Nuclear Facilities Safety Board
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DUN	depleted uranyl nitrate
DUO	depleted uranium oxide
EA	environmental assessment
EAD	Environmental Assessment Determination
EDE	effective dose equivalent
EM	Environmental Management
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
$FeSO_4$	iron sulfate
FONSI	Finding of No Significant Impact
FBI	Federal Bureau of Investigation
FTE	full time equivalent
FY	Fiscal Year
GBOG	Glovebox off-gas
GC-1	Process to combine depleted uranyl nitrate with U-233
GC-2	Process to dry and package product from GC-1
HEPA	high efficiency particulate air
HQ	hazard quotient
IES	Institute of Education Sciences
IFDP	Integrated Facility Disposition Project
I/I	intake/chronic daily intake ratio
kg	kilograms
KOH	potassium hydroxide
LCF	latent cancer fatality
LLC	Limited Liability Corporation
LLLW	liquid low-level waste

LLW	low-level waste
LOG	Laboratory off-gas
$Mg(OH)_2$	magnesium hydroxide
MSC	Manufacturing Sciences Corporation
MVSTs	Melton Valley Storage Tanks
NAAQS	National Ambient Air Quality Standards
NaOH	sodium hydroxide
NEPA	National Environmental Policy Act
NESHAP	national emission standards for hazardous air pollutants
NFS	Nuclear Fuel Services
NRC	Nuclear Regulatory Commission
NRHP	National Register of Historic Places
NPDES	National Pollutant Discharge Elimination System
NTS	Nevada Test Site
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Reservation
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PCs	performance categories
PPE	Personnel Protective Equipment
RADTRAN	RADTRAN, Transportation Risk Assessment Computer Code
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SHPO	State Historic Preservation Office
SR	State Route
SRS	Savannah River Site
TCRA	time-critical removal action
TDEC	Tennessee Department of Environment and Conservation
TRAGIS	Transportation Routing Analysis Geographic Information System
TRU	transuranic
TSCA	Toxic Substances Control Act
TWPC	Transuranic Waste Processing Center
U-233 Project	U-233 Material Downblending and Disposition Project
U-233	uranium-233
U-235	uranium-235
USCB	United States Census Bureau
USFA	United States Fire Association
VOG	Vessel off-gas
VRM	Visual Resource Management
WIPP	Waste Isolation Pilot Plant

1.0 INTRODUCTION AND PURPOSE AND NEED

1.1 INTRODUCTION

Uranium-233 (U-233) is a special nuclear material currently stored at the Oak Ridge National Laboratory (ORNL) in the Building 3019 Complex. Special nuclear material is defined by Title I of the Atomic Energy Act of 1954 (USC 1954) as plutonium, U-233, or uranium enriched in the isotopes of U-233 or uranium-235 (U-235). These materials are radioactive, fissile, and can be formed into nuclear weapons. In powder form, these materials can pose a serious health hazard.

The U-233 Material Downblending and Disposition Project (U-233 Project) was developed by the U.S. Department of Energy (DOE) to resolve security and safety issues associated with the U-233 inventory and its storage facility; specifically, the safety issues identified by the Defense Nuclear Facilities Safety Board (DNFSB) in Recommendation 97-1, Safe Storage of U-233 (DNFSB 1997). The main actions to be performed by the U-233 Project are to:

- Process, downblend, and package the DOE inventory of U-233 (and the 715 gallons of U-233-contaminated thorium nitrate stored in Tank P-24) to eliminate the need for safeguards, security, and nuclear criticality controls, and render these materials suitable for safe disposition
- Remove the U-233 material from the Building 3019 Complex
- Transport the downblended material to one or more licensed disposal facilities
- Place the Building 3019 Complex in safe and stable shutdown condition

To evaluate the potential environmental impacts associated with the U-233 Project, DOE prepared two environmental assessments (EAs) (see Section 1.2.1). An Environmental Assessment Determination (EAD 2008-0004) issued by DOE on January 23, 2009, states that preparation of an additional EA is necessary to assess potential environmental impacts associated with proposed operational changes and facility modifications (DOE 2008a).

1.2 BACKGROUND/OVERVIEW

1.2.1 Project History and Status

In response to DNFSB Recommendation 97-1, DOE formulated a three-phase programmatic plan to satisfy the DNFSB recommendations. Phase I encompasses preliminary planning and design activities; Phase II would involve project execution; and Phase III would include the shutdown of the Building 3019 Complex for eventual Decontamination and Decommissioning (D&D).

In the initial Phase I plan, DOE proposed a U-233 Project that would operate an ion-exchange process to separate Thorium-229 from the U-233 stockpile for medical use; downblend the U-233 material with depleted uranyl nitrate (DUN); transport the downblended material to an ORNL storage facility; and place the Building 3019 in a safe and stable shutdown condition. The initial project plan and associated impacts are detailed in DOE/EA-1488 and are not repeated here (DOE 2004).

In the November 2005 Conference Report for the Energy and Water Development and Related Agencies Appropriations Act for Fiscal Year (FY) 2006, the conferees provided no funding for the Medical Isotope Production and Building 3019 Complex Shutdown project. The conferees action directed DOE to terminate promptly the Medical Isotope Production and Building 3019 Complex Shutdown project. Per DOE's recommendation, the responsibility for disposition of the U-233 was transferred to the DOE Environmental Management (EM) program. The conferees provided FY 2006 funds in the Defense EM appropriation for disposition of the material stored in the Building 3019 Complex and directed the Department to provide a report within 60 days detailing a path forward for managing the material. The Department issued its report to Congress in February 2006 ("Management of U-233 Stored at Building 3019, Oak Ridge National Laboratory, Oak Ridge, Tennessee, Preliminary Report to Congress," dated February 8, 2006, to The Honorable Pete V. Domenici, et al.) (DOE 2007).

Before implementation of the revised project plan, the scope of activities for the U-233 Project was again revised. Based on the present scope of the U-233 Project, some project activities fall under the aegis of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Consistent with the Secretarial Policy Statement on the National Environmental Policy Act, DOE's process for review of actions under CERCLA addresses NEPA values (DOE 1994). Separate NEPA analysis is applied for activities not covered under the aegis of CERCLA.

CERCLA actions include the demolition of the Buildings 3074, 3136, and the 3020 Stack (DOE 2009a). Non-CERCLA actions include the balance of activities associated with the U-233 Project. Some or all of the CERCLA actions would likely occur before the non-CERCLA actions are implemented. The scope of the subject CERCLA and non-CERCLA activities is described in Chapter 2 of this EA.

1.2.2 Building 3019 Complex

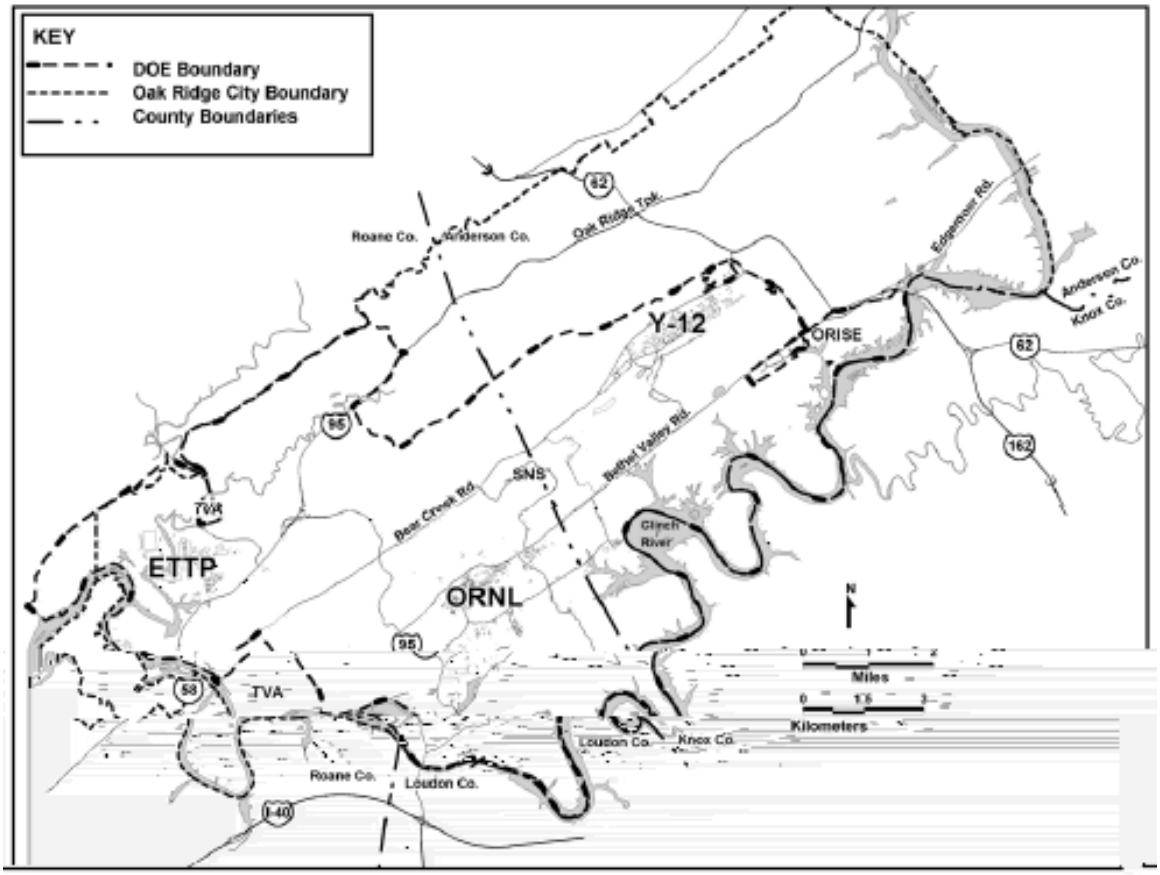
ORNL is located in south-central region of the Oak Ridge Reservation (ORR) in East Tennessee as shown in Figure 1.2-1. The Building 3019 Complex, located in Bethel Valley in the north-central area of ORNL, consists of a main building, several support facilities, grounds defined by a perimeter fence, and access driveways as shown in Figure 1.2-2. Building 3019 is the main building in the Building 3019 Complex. The western portion of this building is designated as 3019B, and the eastern portion is designated as 3019A. Building 3019A was originally constructed in 1943 as a chemical separations pilot plant for the Manhattan Project. Because of its historical significance, Building 3019 is eligible for listing on the National Register of Historic Places (NRHP). Although the majority of the Building 3019 Complex support facilities would not be required to process the U-233 inventory, ancillary equipment such as ventilation systems and stacks that support the entire Building 3019 Complex would continue to be shared consistent with their intended purpose. DOE/EA-1574 contains additional information about the Building 3019 Complex. (DOE 2007)

1.2.3 U-233 Inventory Description

The ORNL inventory consists of about 450 kilograms (kg) of U-233 in about 1,000 canisters in various forms, quantities, and matrices. The U-233 inventory at the Building 3019 Complex is primarily in the form of uranium oxides but also includes metals and other compounds. DOE/EA-1488 (DOE 2004) and DOE/EA-1574 (DOE 2007) give additional information on the U-233 inventory at ORNL.

In addition to the ORNL inventory of U-233, as much as 50 kg of U-233 stored at other DOE facilities may be processed along with the ORNL inventory as part of the U-233 Project. This EA, therefore, considers a U-233 inventory of 500 kg.

Figure 1.2-1—Location of ORNL on the ORR



Source: ORNL 2008

Figure 1.2-2—Building 3019 Complex

Source: DOE 2007

1.2.4 Savannah River Site Depleted Uranium Oxide

The downblend process would use depleted uranium oxide (DUO) that is currently stored at the Savannah River Site (SRS), near Aiken, South Carolina. This material is in the form of uranium trioxide. To perform the proposed downblend activities, around 805 drums of DUO would be transported to Oak Ridge for temporary interim storage until needed. Provisions of the American Recovery and Reinvestment Act of 2009 provide SRS a financial incentive to transfer the material within a limited time window. The potential environmental impacts associated with the transport of the DUO from SRS were previously addressed in DOE/EA-1393 (DOE 2002a). Evaluation of these transportation activities is incorporated by reference.

1.3 PURPOSE AND NEED FOR PROPOSED ACTION

Continued storage of U-233 in the Building 3019 Complex at ORNL in its present form and present containers represents a significant safety, safeguards and security, and financial burden (DOE 2007). As there are no facilities licensed and/or permitted to accept the U-233 in its present form, isotopic downblend has been selected as the preferred method to satisfy the nonproliferation and safety issues associated with this material, consistent with the DNFSB 97-1 recommendations (DOE 2009b). As described in Section 1.4, this EA evaluates the impacts on the human environment of the additional actions not already evaluated in DOE/EA-1488 (DOE 2004), DOE/EA-1574 (DOE 2007), and the CERCLA process.

1.4 SCOPE OF THIS ENVIRONMENTAL ASSESSMENT

This EA assesses the potential consequences of non-CERCLA project activities on the human environment in accordance with the Council on Environmental Quality (CEQ) regulations

(40 Code of Federal Regulations [CFR] Parts 1500 – 1508) for National Environmental Policy Act (NEPA) implementation and with DOE NEPA Implementation Procedures (10 CFR 1021). If the impacts associated with the proposed action are not identified as significant as a result of this EA, DOE shall issue a Finding of No Significant Impact (FONSI) and would proceed with the action. If impacts are identified as potentially significant, an Environmental Impact Statement (EIS) would be prepared.

This EA: (1) describes the affected environment relevant to potential impacts of the proposed operational changes and facility modifications to the U-233 Project; (2) analyzes potential environmental impacts that could result from the proposed operational changes and facility modifications to the U-233 Project; (3) identifies and characterizes cumulative impacts that could result from the proposed operational changes and facility modifications to the U-233 Project in relation to other current or proposed activities within the area; and (4) provides DOE with environmental information to prescribe restrictions to protect, preserve, and enhance the human environment and natural ecosystems.

To follow the analysis presented herein, it is important to understand the distinction between the scope of the U-233 Project and the scope of this EA. As described in Section 1.2.1, the U-233 Project includes (1) actions that fall under the aegis of CERCLA and are evaluated consistent with NEPA values and (2) non-CERCLA actions that require separate NEPA evaluation. Collectively both the CERCLA actions and the non-CERCLA actions are necessary to fulfill the goals of the U-233 Project.

The potential impacts for actions performed under CERCLA are evaluated separately from this EA, and that evaluation is not repeated here. U-233 Project actions that fall under CERCLA include the demolition of Building 3074, Building 3136, and the 3020 Stack, as identified in DOE/OR/01-2407&D1, *Time-Critical Removal Action Memorandum for Buildings 3074 and 3136, and the 3020 Stack at the Oak Ridge National Laboratory* (DOE 2009a).

The scope of activities evaluated in this EA includes:

(1) construction of the 3166 Stack to replace the 3020 Stack
(2) temporary storage of the DUO from SRS at Manufacturing Sciences Corporation (MSC) facility, in Oak Ridge, Tennessee
(3) transport of DUO from Oak Ridge to Nuclear Fuel Services (NFS) in Erwin, Tennessee
(4) transport of DUN solution from NFS to ORNL
(5) construction and operation of an annex within the Building 3019 Complex to dry and package the downblended material for off-site transport (construction and operation of the annex would not occur if the material is transferred to the Transuranic Waste Processing Center (TWPC) as described in item 6)
(6) facility modifications necessary to transfer the downblended material to the TWPC to be dried and packaged for off-site transport, in lieu of construction of the above annex
(7) off-site transport of downblended material and secondary waste to one or more licensed disposal facilities

Two process options are evaluated herein for actions that fall under NEPA. One option involves the construction of an annex within the Building 3019 Complex where the downblended material would be dried and packaged for off-site transport. The other option involves the transfer of aqueous downblended material via underground pipeline to the TWPC at ORNL, where the material would then be processed and packaged for off-site transport.

1.5 RELATIONSHIP TO OTHER REGULATORY ACTIVITIES

To reduce redundancy with previous but relevant documents, CEQ regulations encourage Federal agencies to eliminate repetitive discussions and to focus the decision process on the pertinent issues "ripe for decisions at each level of environmental review" (40 CFR 1502.20). This approach refers to the coverage of general matters in broad-scope documents, with subsequent narrower scope documents that incorporate by reference the general discussions and concentrate primarily on the specific issues associated with the current proposal (40 CFR 1508.28). Such an approach entails references to specific analyses, discussions, and conclusions of these documents without inclusion of detailed discussion in the present EA. This EA is based, in part, on earlier NEPA documentation.

Consistent with CEQ guidance, the following NEPA studies and associated FONSIs relevant to the proposed action of this EA are incorporated by reference:

- *Environmental Assessment for the U-233 Disposition, Medical Isotope Production, and Building 3019 Complex Shutdown at the Oak Ridge National Laboratory, Oak Ridge Tennessee,* DOE/EA-1488 (DOE 2004)
- *Environmental Assessment for U-233 Stabilization, and Building 3019 Complex Shutdown at the Oak Ridge National Laboratory, Oak Ridge, Tennessee,* DOE/EA-1574 (DOE 2007)
- *Programmatic Environmental Assessment for the U. S. Department of Energy, Oak Ridge Operations Implementation of a Comprehensive Management Program for the Storage, Transportation, and Disposition of Potentially Reusable Uranium Materials,* DOE/EA-1393 (DOE 2002a)

The removal of the 3020 Stack and two other facilities located within the Building 3019 Complex would be conducted under the authority of a CERCLA time-critical removal action (TCRA) Memorandum (DOE 2009a). The NEPA values applied by the CERCLA review process provide sufficient NEPA coverage. Environmental analysis of CERCLA actions is therefore excluded from this EA. These are separate actions with different regulatory requirements and are referenced in this EA to the extent that they influence the facility needs and timing of the actions considered in this EA. Cumulative impacts from the Proposed Action and other actions in the region are described in Chapter 4.

1.6 PUBLIC INVOLVEMENT

Public involvement is an integral part of the NEPA process. On December 6, 2006, DOE informed stakeholders and posted notice of this proposed action on the DOE Oak Ridge Operations (ORO) Information Site. As the U-233 Project has developed, programmatic changes have been posted on the ORO Information Site (DOE 2007). On March 25, 2009, DOE notified the Tennessee Department of Environment and Conservation (TDEC), the City of Oak Ridge, and other stakeholders of proposed changes to the U-233 Project and of its intention to prepare this EA. DOE plans to provide stakeholders a copy of the Draft EA for review. After a 30-day review and comment period, DOE will address any comments from the review in the Final EA and will appended comment response documentation.

1.7 ORGANIZATION OF ENVIRONMENTAL ASSESSMENT

This EA is organized as follows:

Chapter 1 – Introduction and Purpose and Need. Presents an overview of the EA, summarizes the background information necessary to understand the purpose and need for the proposed action, presents additional, relevant NEPA documents, and includes an overview of the public involvement process.

Chapter 2 –Proposed Action and Alternatives. Provides more detailed background information on the proposed action and provides a description of the alternatives, including a discussion of alternatives that were considered and eliminated from detailed analysis. This chapter also identifies the preferred alternative.

Chapter 3 – Affected Environment and Environmental Impacts. Presents information describing the existing environment at ORNL and how the environment might be affected by the No Action Alternative and the Proposed Action. Impacts are compared to the environmental conditions that would be expected if continuing the status quo (i.e., the No Action Alternative).

Chapter 4 – Cumulative Impacts. Presents information on other proposed actions (both Federal and non-Federal) which could effect the environment both by themselves and in conjunction with the actions proposed by this EA.

Chapter 5 – Permits and Environmental Regulation. Presents a discussion of the permits and environmental regulations that apply to the project.

Chapter 6 – Agencies Contacted. Identifies agencies contacted as part of the EA process.

Chapter 7 – References. Identifies documents referenced in the text of the EA.

Appendix A – State Historic Preservation Office **(**SHPO) Letter 1

Appendix B – SHPO Letter 2

Appendix C – Public Comment Response Table

2.0 PROPOSED ACTION AND ALTERNATIVES

2.1 NO ACTION ALTERNATIVE

The No Action Alternative has not changed since the issue of DOE/EA-1574 (DOE 2007). Under the No Action Alternative, the ORNL inventory of U-233 would remain stored within the Building 3019 Complex. Continued storage in the Building 3019 Complex would require major capital upgrades and retrofits to critical facility systems that have nearly reached the end of their effective design life or have deteriorated beyond cost-effective repair. Significant additional operational expenses would also be incurred to repackage about 400 containers to satisfy current DOE storage standards for U-233 (DOE 2002a) and to provide protection against potential nuclear criticality accidents or theft of the material. Extended storage of the U-233 in the Building 3019 Complex would require additional structural and confinement systems upgrades with a preliminary estimated cost of $20 million. (DOE 2007) However, no engineering analysis of the upgrades has been completed (DOE 2007).

Under the No Action Alternative, DOE would fail to satisfy a commitment to Congress. On February 17, 2006, DOE informed Congress of its intent to safely process and stabilize the U-233 inventory stored in Building 3019A (DOE 2007). Because of the fissile content of the U-233 material, the material must be processed before final disposition.

2.2 PROPOSED ACTION ALTERNATIVE

The Proposed Action is to proceed with design and execution of the U-233 Project to achieve closure of DNFSB 97-1, to disposition the U-233 inventory, and to facilitate safe shutdown of the Building 3019 Complex. The main activities of the Proposed Action are covered under both CERCLA and NEPA as shown in Table 2.2-1. CERCLA actions, though part of the Proposed Action, are not within the scope of this EA as described in Section 1.4. Similarly, some Proposed Action activities have been evaluated in previous EAs and are therefore not evaluated in this EA. Additional details for the Proposed Action are given in the subsections below. Chapter 3 describes the potential environmental impacts for activities within the scope of this EA.

2.2.1 Demolition, Construction, and Equipment Installation

As part of the Proposed Action, in April 2009, DOE issued a CERCLA TCRA Memorandum to address removal of three structures within the Building 3019 Complex: Building 3074, Building 3136, and the 3020 Stack (DOE 2009a). Because this removal action is subject to the provisions of CERCLA, the impacts of the activities authorized in the TCRA Memorandum are not evaluated in this EA. Although the CERCLA activities are not evaluated in this EA, they are a necessary part of the Proposed Action for the U-233 Project, and would only be performed to support the U-233 Project.

Table 2.2-1—Main Activities Included in the U-233 Project

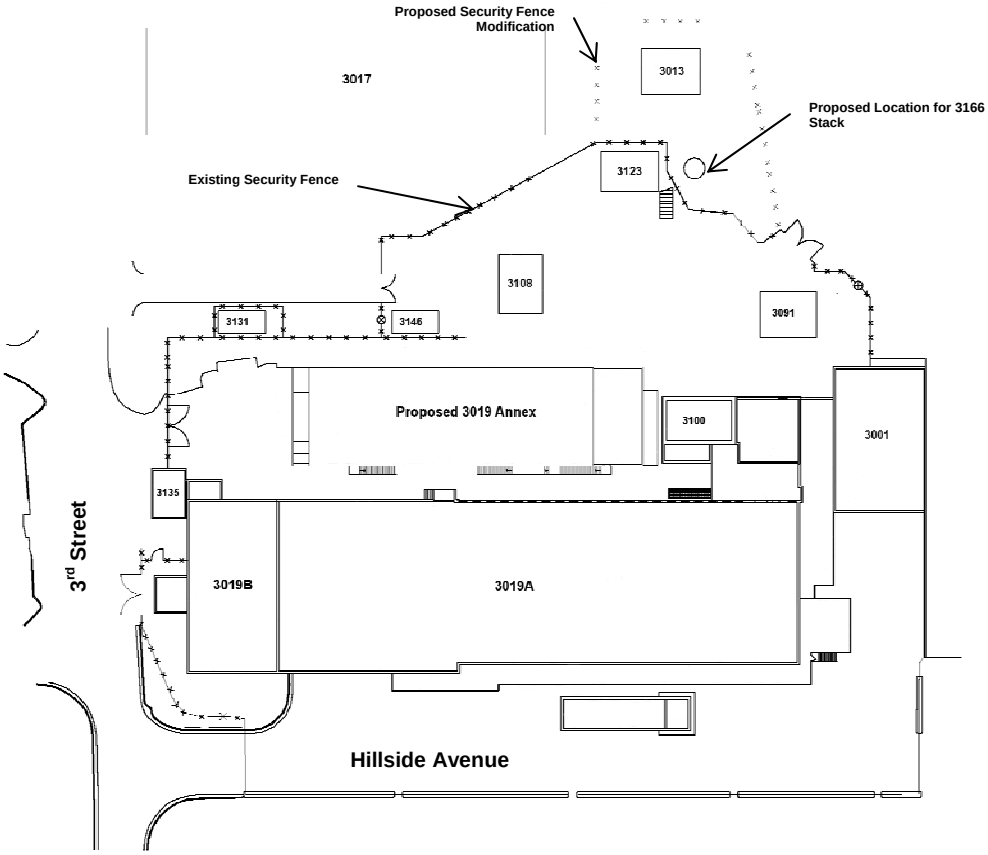
Activity	Evaluation
Remove Buildings 3074 and 3136 and the 3020 Stack	CERCLA TCRA (DOE/OR/01-2407& D1) (DOE 2009a)
Construct the 3166 Stack to replace the 3020 Stack and perform modifications to the Building 3019 Complex as needed to support the planned downblend activities.	DOE/EA-1651 (current document)
Transport DUO from SRS to Oak Ridge, Tennessee	DOE/EA-1393 (DOE 2002a)
Temporary Interim Storage of DUO at a storage facility in Oak Ridge, Tennessee	DOE/EA-1651 (current document)
Transport of DUO to NFS in Erwin, TN for conversion to DUN	DOE/EA-1651 (current document)
Transport of DUN from NFS to the Building 3019 Complex at ORNL	DOE/EA-1651 (current document)
Perform U-233 Downblend Activities in the Building 3019 Complex	DOE/EA-1574 (DOE 2007)
Dry, package, and prepare downblended material for off-site transport	
Annex Option: Construct and operate the 3019 Annex facility to dry, package, and load the downblended material on a truck for off-site transport to a licensed disposal facility	DOE/EA-1651 (current document)
TWPC Option: Perform the modifications to the TWPC as needed to dry, package, and load the downblended material on a truck for off-site transport to a licensed disposal facility. This would include transfer of the downblended material through an extant underground pipeline from the Building 3019 Complex to the TWPC.	DOE/EA-1651 (current document)
Transport the downblended material and secondary waste material via truck to a licensed disposal facility, preferably the Nevada Test Site (NTS) or the Waste Isolation Pilot Plant (WIPP)	DOE/EA-1651 (current document)
Shutdown of the Building 3019 Complex in safe and stable shutdown condition for eventual D&D	DOE/EA-1574 (DOE 2007)

The 3020 Stack is located north of the Building 3019 Complex as illustrated in Figure 1.2-2. The 3020 Stack was originally constructed in the 1940s to support Building 3019 operations as part of the Manhattan Project. The 3020 Stack is a 200 foot masonry structure with an interior brick liner and a concrete outer liner. The 3020 Stack has supported emissions from the operations conducted within the Building 3019 Complex under Title V Operating Permit issued by TDEC in conjunction with the U.S. Environmental Protection Agency (EPA). The 3020 Stack is known to be radiologically contaminated due to the nature of emissions and past operational upsets; asbestos containing materials and polychlorinated biphenyl (PCB) containing materials may also be associated with the stack structure (DOE 2009a). Removal of the 3020 Stack would be conducted only after a new permitted stack is built and placed in operation. During removal activities, a negative pressure downdraft would be applied to the 3020 Stack and the down

drafted air would be vented through an air pollution control system and discharged under the requirements of an air emissions permit to be issued by TDEC.

A new replacement stack (the 3166 Stack) would be constructed to support the U-233 downblend activities. The 3166 Stack would use the existing Cell off-gas (COG), Glovebox off-gas (GBOG), and Laboratory off-gas (LOG) ventilation ductwork from Building 3019A and would be sited north of Building 3019A as shown in Figure 2.2-1.

Figure 2.2-1—Proposed Site Plan for the Building 3019 Complex



Based on preliminary design plans for the Annex Option (construction of the 3019 Annex to dry and package the downblended material), the 3166 Stack (1) would have a design flow capacity of 33,000 to 44,000 cubic feet per minute (cfm) with a minimum discharge velocity of 3,000 feet per minute and (2) would be approximately 80 feet tall based on the results of an optimization study performed by Isotek (Isotek 2008). The specifications of the 3166 Stack, however, may change as the project engineering design is finalized. Additionally, the 3166 Stack parameters may be different if the TWPC Option is selected; however, a 3166 Stack analysis has not been performed for the TWPC Option. For either option, construction materials and supplies would be temporarily staged at construction laydown areas which may be located either inside or outside of the ORNL plant boundary. Areas where land has been previously disturbed are the preferred locations for construction laydown areas; construction laydown areas are estimated to cover less than two acres.

2.2.2 Transport of DUO from SRS to Oak Ridge, TN

Various sources of DUO were evaluated for use in the downblend process, based on material availability and characteristics (e.g. physical and chemical composition, contaminants, potential emissions). The only available source of DUO in sufficient quantities and with the required attributes is located at the DOE SRS (DOE 2007).

To perform the proposed downblend activities, an estimated 1,038,000 pounds (472,000 kg) of DUO would be packaged into about 805 drums and transported to Oak Ridge for temporary interim storage at a licensed storage facility until needed. Environmental impacts for this transportation activity are described in DOE/EA-1393 (DOE 2002a).

2.2.3 Temporary Storage of DUO at a Storage Facility in Oak Ridge, TN

DUO transported from SRS would be delivered to a storage facility in Oak Ridge for temporary storage. Before these deliveries begin; however, Isotek would ensure that the selected storage facility is licensed by the appropriate regulatory authorities for the storage of DUO. Based on current plans, the preferred storage location is the MSC facility owned and operated by Energy*Solutions*. The MSC facility was originally constructed in the early 1980s to cast and roll uranium for defense and energy applications. DUO would be received, stored, and shipped to NFS in the same Sea-Land containers in which the DUO is received. No material handling is expected while the DUO is in temporary storage at MSC.

2.2.4 Transport of DUO from Oak Ridge to NFS

About 805 drums of DUO would be transported from the temporary storage facility in Oak Ridge to the NFS uranium operations facility located in Erwin, Tennessee. Each truckload would include about 23 drums of DUO packaged in a 20-foot Sea-Land Container. At the NFS facility, the drums of DUO would be stored temporarily prior to conversion to DUN solution.

2.2.5 Transport of DUN from NFS to ORNL

An estimated 1.43 million pounds (650,455 kg) of DUN would be transported by tanker truck from NFS to ORNL. The DUN solution would be transferred via Department of Transportation (DOT)-compliant 3,500-gallon tanker trucks (or equivalent), at a rate of one to five tanker trucks per month, for transport to the 3019 Building Complex. Each truckload would carry around 6,102 pounds (2,768 kg) of material that includes roughly 3,678 pounds (1,671 kg) of uranium.

Upon arrival at ORNL, the liquid DUN would be transferred from the tanker truck to a stationary tank located adjacent to Building 3019A. The stationary tank is a 10,000-gallon stainless steel tank located adjacent to Building 3019A in a concrete bunker. The bunker is partially below ground and is accessible by removal of concrete shield hatches. The tank would be equipped with a high level alarm to assist in overflow prevention.

2.2.6 Perform U-233 Downblend Activities in the Building 3019 Complex

The primary purpose of downblend operations is to reduce the concentration of fissile material. The downblend process is designed to achieve a fissile content of less than 0.96 percent U-235 equivalent (one gram of U-233 has a fissile equivalent to 1.4 grams of U-235). Nuclear criticality safety and analysis generally evaluates fissile material on a U-235 equivalency basis. Below the 0.96 percent concentration, the safeguards significance and the nuclear criticality controls would no longer be necessary, as the material would be non-weapons usable, would not pose criticality concerns, and would satisfy the original DNFSB concerns for this material.

The Proposed Action would be performed in two stages. The first stage involves the downblend operations performed in Building 3019A. The process for this stage is termed GC-1. A conceptual process diagram for GC-1 is presented in the top portion of Figure 2.2-2. The second stage would include operations to dry, package, and prepare the downblended material for transport to NTS or other licensed disposal facilities. The second stage is described in Subsection 2.2.7.

Downblend activities would begin with the retrieval and inspection of the U-233 containers. The containers would then be opened with robotic manipulators in shielded workstations. Various types of retrieval equipment will be designed into the operational configuration for use to accommodate the configuration of each container in the inventory. Inspection equipment would allow visual inspection of the container surface and labels. Retrieval equipment would not need to be changed out unless a repair was necessary. Contingencies for equipment change-out will be incorporated into the design and project schedule.

The next step would involve the oxidation of the uranium, if necessary, in a small furnace. The material would then be dissolved in nitric acid. When dissolved, the total uranium in a batch would be determined based on a certified analytical procedure. The storage containers that formerly held the material would be assayed, characterized, and routed for disposal as low-level secondary waste. Size reduction techniques for the U-233 inventory, such as crushing, to enhance the dissolution process may be used. The furnace, crusher station, and dissolvers would all be housed in a shielded workstation in Building 3019A.

2.2.7 Dry, Package, and Prepare Downblended Material for Off-site Transport

In the second stage of the Proposed Action, the downblended material would be dried, packaged, and prepared for off-site transport. This EA evaluates two mutually exclusive options for this stage. The preferred option involves the construction of an annex facility (hereafter called the 3019 Annex) adjacent to Building 3019A. A second option involves the transfer of downblended material via underground pipelines to the TWPC. If the TWPC Option is selected, then construction and operation of the 3019 Annex would not occur.

Figure 2.2-2—Conceptual U-233 Project Downblend Process

Source: DOE 2009b

Both of these options would perform the same basic functions—that is, they would dry, package, and load the downblended material onto a truck for off-site transport; however, the GC-2 option would render the downblended material in the form of uranium salt monoliths, and the TWPC Option would render the downblended material in the form of cementitious grout monoliths. Regardless of the process option selected, the final waste form produced will not be a RCRA-regulated waste. A conceptual process diagram for GC-2 is presented in the bottom portion of Figure 2.2-2. Processes performed at the TWPC are described in detail in DOE/EIS-0305-F (DOE 2000).

Annex Option

The proposed 3019 Annex would be constructed on less than an acre of land where Building 3074 is presently located. In the 3019 Annex, chemical and pH adjustments would be performed through the addition of iron sulfate [$FeSO_4$], sodium hydroxide [NaOH] and/or potassium hydroxide [KOH], and magnesium hydroxide [$Mg(OH)_2$] to convert the material into a stable uranium salt. The material would be routed to a dryer to remove moisture and other volatile materials. Steam condensate and nitrogen oxides would be collected in a scrubber and off-gas collection system. The stable uranium salt monoliths would then be packaged in DOE-approved, dual-layer containers. These containers would be constructed of stainless steel and would include technology to address the formation of radon-220 gas, such as decay tubes, activated carbon filtration, or other suitable technology. The containers would be placed in lead-lined, shielded over-packs to allow the material to be contact-handled. The material would be removed from the shielded over-packs and placed into shipping casks for transport to NTS or other licensed disposal facilities.

TWPC Option

Based on preliminary analysis, DOE believes that the transuranic (TRU) content of the downblended U-233 is sufficiently low such that co-processing the U-233 materials with material from the Melton Valley Storage Tanks (MVSTs) waste campaign at the TWPC would allow the combined waste stream to be dispositioned at NTS. The ability to co-process waste would help reduce overall waste quantities required for disposal.

The TWPC is located in the southwestern region of ORNL and is operated by EnergX for the DOE. The TWPC Option would use the ORNL network of underground liquid low-level waste (LLLW) pipelines to transfer downblended material, in liquid form, to the TWPC. These pipelines are double-walled stainless steel and are designed to carry LLLW. A pipeline for LLLW extends from the 3019 facility to the Bethel Valley Evaporator System, Building 2537. From Building 2537, the material could be transferred to the MVSTs. The material would be stored there until transfer to the TWPC.

Use of the LLLW pipelines would require the material to be highly alkaline and well mixed. The solids content of the transferred slurry would typically be less than 5 percent and would therefore require significant water additions to facilitate transfer. The TWPC evaporator could re-concentrate the slurried materials in the MVSTs. To accommodate the downblended material,

modifications would be required for the LLLW pipeline, the interim storage tanks and systems, and the TWPC.

2.2.8 Transport Downblended Material to a Licensed Disposal Facility

Whether the GC-2 process (Annex Option) or the TWPC process (TWPC Option) is selected, the downblended, end-product material would be packaged in DOT-compliant/Nuclear Regulatory Commission (NRC)-licensed containers and transported off-site via truck to NTS or another licensed disposal facility. Waste forms from the GC-2 process would be packaged in 55-gallon drums (IP-1 containers); the drums would be shipped to NTS or other licensed disposal facility in a shielded 10-160B shipping cask (NRC-licensed Type-B). Each shipment of GC-2 waste would contain 10 drums. Waste forms from the TWPC process would be packaged and transported to NTS or another licensed disposal facility in DOT Type A containers. Additional details regarding processes, waste forms, and shipping from the TWPC can be found in DOE/EIS-0305-F (DOE 2000).

2.2.9 Disposition of Secondary Waste

Secondary waste would be generated by demolition and construction activities; U-233 downblend and preparation activities; and facility stabilization, shutdown, surveillance, and maintenance activities. Secondary waste does not include downblended material or material that has a future use. Examples of secondary waste include items such as used personal protective equipment, construction and demolition debris, filters from air handling equipment, and sampling equipment. Secondary waste would also include any DUO not consumed during the downblending project. Secondary wastes are expected to be generated throughout all phases of the project and would be managed in accordance with all federal, state, and local laws and regulations. All wastes expected to be generated from the U-233 Project are similar in nature to wastes already generated on a regular basis from current ORNL activities. Secondary waste and disposition pathways are further described in Section 3.12. DOE/EA-1393 (DOE 2002a) addresses transportion and disposal of secondary waste.

2.2.10 Facility Shutdown, Surveillance, and Maintenance

When the downblend program is completed and the downblended material has been transported off-site, plans would be developed to place the Building 3019 Complex in a safe and stable shutdown condition for eventual D&D activities. These plans would be consistent with applicable functional end points specified by DOE to meet facility stabilization/transition requirements. As part of this transition, all process systems and equipment used for the U-233 downblend operations would be cleaned so as to minimize the amount of contaminated material. The pipes and tanks would be flushed to remove all unattached solid waste materials. These systems and equipment would then be characterized for subsequent disposal. Additionally, remaining process materials or wastes would be removed and disposed of in accordance with all applicable regulatory requirements (DOE 2007).

Because only a portion of Building 3019A would be utilized for the operations phase of the project, at DOE’s direction, shutdown activities could begin during ongoing operations in unused

portions of the facility. Activities would include removal of processing residues and radioactive and hazardous materials. Radiological control practices and procedures would be implemented to minimize the potential for airborne contamination and spread of contamination, with particular emphasis on in-use areas. After building shutdown is complete, surveillance and monitoring activities would be provided for the Building 3019 Complex and associated facilities until the facility is transferred to D&D.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED CONSIDERATION

In addition to the Proposed Action and No Action Alternatives, other alternatives were considered but not evaluated. With the exception of an expression of interest from the National Nuclear Security Administration for a small quantity of U-233 in support of weapons test programs, there is no programmatic use for the U-233 inventory (DOE 2004). Therefore, reuse options were eliminated from further evaluation. Four alternatives to the proposed aqueous process were considered but were eliminated based on cost and/or the technological basis. Other downblend alternatives considered are described in Section 2.3 of DOE/EA-1574 (DOE 2007).

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3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

3.1 INTRODUCTION

This chapter provides background information to evaluate the potential environmental impacts of the Proposed Action Alternative and the No Action Alternative. This chapter references information presented in DOE/EA-1488 (DOE 2004), DOE/EA-1574 (DOE 2007), and DOE/EA-1393 (DOE 2002a). Referenced information is generally summarized to give the reader an overview of the analysis presented in other documents.

The main activities associated with the Proposed Action are described in Chapter 2. At ORNL, these activities include material downblend activities within Building 3019A (the GC-1 process) and one of two mutually exclusive options (the GC-2 process and the TWPC process) to dry, package, and prepare the downblended material for off-site transport.

The Annex Option (GC-2 process) involves the construction and operation of the 3019 Annex within the Building 3019 Complex. The Annex Option would yield a waste product in the form of chemically stable uranium salt monoliths. The TWPC Option involves the transfer of downblended material to the TWPC via underground pipeline. Operations at the TWPC would solidify the downblended material into hardened cementitious grout monoliths. Impacts for both options are addressed in the subsections below.

3.2 LAND USE

3.2.1 Affected Environment

The main ORNL site encompasses facilities in two valleys (Bethel and Melton Valleys) on 1,100 acres of land within the ORR. Within the main area of ORNL, the DOE land use designation is "institutional and research." ORNL supports research and development mission activities in science and technology, energy resources, environmental quality, and national security. The Building 3019 Complex is located within the heavily developed Bethel Valley area of ORNL. The TWPC is located near the MVSTs in the southwestern portion of ORNL about 1.1 miles south of the Building 3019 Complex. The region south of the TWPC is wooded and generally undeveloped. The area north of the TWPC includes ORNL waste operations facilities.

3.2.2 No Action Alternative

Based on a review of the *Oak Ridge National Laboratory Land and Facilities Plan* (ORNL 2002), there would be no change to the existing land use for the area in and around the Building 3019 Complex under the No Action Alternative. The Building 3019 Complex would continue to operate as the storage location for the U-233 inventory, and the surrounding area is expected to continue to be used for institutional and research purposes. The Building 3019 Complex would require major capital upgrades and retrofits to critical facility systems that have nearly reached the end of their effective design life or have deteriorated beyond cost-effective repair. Significant additional operational expenses would also be incurred to repackage about 400 containers to satisfy current DOE storage standards for U-233 (DOE 2002a) and to provide

protection against potential nuclear criticality accidents or theft of the material. However, facility improvements needed for the No Action alternative would not impact land use.

3.2.3 Proposed Action Alternative

Annex Option

Land disturbance associated with the Annex Option of the Proposed Action would total less than one acre. Buildings 3074 and 3136 would be demolished; and the 3019 Annex would be constructed in the area currently occupied by these buildings. Prior to demolition of the 3020 Stack, the 3166 Stack would be constructed on previously disturbed land within the 3019 Complex. This land disturbance would have no impact on land use at or in the immediate vicinity of the Building 3019 Complex since the area is currently used for institutional and research purposes and is part of the industrialized portion of ORNL. Previously disturbed areas outside of ORNL may be temporarily used as laydown areas and are not expected to exceed two acres in size; there would be no significant impact on land use at these locations.

TWPC Option

Land disturbance for the TWPC Option would include the demolition of the 3020 Stack and the construction of the 3166 Stack. Land disturbance would have no impact on land use at or in the immediate vicinity of the Building 3019 Complex. Although system modifications would be required, these modifications would be to current operating systems at LLLW facilities and at the TWPC; therefore, there will be no impact to undisturbed land.

3.3 INFRASTRUCTURE

3.3.1 Affected Environment

In terms of infrastructure, ORNL is similar to a small city, supported by a dedicated fire department, a medical center, a security force, a wastewater treatment plant, and a steam plant. Major utilities required for ORNL operations, such as electricity, natural gas, water, and telecommunications, are available. These utilities are supplied by external entities. ORNL produces steam and compressed air and operates and maintains systems for the collection and treatment of sanitary, process, and industrial-type wastes. Utilities available to the Building 3019 Complex from ORNL include steam; potable, process and fire water; electricity; plant air; storm sewer; and sanitary sewer. ORNL transportation and infrastructure information is described in the *Oak Ridge National Laboratory Land and Facilities Plan* (ORNL 2002). In addition, Section 3.8 of DOE/EA-1574 (DOE 2007) also provides information on roads, electrical, natural gas, sewage, water, stormwater collection system, fire protection, compressed air, steam, and telecommunications. This information is incorporated by reference and is not repeated here.

3.3.2 No Action Alternative

Under the No Action Alternative, normal operations of the Building 3019 Complex and any future upgrades or modifications of the Building 3019 Complex would pose little or no increase in utility usage, and current building space allocation would not be affected. Changes to utilities would be limited to normal maintenance activities. There would be no expected changes to the utilization of the existing infrastructure and it is expected that the current infrastructure would be sufficient to satisfy future program needs.

3.3.3 Proposed Action Alternative

For the Proposed Action Alternative, estimated material requirements for construction of the 3166 Stack include 25 cubic yards of concrete and less than three tons of steel. Associated base and duct supports would require an additional 10 cubic yards of concrete. Construction of the Annex would require around 700 cubic yards of concrete and 25 tons of steel. These are small quantities for an industrial construction project and could easily be provided by local suppliers without prior notification. Construction would also require modest quantities of water, electrical power, diesel fuel, and propane; however, these modest demands on infrastructure would pose effectively no impact on ORNL infrastructure.

For project operations, all equipment used to downblend, dry, and package the material for off-site transport would be electrically powered. Equipment would be laboratory-scale with moderate power requirements.

Emergency Power – For both the Annex Option and the TWPC Option, the diesel generators that now serve the Building 3019 Complex are adequate to support the power requirements within the Building 3019 Complex, and therefore no new emergency power infrastructure would be needed. Likewise, the emergency power system at the TWPC is adequate to support the Proposed Action, and no new emergency power infrastructure would be needed. Therefore, the Proposed Action would have no impact on Emergency Power infrastructure.

Electrical Power – Since the project would occur within an existing facility within an industrial complex, it is expected that the current electrical power supply and transmission system would be adequate to supply the needed electricity without major modifications or upgrades. Whether the Annex Option or the TWPC Option is selected, power requirements would not pose an appreciable increase in demand from the ORNL grid, and the impacts to the ORNL power system would be small. Electrical service would be provided under site use agreements with ORNL such as is currently in place.

Potable and Process Water – For either the Annex Option or the TWPC Option, the maximum anticipated water usage (potable and process) would range from 1,000 to 3,000 gallons per day above the No Action Alternative water use levels. This estimated usage could be readily accommodated by the existing ORNL water supply system. Therefore, impacts on potable and process water systems would be small.

Sanitary Wastewater – For either the Annex Option or the TWPC Option, project operations could generate from 1,000 to 3,000 gallons of sanitary wastewater per day above the No Action Alternative wastewater generation levels. This water would be discharged into existing sewage lines for subsequent treatment at the ORNL Sewage Treatment Plant. The ORNL Sewage Treatment Plant has adequate capacity to handle the expected additional discharge of the sanitary wastewater that would be generated from U-233 Project operations. Therefore, impacts to the sanitary wastewater systems would be small.

After the Building 3019 Complex is placed in safe and stable shutdown, the major utility systems that serve the facility would remain operational until D&D occurs. Infrastructure requirements for the Proposed Action are small and could easily be satisfied by the existing infrastructure.

3.4 AIR QUALITY

3.4.1 Affected Environment

Ambient air quality is a measure of pollutant concentrations in the ambient air. In 1970, the Clean Air Act (CAA) was promulgated to address air quality concerns. CAA regulations limit the ambient concentration of seven specific pollutants known to cause adverse health effects. These pollutants, known as criteria pollutants, include carbon monoxide, lead, nitrogen dioxide, ozone, particulates less than 10 microns in diameter, particulates less than 2.5 microns in diameter, and sulfur dioxide. National Ambient Air Quality Standards (NAAQS) identify the federal, time-averaged concentration limits for these pollutants (40 CFR 50). Regional air monitors provide the data necessary to determine whether or not a region satisfies the NAAQS. Areas known to satisfy the NAAQS are designated as attainment areas, and areas that do not satisfy the NAAQS are designated as nonattainment areas. Areas that lack sufficient data to determine NAAQS compliance are designated as unclassifiable. Because there are seven criteria pollutants, an area can be designated as attainment for some pollutants and nonattainment for other pollutants. The 3019 Complex is located in a portion of Roane County which is designated as attainment or unclassifiable for all NAAQS (40 CFR 81.343).

Authority for implementation and enforcement of the CAA has been delegated to TDEC by EPA. TDEC has adopted NAAQS as the state standards, and has also adopted regulations to specify permissible short term and long term concentrations of hazardous and toxic air pollutants (TDEC 2006).

The TDEC Division of Air Pollution Control issues air permits for stationary emission sources (non-radiological and radiological) at ORNL. Nine major sources of air emissions from ORNL operations are covered under a CAA Title V Operating Permit (Number 556850). The primary sources of non-radioactive emissions from ORNL include the steam plant located in the main plant area of ORNL, four small package-unit boilers located at the 7600-area, and the Spallation Neutron Source. TDEC performed a regulatory inspection of ORNL air emission sources in year 2007 and all were found to be in compliance (DOE 2008b).

Radioactive airborne discharges at ORNL consist primarily of ventilation air from radioactively contaminated or potentially contaminated areas, vents from tanks and processes, and ventilation

for reactor facilities (DOE 2007). Radiological airborne emissions from ORNL consist of solid particulates, tritium, and other gases, both absorbable and nonabsorbable. Radiological emissions are treated and then routed through high efficiency particulate air (HEPA) and/or charcoal filters before discharge to the atmosphere. The primary radiological emission point sources for ORNL consist of seven stacks located in Bethel and Melton Valleys, as listed below (DOE 2008b):

- 2026 Radioactive Materials Analytical Laboratory
- 3020 Radiochemical Development Facility
- 3039 central off-gas and scrubber system, which includes Building 3019A VOG System, and serves the 3500 and 4500 areas cell ventilation system, isotope solid-state ventilation system, 3025 and 3026 areas cell ventilation system, 3042 ventilation system, and 3092 central off-gas system;
- 7503 Molten Salt Reactor Experiment Facility
- 7880 TWPC
- 7911 Melton Valley complex which includes the High Flux Isotope Reactor and the Radiochemical Engineering Development Center
- 8915 Spallation Neutron Source Central Exhaust Facility Stack

The ORR Annual National Emission Standards for Hazardous Air Pollutants (NESHAP) Report identifies emissions for 171 individual isotopes for year 2008. The combined radiological content of these emissions from ORNL was 8,590 curies. Isotopes of argon, carbon, cesium, and krypton represented about 95 percent of the total curies released, which included 67 percent from argon-41, 9 percent from cesium-138, 3 percent from carbon-11, and 16 percent from various isotopes of krypton. Collectively, the other radionuclides represented less than five percent of the total curies released. Based on radiological emissions for year 2008, the maximum off-site dose was estimated at 0.4 mrem (DOE 2009c).

Vessel off-gas (VOG) emissions from the Building 3019 Complex are exhausted through the 3039 Stack, which is managed by Bechtel Jacobs LLC (BJC) under TDEC Permit 547563. All other emissions are exhausted through the 3020 Stack (DOE 2007) under TDEC Permit 560898 managed by Isotek Systems, LLC.

3.4.2 No Action Alternative

As described in DOE/EA-1574 (DOE 2007), air quality impacts associated with the No Action Alternative would be small and within established regulatory limits. Surveillance and maintenance activities would continue for the U-233 inventory stored at the Building 3019 Complex. Some off-gas emissions from present operations are discharged through the 3020 Stack and some are vented through the 3039 Stack Ventilation System. In year 2007, the Curie content in emissions from the 3020 Stack and the 3039 Stack represented 0.0000000324 percent and 0.37 percent of combined Curie content from all ORNL stack emissions, respectively (DOE 2008b).

Extended storage of the U-233 in the Building 3019 Complex could require additional structural and confinement system upgrades. These upgrades could result in temporary and localized criteria pollutant emissions from operation of any heavy equipment and transportation vehicles

associated with construction activities. Off-gas emissions from current operations would be expected to remain unchanged (DOE 2007).

3.4.3 Proposed Action Alternative

Primary construction activities for the Proposed Action that are common to both the Annex Option and the TWPC Option include site preparation and construction of the 3166 Stack, internal modifications to Building 3019, and the operation of delivery trucks that transfer materials to and from the Building 3019 Complex and temporary laydown areas. Operation of construction equipment and delivery trucks would generate combustion tailpipe emissions and fugitive dust emissions. These emissions could produce odors that are temporarily noticeable to site workers near the construction area; however, these impacts would cease when site preparation and construction activities were completed. Best management practices would include the application of water on unpaved surfaces to reduce fugitive emissions, and the use of newer trucks and equipment that generate reduced emission levels. Emission levels from these construction activities would be very small compared to other emissions sources at ORNL, and the impact of these emissions would be small and temporary. Isotek would acquire a construction permit from TDEC before construction activities begin.

Emissions generated by construction activities within Building 3019 could include criteria pollutants, asbestos, and radiologically contaminated particulates. These emissions would be vented through a HEPA filtration system and exhausted through the 3020 Stack or the 3166 Stack. Overall, emission levels from construction activities would be very small compared to other emissions sources at ORNL, and the impact of these emissions would be small and temporary.

Off-site emissions associated with the Proposed Action would include combustion tailpipe emissions and fugitive dust generated by truck deliveries of process materials, such as uranyl nitrate, nitric acid, sodium hydroxide, magnesium hydroxide, ferrous sulfate, and other materials required to support demolition, construction, and process activities. The per-mile emissions from delivery trucks are relatively small, the number of truck deliveries would be limited, and truck emissions would be distributed over a wide area and a relatively long period of time. For these reasons, regional impacts to the existing air quality would be small.

The Building 3019 Complex has four ventilation systems. The purpose of these ventilation systems is to safely and efficiently collect gaseous waste streams, provide the necessary filtration, monitor the streams for radionuclide and hazardous material contents, and discharge the combined streams to the atmosphere at a central location. The systems are designed to provide continuous, uninterrupted operation. A detailed description of these systems is presented in DOE/EA-1574 (DOE 2007) and is not repeated here. For the Proposed Action, portions of these systems would be reconfigured to exhaust through the 3166 Stack. Emissions associated with current and proposed process operations may include filterable particulates, entrained nitric acid, uranium oxides, sodium hydroxide (GC-2 only), magnesium hydroxide (GC-2 only), iron sulfate (GC-2 only), and trace radioactive contaminants. Emissions from the Building 3019A VOG System would continue to be exhausted through the 3039 Stack; however, as a result of the Proposed Action, the nature of the 3019A contribution to the 3039 Stack emissions could change

slightly as thorium nitrate is removed from tank P-24 and uranyl nitrate is placed in a stationary tank adjacent to 3019A.

Radionuclide emissions from each process (GC-1, GC-2, and TWPC) would be subject to Title 40 of CFR Part 61 (40 CFR 61), Subpart H – National Emission Standard for Emissions of Radionuclides other than Radon from Department of Energy Facilities. When the design for the Proposed Action is sufficiently complete, the air permit application/modification process would be initiated. The applicable air permits would outline the applicable 40 CFR 61, Subpart H requirements to monitor and report radiological stack emissions to ensure regulatory compliance and public safety.

Upon completion of all downblend activities, Building 3019 would be placed in safe and stable shutdown and in preparation for D&D. Potential air emissions from the current storage activities would be eliminated, and no additional emissions would be expected from facility shutdown.

Annex Option

For the Annex Option, process emissions generated by the GC-1 and GC-2 activities would pass through a charcoal filtration system and HEPA filtration system before discharge through the 3166 Stack. The combined estimated annual radiological emissions from GC-1 and GC-2 operations are listed in Table 3.4-1. These emissions represent less than 0.2 percent of the radiological stack emissions at ORNL for year 2008. For the Annex Option, emissions from the 3039 Stack are expected to be as described above.

Table 3.4-1—Anticipated Radiological Emissions from the 3166 Stack

Radionuclide	Estimated Annual Emissions (Ci)
Am-241	2.19E-04
Cm-244	1.84E-05
Cs-137	1.26E-03
Tl-208	6.30E-01
Bi-212	2.18E+00
Pb-212	1.02E+01
Pu-238	1.26E-04
Pu-239	2.33E-04
Rn-220	2.00E+00
Total-Sr (as Sr-90)	1.21E-03
U-232	4.66E-09
U-234	9.09E-05
U-235/U-236 (as U-235)	8.39E-06
U-238	5.59E-06
TOTAL	1.50E+01

Source: Isotek 2008

EPA-approved fate and transport models AERMOD and CAP88 were applied to determine dose impacts from proposed facility operations for a range of stack heights for the Annex Option. The estimated emissions presented in Table 3.4-1 are based on a preliminary design height of 80 feet for the 3166 Stack; the final design stack height may change. The selected stack height will

(1) cost-effectively satisfy the as low as reasonably achievable (ALARA) principle, (2) ensure the radiological exposure to workers in all occupied on-site buildings (outside the Building 3019 Complex) is less than 1.0 mrem per year, and (3) ensure the radiological exposure to the off-site maximally exposed individual (members of the public) would not exceed 0.3 mrem per year as a result of the downblend operations. Radiological exposure to each member of the public (from ORR operations) would be well within the 10 mrem per year limit established in 40 CFR 61, Subpart H. The 3166 Stack emissions would also comply with the 10 CFR 835 limit of 100 mrem per year for near field exposure to the on-site worker (Isotek 2008). The Title V Permit would outline the requisite mitigation measures for regulatory compliance and public safety. Isotek anticipates the permit process will begin in December 2009.

TWPC Option

Radiological emissions for the TWPC Option would be similar to those for the Annex Option; however, unlike the Annex Option, which would exhaust through the 3039 and 3166 Stacks, the TWPC Option would exhaust through the 3039 Stack, the 3166 Stack, and the TWPC emissions system. For the TWPC Option, emissions from the 3039 Stack are expected to be as described above. Also, because project emissions for the TWPC Option would be distributed between stacks, separated by more than a mile, it is anticipated that the overall impacts on the region would not be appreciably different from the impacts for the Annex Option. Additionally, it is expected that if the TWPC Option is selected, the dose to the public attributable to processing downblended U-233 material will not be significantly different than the dose to the public from current operations at the TWPC. Air permit modifications attributable to implementation of the TWPC Option, if necessary, would outline the necessary mitigation measures to ensure regulatory compliance and public safety.

3.5 NOISE

3.5.1 Affected Environment

Noise is generally defined as unwanted sound. Noise energy naturally attenuates (lessens) with distance from the source. Grass-covered ground surfaces tend to absorb noise energy to enhance noise attenuation. Paved surfaces tend to reflect noise energy and do little to attenuate noise energy. Barriers, such as buildings or trees, also absorb noise energy which enhances noise attenuation.

Both mobile and stationary noise sources contribute to noise levels at ORNL. Mobile noise sources are associated with the travel of vehicles and equipment. Mobile sources pose a temporary increase in ambient noise levels for short durations. Peak traffic flow along Bethel Valley Road can pose a noticeable increase in noise levels in some areas of ORNL. Stationary noise sources are those that do not move or that move relatively short distances. Stationary noise sources in the vicinity of the Building 3019 Complex include ventilation systems, air compressors, generators, power transformers, and construction equipment. Beyond a few hundred feet away, noise levels from stationary sources are generally not distinguishable from background noise levels.

Occupational Safety and Health Administration (OSHA) standards (29 CFR 1910.95) define noise exposure limits for occupational workers. OSHA standards are implemented through the ORNL safety procedures. Allowable noise exposures are based on a combination of the noise exposure levels and exposure duration. As necessary, administrative controls, engineered controls (such as noise barriers and mufflers), and personal protective equipment (ear muffs or ear plugs) provide the means to protect workers from excessive noise levels.

3.5.2 No Action Alternative

Sound energy generated by current operations within the Building 3019 Complex are generally confined within the building. Current noise levels at the Building 3019 Complex are typical of an active industrial area and are primarily associated with traffic, stationary equipment operation, and nearby construction activities. Beyond the 3019 fenced area, these noise levels are generally indistinguishable from background noise levels. Routine maintenance activities associated with the continued storage of U-233 at the Building 3019 Complex generally do not generate noise levels that would pose a hazard to facility workers. All planned maintenance activities are subjected to a safety evaluation, and the potential for hazardous noise exposures are identified and mitigated in accordance with project safety procedures.

The No Action Alternative would eventually require facility upgrades. Noise hazards associated with these upgrades would be evaluated, and the appropriate levels of noise mitigation would be identified and implemented in accordance with project safety procedures. Construction activities associated with facility upgrades would pose a modest but noticeable increase in noise levels beyond the fenced area; however, the impacts would be temporary and small.

3.5.3 Proposed Action Alternative

Site preparation and construction activities associated with the 3019 annex and the 3166 Stack would contribute to current noise levels in the 3000 area of ORNL. Peak noise levels associated with site preparation and construction activities could exceed 85 A-weighted decibels (dBA); however, peak noise levels would generally be of short duration, and would attenuate to moderate levels within a few hundred feet of the source. The noise could pose a minor and temporary annoyance to ORNL workers near the construction site. Increased noise at the construction laydown area would be intermittent and temporary and would generally only occur in daytime hours. Construction activities associated with the TWPC Option would occur at existing LLLW facilities and at the TWPC; construction activities would affect existing systems generally located on the interior of buildings and would not pose a discernable increase in outdoor noise levels. OSHA requirements, implanted through project health and safety procedures, would require the use of ear protection for on-site construction workers exposed to noise levels above safe threshold levels. Best Management Practices, such as the installation of temporary noise barriers, would be applied as necessary to mitigate problematic noise levels caused by site preparation and construction activities.

Noise would also be generated by material transfer trucks that travel to and from the Building 3019 Complex. Noise levels associated with truck operations would be temporary and would attenuate quickly with distance. Noise levels from truck operations at the Building 3019

Complex would have little impact on the overall noise levels at ORNL and would not be expected to pose an annoyance to workers outside the Building 3019 Complex. No need for noise mitigation is anticipated.

The operation of equipment for the proposed downblend process would also contribute to noise levels in the area; however, most of the noise sources would be contained within a structure, and the increase in noise levels above current background levels, at and beyond the 3019 fenced area, would be small and would likely pose no annoyance to site workers nearby. Upon completion of the downblend process, the Building 3019 Complex facilities would be placed in a shutdown mode, and noise generated at the facility would return to the current levels.

3.6 GEOLOGY AND SOILS

3.6.1 Affected Environment

Bedrock beneath the main plant area of ORNL in Bethel Valley is composed of limestone, siltstone, and calcareous shale facies of the Ordovician Chickamauga Group. Bedrock beneath the Building 3019 Complex area includes the Fleanor Formation, Rockdell Formation, and the lower portion of the Benbolt Formation. Heterogeneous soils overlying bedrock include a mixture of fill, reworked soils, and native residual soils. During construction of the existing facilities of the Building 3019 Complex, soils were extensively modified by the excavation and refill of areas around waste storage tanks, underground pipes, and buildings (DOE 2007).

Because structures are ultimately supported by the soils upon which they are built, the soil characteristics influence the ability of a structure to withstand a seismic event. Above-ground structure design also influences seismic resistance. DOE-STD-1021-93 defines five levels of seismic performance, or performance categories (PCs), for structures based on the potential adverse impacts that may occur due to structure failure in a seismic event. Performance categories range from the most stringent design seismic requirements (PC-4) to the least stringent seismic design requirements (PC-0) (DOE 2002b). The process cells and storage tube vaults within Building 3019A are designated as a PC-3 structure. The rest of the facility is designated as a PC-1 structure, with one area which is PC-2.

3.6.2 No Action Alternative

Foundation soils for the Building 3019 Complex are predominantly residual clays with fair to hard consistencies. Generally, these types of clays are not susceptible to liquefaction, a condition whereby soils transition from a solid form to the form of a heavy liquid. Soil liquefaction hinders the ability of the soil to support a structure. The soils that support foundations of the Building 3019 Complex should therefore remain stable against liquefaction during and after a seismic event (ORNL 2004).

No effects to geological resources would occur under the No Action Alternative since the activities associated with the continued storage of U-233 at Building 3019 Complex and any future facility upgrades would occur within the existing facility in a previously disturbed area used for institutional and research applications.

3.6.3 Proposed Action Alternative

Construction activities would disturb the soil, most of which is similar in nature to the original soil of the area and was imported for fill at the time the earlier structures were constructed. Soil disturbances would be temporary and would occur within previously disturbed areas used for industrial applications. Additional soil, if necessary, would be delivered to the facility from an external source. It is anticipated that construction laydown areas would be located on previously disturbed soils; however, if otherwise, the construction laydown areas would be sited and prepared such that soils are not significantly impacted.

Standard soil retention and erosion practices would be applied throughout the construction process to minimize or eliminate soil destruction caused by erosion and surface water run-off. Potential impacts associated with seismicity would be similar to those described for the No Action Alternative. Although modifications would occur to Building 3019A, and potentially to the TWPC and LLLW facilities, these modifications would be to existing systems generally internal to the structures and are not anticipated to disturb soils. It is anticipated that seismic design requirements of the 3019 Annex would be mitigated by the stability of the soils within the Building 3019 Complex. Best Management Practices for construction would provide adequate mitigation for the planned activities.

3.7 WATER RESOURCES

3.7.1 Affected Environment

Surface Water

The Building 3019 Complex is located in the Bethel Valley Watershed. White Oak Creek is the main receiving surface water body in Bethel Valley. Its watershed comprises about 2,098 acres of Bethel Valley and includes three tributaries: Northwest Tributary (along the west side of the West Campus); First Creek (divides the west end of ORNL from the central area and receives drainage from both); and Fifth Creek (through the middle of central ORNL). Flow from White Oak Creek in Bethel Valley flows downstream to White Oak Lake, and eventually discharges to the Clinch River (DOE 1999). Surface runoff from the impervious surfaces around the Building 3019 Complex is routed to Fifth Creek via storm drains. Fifth Creek discharges into White Oak Creek via NPDES-permitted stormwater outfalls. No wetlands are present in the immediate vicinity of the Building 3019 Complex, and the area is not located within a floodplain. ORNL routinely monitors surface waters as described in the 2008 ORR Annual Site Environmental Report (DOE 2008b). Stormwater from the 3019 Complex discharges via Outfall 302.

Groundwater

Groundwater flow in Bethel Valley is generally from the northeast to the southwest (i.e., parallel to the strike direction). Some of the limestone bedrock beneath the area is subject to chemical attack and dissolution from weather to produce karst features such as cavities and conduits which strongly influence groundwater flow and transport of contaminants. In addition, extensive

modification of the soils profile has altered the soil hydrology and created numerous preferential seepage pathways, which provides a preferred pathway for groundwater flow and contaminant transport in the shallow groundwater zone (DOE 1999). DOE/EA-1574 (DOE 2007) gives additional information about ORNL groundwater quality.

3.7.2 No Action Alternative

Under the No Action Alternative, surface and groundwater monitoring programs would be continued at ORNL. The Building 3019 Complex contains several drain sources that send wastewaters, process wastewaters, domestic wastewater, stormwater runoff, cooling water, and condensate via piped collection systems to ORNL treatment facilities or outfalls, depending on the nature of the wastewater. The No Action Alternative would not result in any changes to these sources, and no additional adverse effects to water resources would be expected to occur. Impacts to surface water or groundwater could occur as the result of a spill or leak of fuel or hazardous material from current operations. Surface and groundwater protection measures, such as spill prevention and spill response plans, are already in place at ORNL. These measures would be continued under the No Action Alternative.

3.7.3 Proposed Action Alternative

The Building 3019 Complex area is a primarily impervious surface that would not be appreciably altered. The present stormwater collection system in this area would continue to collect runoff from the project area, and no new stormwater facilities would be required. Construction of the 3166 Stack would be required for both the Annex Option and the TWPC Option. Construction laydown areas would be located on previously disturbed land and would therefore not be expected to alter the flow of surface waters or contribute to turbidity of drainage tributaries in the region.

Stormwater runoff from the Building 3019 Complex and the construction laydown area would be controlled through implementation of appropriate Best Management Practices. Exterior storage vessels would be placed in diked areas for spill control. Stormwater discharges would be controlled, if necessary, to remove soil and any contaminants before discharge to storm drains or surface waters. Concentrations of toxic and conventional pollutants and radionuclides would be expected to remain within the current NPDES limits. There would be no impacts to surface water at the TWPC because TWPC modifications would be limited to upgrades to existing ventilation and piping systems. Neither option would draw from or discharge to groundwater sources and would therefore have no impact on groundwater resources under normal operations.

The safe and secure shutdown of the Building 3019 Complex at the completion of the proposed processing activities would not substantially change the amount of stormwater runoff generated and discharged, and would reduce the potential for a spill or release into the stormwater collection system or groundwater, which would be a net positive benefit. The application of Best Management Practices would provide adequate mitigation to minimize impacts to water resources.

3.8 ECOLOGICAL RESOURCES

3.8.1 Affected Environment

Vegetation in the vicinity of the Building 3019 Complex is limited, highly disturbed, and mostly maintained by lawn equipment. Grasses and herbaceous vegetation dominate the vegetative cover except for some Virginia pines located to the north and south of the building.

Since there is very little habitat available for native animals, the majority of the animal species found in the vicinity are species that adapt well to disturbance and the presence of humans, such as small rodents, birds such as starlings and pigeons, reptiles and waterfowl, especially Canada geese. There would be no changes to the existing habitat under the Proposed Action. Furthermore, existing routine disturbances from lawnmowers, traffic, fences, and industrial activities currently preclude the presence of rare, threatened, and endangered plant and animal species (DOE 2007).

3.8.2 No Action Alternative

The No Action Alternative is described in DOE/EA-1574 (DOE 2007). Under the No Action Alternative, no adverse environmental impacts would be expected to occur to any habitat or wildlife. The Building 3019 Complex is located in a highly disturbed area of ORNL used for institutional and research purposes. Habitat in the vicinity of the Building 3019 Complex is limited and mostly maintained by lawn equipment. The U.S. Fish and Wildlife Service, in a letter dated May 17, 2004, stated that available endangered species collection records do not indicate that federally listed or proposed endangered or threatened species occur within the impacted area of the proposed project (DOE 2007).

3.8.3 Proposed Action Alternative

No adverse environmental impacts would be expected to occur to any habitat or wildlife for the Proposed Action. All activities associated with the U-233 Project and the shutdown of the Building 3019 Complex would occur within previously disturbed areas continuously utilized for institutional and research purposes over an extended period of time. Habitat in the vicinity of the Building 3019 Complex is already highly disturbed and mostly maintained by lawn equipment. This type of habitat precludes the presence of rare, threatened, and endangered plant and animal species. Therefore, impacts to ecological resources would be small.

3.9 CULTURAL RESOURCES

3.9.1 Affected Environment

Building 3019A is considered to contribute to the ORNL Main Facilities Complex Historic District and is eligible to be listed in the NRHP (Thomason 2004). The facility, which was part of the Manhattan Project, was completed in December 1943. The purpose of the facility was to serve as a pilot plant to process and separate plutonium from irradiated slugs produced in the adjacent Graphite Reactor. The design and technology developed for this chemical processing

plant were used for the construction of a full-scale plant at Hanford, Washington. After World War II, Building 3019A served as a pilot plant for the development of other chemical separation processes that have played a major role in the advancement of chemical reprocessing techniques used worldwide (Carver/Slater 1994).

The original facility was comprised solely of seven concrete cells that rise from a basement level to about one story above ground and a wood-frame office and control gallery attached to the north side of the cells. In 1950, a new structure was built around the cells for containment, laboratory space, and control rooms. In 1954, a "hot analytical facility", Building 3019B, was built onto the west end of Building 3019A. Past interior alterations include the removal of all original process equipment, modernization of equipment in the control rooms, and installation of a new ventilation system (Carver/Slater 1994).

3.9.2 No Action Alternative

Current activities at the Building 3019 Complex would not be expected to impact the historical integrity of the Building 3019 Complex. Normal facility maintenance and facility upgrades necessary to continue present storage activities could require facility modifications or alterations. Prior to any such upgrades, DOE would conduct a review of the National Historic Preservation Act Historic Preservation Plan for the Oak Ridge National Laboratory, approved in 2005, and make such changes only after a determination was made that such actions would not adversely affect the potential listing of eligible buildings on the NRHP (ORNL 2005). DOE would consult with the Tennessee SHPO and furnish the SHPO with such determinations.

3.9.3 Proposed Action Alternative

Although there have been modifications to the structures, much of the original integrity of the Building 3019 Complex remains intact. However, the interior of the facility has lost its historical integrity because of extensive internal modifications that were made to provide support for past and current missions (DOE 2007). As part of the Proposed Action, additional modifications would be made to accommodate various process activities.

Based on the preliminary design, modifications would be made to Cell 2, Room 201, and Room 147 to support the installation of new process equipment. Rooms would be altered as necessary to allow for the installation of new process equipment. The building utility systems would be modified as necessary to support the project, and pipelines would be installed at various locations to permit the transfer of material and waste solutions. Chemical storage tanks and hazardous material transfer and storage areas would be constructed. Solution transfer equipment and spill containment would be modified and/or installed as necessary. Access to Building 3100 might need to be improved to facilitate drum storage, and additional construction access might be needed on two sides of Building 3019A to facilitate delivery of large equipment. In addition, the Proposed Action would include removal of the 3020 Stack, authorized via CERCLA TCRA Memorandum (DOE 2009a), and construction of the 3166 Stack and the 3019 Annex.

DOE prepared a letter to the SHPO, dated March 18, 2008 (DOE 2008c). In this letter DOE outlined the planned modifications to Building 3019A to enable the U-233 Project. DOE further

indicated that no adverse impacts to buildings eligible for listing as historic properties would occur. The SHPO responded to DOE on April 11, 2008, to concur with this assessment. (TDEC 2008)

The National Historic Preservation Act Historic Preservation Plan for Oak Ridge National Laboratory (ORNL 2005) is currently under DOE review, and existing Project Summary and Archeological and Historical Reviews prepared for this project to determine if the proposed construction of a new Building 3019 Annex and the construction of the new 3166 Stack are consistent with these analyses. It is expected that such a review will conclude that these two actions are consistent with analyses already conducted and would have no adverse impacts to buildings eligible for listing as historic properties, as the new stack would be smaller and less prominent than the original stack and the proposed Building 3019 Annex would not alter or distract from existing buildings in the Building 3019 Complex. Once this analysis is completed, any required assessment and notification to the SHPO would be performed.

3.10 SOCIOECONOMICS

3.10.1 Affected Environment

Region of Influence

The Region of Influence (ROI) is defined as the geographic region that is most affected by a Proposed Action. The ROI for the socioeconomic analysis consists of a four-county area in Tennessee that includes Anderson, Knox, Loudon, and Roane Counties. Figure 3.10–1 shows the regional counties influenced by ORR. About 40 percent of the current ORR workforce resides in Knox County, 29 percent in Anderson County, 16 percent in Roane County, and 6 percent in Loudon County. The other 9 percent of the workforce resides in other counties across Tennessee, none of which are home to more than 3 percent of the workforce (BEA 2009). Figure 3.10-1 shows the location of the ORR and the surrounding counties.

Demographic and Economic Characteristics

Table 3.10-1 summarizes population, per capita income, and total employment from years 2003 to 2007, the most recent years for which data are available. Population for the ROI has increased about 1.4 percent over the 5-year period from 562,845 in year 2003 to 595,518 in year 2007. Employment for the region rose slightly at 2.4 percent from 366,895 in year 2003 to 403,993 in year 2007. Total per capita income grew over the same period at a rate of about 4.3 percent (BEA 2009).

The average per capita income in the ROI was $32,597 in year 2007, an 18.4 percent increase from the year 2003 level of $27,541. Per capita income in year 2007 in the ROI ranged from a low of $30,278 in Roane County to a high of $35,491 in Knox County (BEA 2009).

The average employment rate in the ROI improved from 65.2 percent in year 2003 to 67.8 percent in year 2007. In years 2003 to 2007, the highest average employment rates in the ROI were 72.5 percent in Anderson County and 71.8 percent in Knox County. Employment rates in

Roane County and Loudon County were much lower at 40.7 percent and 42.1 percent, respectively. (BEA 2009).

Figure 3.10-1—Location of Oak Ridge Reservation and Regional Counties

Source: DOE 2001

Population and Housing

Between 1960 and 1990, population growth in the ROI was slightly slower than population growth in the State of Tennessee. The ROI population increased at an average annual rate of 1 percent while the state population increased 1.2 percent, annually. Between years 1990 and 2002, ROI population growth increased 1.2 percent, annually while the state population increased 1.6 percent, annually. Loudon County experienced the fastest rate of population growth at 2.5 percent annually between years 1990 and 2002, while Anderson County population has increased an average of only 0.4 percent annually (USCB 2005).

Table 3.10-1—Demographic and Economic Characteristics in the ROI

County	2003	2004	2005	2006	2007	Average Annual Growth 2003 – 2007 (percent)
Anderson						
Population	71970	72,244	71,725	72,735	73,246	0.440%
Per capita income ($)	27,664	28,588	29,010	30,165	31,077	2.951%
Total employment	51,907	51,693	52,707	52,987	52,906	0.478%
Roane						
Population	52,557	52,920	52,569	53,040	53,306	0.354%
Per capita income ($)	24,949	26,051	27,852	29,144	30,278	4.959%
Total employment	20,847	20,606	21,741	22,126	22,245	1.636%
Knox						
Population	396,672	400,061	408,809	416,014	423,603	1.656%
Per capita income ($)	30,265	32,040	32,430	33,996	35,491	4.036%
Total employment	277,519	286,689	294,496	301,529	309,116	2.732%
Loudon						
Population	41,646	42,237	43,194	44,281	45,363	2.160%
Per capita income ($)	27,286	29,270	30,697	32,037	33,543	5.297%
Total employment	16,622	17,330	18,567	19,092	19,726	4.373%
Region Totals						
Population	562,845	567,462	576,297	586,070	595,518	1.421%
Per capita income ($)	27,541	28,987	29,997	31,336	32,597	4.304%
Total employment	366,895	376,318	387,511	395,734	403,993	2.437%

Source: BEA 2009

Knox County is the largest county in the ROI with a year 2007 population of 423,603. Knox County includes the city of Knoxville, the largest city in the ROI. Loudon County is the smallest county in the ROI had a year 2007 total population of 45,363. The city of Oak Ridge and the ORR are located in both Roane and Anderson Counties which had populations of 53,306 and 73,246 in year 2007, respectively (BEA 2009).

There were a total of 244,536 housing units in the ROI in year 2000. A summary of ROI housing characteristics is shown in Table 3.10-2. About 8 percent of the housing units were vacant, although some vacant units were used for seasonal, recreational, or other occasional purposes. Rental vacancy rates ranged from 9.0 percent in Loudon County to 13.1 percent in Roane County, while homeowner vacancy rates ranged from 1.7 percent in Roane County, to 2.5 percent in Knox County. Owner-occupied housing units accounted for 64 percent of the total housing units while renter-occupied units accounted for about 28 percent (USCB 2001). In year 2000, the median value of owner-occupied housing units ranged from $86,500 in Roane County to $98,500 in Knox County and the median contract rent ranged from $398 in Roane County to $493 in Knox County. Housing characteristics for the ROI are shown in Table 3.10-2.

Table 3.10-2—Housing Characteristics for the ROI, Year 2000

County	Total Number of Housing Units	Number of Owner-Occupied Units	Homeowner Vacancy Rates (percent)	Median Value	Number of Occupied Rental Units	Rental Vacancy Rates (percent)	Median Monthly Contract Rent
Anderson	32,451	21,592	1.9	$87,500	8,188	12.8	$450
Knox	171,439	105,562	2.5	$98,500	52,310	10.0	$493
Loudon	17,277	12,612	1.9	$97,300	3,332	9.0	$462
Roane	23,369	16,453	1.7	$86,500	4,747	13.1	$398
ROI	244,536	156,219	NA	NA	68,577	NA	NA

Note: NA - Not applicable.
Source: USCB 2000

Distribution of Minority and Economically Disadvantaged Populations and Environmental Justice Concerns

For the purpose of this analysis, a minority population consists of any census tract in which minority representation is greater than the national average of 30.7 percent. Minorities include individuals classified by the U.S. Census Bureau as Black or African-American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, and Hispanic or Latino, and those classified under “two or more races.” This provides a conservative estimate consistent with Office of Management and Budget guidance (OMB 2000). Hispanics may be of any race and are excluded from the totals for individual races to avoid double counting.

The distribution of minority and economically disadvantaged populations changed little between years 1990 and 2000. Only one of the census tracts near the ORR currently includes a minority population greater than the national average of 30.7 percent. As of the 2000 census, minorities represented 40.1 percent of the population in Tract 201. As of year 1990, Black or African-American residents comprised the largest group (29.6 percent). The proportion of minority residents in all other Oak Ridge census tracts was below the national average with a range from 8.8 in Tract 206 to 17.4 percent in Tract 205 (USCB 2001). No federally recognized Native American groups live within 50 miles of ORNL.

Based on the 2000 Census, 12.4 percent of the United States population and 13.5 percent of the Tennessee population had incomes below the poverty level in year 1999. In this analysis, a low-income population consists of any census tract in which the proportion of individuals below the poverty level exceeds the national average. Within the ROI, 13.1 percent of the population in Anderson County had incomes below the poverty level. The proportion in Knox County was 12.6 percent, in Loudon County it was 10.0 percent, and in Roane County it was 13.9 percent (USCB 2001).

Economic Benefits of DOE Activities on the ORR

DOE employment and outlays generate additional benefits to the ROI and state economies through the creation of additional jobs. An analysis of the economic impacts of DOE operations conducted by the Center for Business and Economic Research at the University of Tennessee revealed that:

- Expenditures by DOE and its contractors led to an increase of nearly 4 billion dollars in the state of Tennessee gross state domestic product in year 2008(Murray 2009).
- Total personal income generated in the state of Tennessee by DOE-related activities was roughly 2.3 billion dollars in 2008. Each dollar of income directly paid by DOE in the state translates into a total of $2.08 in personal income for Tennessee residents (Murray 2009).
- DOE-related activities generated 90.1 million dollars in state and local sales tax revenue in Tennessee in year 2008 (Murray 2009).
- 45,372 full-time jobs were created in Tennessee either directly or indirectly by the DOE in 2008, which means that for every one DOE job there were 3.7 other jobs created across the state economy(Murray 2009).

Community Services

Community services in the ROI include public schools, law enforcement, fire suppression, and medical services. There are 7 school districts with 144 schools that serve the ROI. Educational services are provided for 87,568 students by 5,434 teachers for the 2008 to 2009 school year (IES 2009). The student-to-teacher ratio in these school districts ranges from a high of 16.8:1 in the Loudon County School District to a low of 13.7:1 in the Oak Ridge School District. The average student-to-teacher ratio in the ROI is 16.8:1 (IES 2009).

Based on 2007 data, counties within the ROI collectively employ 494 full time police officers (FBI 2007). The ROI also includes a total of 95 fire stations with 644 career firefighters, 495 volunteer firefighters, and 166 paid-per-call firefighters (USFA 2008). There are 14 hospitals in the four county ROI that serve the regional population (US News 2009).

3.10.2 No Action Alternative

Current operational expenses for routine storage, security, and maintenance activities for the No Action Alternative are estimated at $5 to $6 million per year and account for roughly 31 full-time-equivalent (FTE) jobs. Repackaging activities are expected to cost an additional $8 to $10 million per year for five to six years, and construction activities to upgrade the facility are estimated to cost about $20 million. It is assumed that continued surveillance and maintenance after these activities are completed would require the same 31 positions that are currently assigned to this task. No demographic or environmental justice impacts would be expected to occur under the No Action Alternative.

3.10.3 Proposed Action Alternative

Construction of the replacement 3166 Stack would generate an estimated 25 construction jobs that would last about 6 months. Construction of the Building 3019 Annex would generate about 50 construction jobs and that would last about 24 months. Facility modifications within Building 3019 would generate an estimated 15 construction jobs that would last for about 6 months. If the TWPC Option was selected, necessary modifications to the TWPC and LLLW facilities would generate an estimated 25 construction jobs and last about 9 months. Relative to the ROI population, these impacts would represent less than a one percent increase in the total regional

employment, and would have little impact on housing, schools, medical services, or emergency services in the ROI. The impacts, though small, would be positive for the community. No demographic or environmental justice impacts would be expected to occur as a result of construction.

For the Annex Option, an estimated peak level of 127 direct jobs would be generated to support operations for Phase II execution of the project and would continue for about 30 months. About 31 of these jobs would be associated with continued storage and maintenance activities in Building 3019A, and 96 jobs would be generated for other project operations. Since employment changes associated with other phases of the project would be considerably lower, this represents an upper bound for project employment. Relative to the ROI population, these impacts would represent less than a one percent increase in the total regional employment, and would have little impact on housing, schools, medical services, or emergency services in the ROI. The impacts, though small, would be positive for the community. Employment levels for the TWPC Option would be slightly lower than the Annex Option.

Once the Proposed Action is complete, employment levels would be reduced to support long-term surveillance and maintenance until D&D activities begin. No demographic or environmental justice impacts would be expected to occur as a result of operations.

Population

Based on the small number of jobs created and the pool of qualified local residents available, no impact on population is anticipated as a result of the Proposed Action.

Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires agencies to identify and address disproportionately high and adverse human health or environmental effects their activities may have on minority and low-income populations. Current information suggests that there would be no high and adverse human health or environmental impacts under normal operations. As discussed in earlier in this section, only one Tract in the ORR region includes a higher proportion of minorities in the population than the national average. Other tracts in the ROI have low proportions of minorities in their populations. Since no socioeconomic impacts are expected, no disproportionate impacts to minority or low income populations would be expected.

Employment and Income

This analysis assumes that the Proposed Action would create a net gain of 75 jobs for construction and 96 new jobs for peak operations, for a total of 171 jobs. These figures represent a very small increase (less than 0.1 percent) from the 2007 ROI employment total shown in Table 3.10-1. As a whole, the number of DOE employees and contractors exceed 13,700 in Tennessee, and most live within the ROI. These jobs have an average salary of nearly $65,000 in comparison to the statewide average of less than $45,000 (Murray 2009). Based on an average annual income of $65,000, 171 additional jobs would add about $11 million to the overall

income of the ROI or less than 0.1 percent of the 2007 ROI income. When the U-233 Project is completed, it would be expected that most or all of the 31 jobs associated with current 3019A operations would be eliminated. This employment level is a small percentage of the total ORNL or ROI employment and would not be expected to have any socioeconomic impacts.

Community Services

The small increases in employment and the lack of impacts on population and tax revenues indicate that there would be no impact on the existing community services of the ROI.

3.11 VISUAL RESOURCES

3.11.1 Affected Environment

The landscape at ORNL is characterized by a series of ridges and valleys that trend in a northeast-to-southwest direction. The vegetation is dominated by deciduous forest mixed with some coniferous forest. Most of the original open field areas on the site have been planted in shortleaf and loblolly pine, although smaller areas have been planted in a variety of deciduous and coniferous trees. The viewshed, which is the extent of the area that may be viewed from the ORR, consists mainly of rural land. The City of Oak Ridge is the only conterminous urban area. Viewpoints affected by DOE facilities are primarily associated with the public access roadways, the Clinch River/Melton Hill Lake, and the bluffs on the opposite side of the Clinch River. Views are limited by the hilly terrain, heavy vegetation, and generally hazy atmospheric conditions.

The Bureau of Land Management (BLM) Visual Resource Management (VRM) Classification System was applied to rate the scenic quality of ORNL and surrounding areas. Although this classification system is designed for undeveloped and open land managed by BLM, it is one of the only systems of its kind available for the analysis of visual resource management and planning activities. Currently, there is no BLM classification for ORNL; however, the level of development at ORNL is consistent with VRM Class IV, which is used to describe a highly developed area. ORNL structures are mostly low profile, masonry or concrete construction, generally three stories or less, and built mainly in the 1940s and 1950s. Facilities at ORNL are visible at night because they are brightly illuminated.

3.11.2 No Action Alternative

The No Action Alternative is described in DOE/EA-1574 (DOE 2007). Under the No Action Alternative, ORNL would proceed with current long-term plans to consolidate operations and reduce the number of excess facilities. This mission would continue for the foreseeable future. Although there would be some reduction in the density of industrial facilities as a result of such consolidation, ORNL would still remain a highly developed area with an industrial appearance, and no change to the VRM classification would be expected.

3.11.3 Proposed Action Alternative

Visual impacts associated with construction activities at the Building 3019 Complex would include construction materials and equipment and additional traffic from construction workers and material deliveries. Minor visual impacts may also occur due to fugitive dust and dark tailpipe emissions generated by construction equipment. Other visual impacts would be posed by construction of the 3166 Stack and the 3019 Annex. These impacts would be minor, temporary, and consistent with those of an industrial area. After construction of the facilities, construction materials, equipment, and construction debris would be removed, and construction laydown areas would be graded and seeded. There would be no impacts to visual resources associated with construction at the TWPC and LLLW facilities because all facility modifications would be incorporated into existing systems.

During the operation of the U-233 Project no significant changes to the existing visual appearances at ORNL would be expected. The 3166 Stack would be shorter and less prominent to the skyline than the 3020 Stack. The 3019 Annex would occupy the area now occupied by two other buildings slated for near-term removal under the CERCLA TCRA Memorandum (DOE 2009a), and would therefore pose no appreciable difference in appearance to the area. At some point activities of the U-233 Project would be completed and would allow for the D&D and ultimate removal of the entire Complex. Additional storage tanks would be small and would be located next to existing structures which would minimize their prominence. Consequently, operations for the Proposed Action would not be expected to degrade the visual resources of the Building 3019 Complex.

3.12 WASTE GENERATION AND MANAGEMENT

3.12.1 Affected Environment

Over the years, use of the facilities, rehabilitation, and construction have generated waste at the Building 3019 Complex. As a result, facilities and procedures to allow for the proper management of these wastes were developed by ORNL. As the use of these facilities has shifted to storage, volumes of waste generation decreased dramatically. Section 3.9 of DOE/EA-1574 (DOE 2007) explains the various categories of waste and describes the manner in which ORNL has managed this waste. This information is incorporated by reference and is not repeated here.

The U-233 Project is now responsible for the waste management activities for the Building 3019 Complex and has adopted waste management procedures which are similar to those of ORNL. ORNL waste management activities include the transport of waste off-site to commercially licensed treatment and disposal facilities for Resource Conservation and Recovery Act (RCRA) waste, Toxic Substances Control Act (TSCA) waste, and low-level waste (LLW). Solid waste is transported to municipal landfills and TRU waste is transferred to BJC (DOE 2007).

TWPC waste operations are described in DOE/EIS-0305-F (DOE 2000). Waste management procedures at the TWPC are also similar to those of ORNL. In general, the TWPC immobilizes TRU waste and/or alpha LLW into cementitious grout monoliths and then transfers the material

to a Type A waste container. After the waste/grout matrix is adequately cured (dry), the container is sealed and placed on a truck for off-site transport to a licensed disposal facility – generally the WIPP located in Carlsbad, New Mexico (DOE 2000).

3.12.2 No Action Alternative

Under the No Action Alternative, waste storage, transport, and disposal activities associated with the Building 3019 Complex would be minimal. Waste generation would be associated with normal routine maintenance activities. Facility upgrades would be required to support security and safety requirements; therefore, waste generation would increase periodically over current rates until the inventory is removed and the facility placed in safe shutdown (DOE 2007). Current operations generate around 3,500 cubic feet of LLW debris and scrap metal annually. This material is packaged and sent to NTS for disposal.

Similarly, the current waste activities performed at the TWPC would continue to meet current DOE project and programmatic objectives. Waste volumes generated by the TWPC are described in DOE/EIS-0305-F (DOE 2000).

3.12.3 Proposed Action Alternative

<u>Annex Option</u>

Excavations required for construction of the 3166 Stack and the 3019 Annex would generate excess soils, concrete, scrap metal, and debris which may be contaminated from previous ORNL activities. Excavated materials would be characterized to determine the appropriate manner of disposal. The nature of contamination for these materials could be radiological, RCRA, or TSCA. An estimated 16,240 cubic feet of LLW would be generated by construction activities. This material would be routed to NTS or other suitable facility for disposal. In addition, an estimated 1,000 cubic feet of chromium contaminated scrap metal (mixed LLW) would be generated. This material would likely be treated locally then routed to NTS or other suitable facility for disposal. Clean materials would be sent to a local construction and demolition waste landfill for disposal.

Facility modifications to Building 3019A would generate an estimated 10,000 cubic feet of LLW mainly in the form of scrap metal, debris, and concrete. This material would be packaged and sent to NTS for disposal.

The P-24 tank contains an estimated 715 gallons of thorium nitrate. This material would be addressed in a detailed P-24 Tank Content Disposition Plan. The plan would include collection of additional characterization data, identification of environmental requirements, and evaluation of specific treatment and disposition approaches. The P-24 Tank liquids could be transported to a commercial waste treatment facility for stabilization then routed for disposal at an appropriately permitted facility. Alternatively, these liquids could be processed along with the U-233 inventory.

Downblended material from Building 3019A would be transferred to the 3019 Annex where the GC-2 process would be performed. Primary waste generated by the GC-2 process would include LLW in the form of a dry monolithic uranium salt and LLLW.

Primary LLW would be packaged in stainless steel, 55-gallon, Type B, IP-1 containers for off-site transport. Each container would be equipped with a HEPA vent filter and a radon-220 decay tube, or other suitable means to address radon-220 formation within the drum. The estimated surface dose rate from each drum would range from 5 to 7 rad per hour. The total volume of primary waste is estimated at 3,667 drums. Waste drums would be secured in an NRC licensed Type-B shielded cask (10-160B). Each cask would contain 10 drums, and each cask would constitute a truckload. The surface dose rate from the cask would not exceed 0.5 mRad per hour. When GC-2 operations begin, an estimated three truckloads per week would be delivered to NTS or other licensed disposal facility. An estimated 367 truckloads would be required to transfer the downblended material off-site.

The GC-2 process would generate an estimated 211 gallons of condensate per week. This material would be discharged to the ORNL LLLW treatment facility.

Solid, secondary waste materials would also be generated by the GC-1 and GC-2 processes. These materials would include items such as U-233 package waste, hot cell debris waste, empty cans, failed equipment and components, decontamination waste, gas filtration media, personal protective equipment, maintenance waste, and DUO not consumed by the project. Small volumes of RCRA hazardous waste could be generated by laboratory activities. Small volumes of PCB waste could be generated from old paint/coatings and light ballasts during dismantlement activities. Secondary waste materials would be packaged in Type A containers and transported off-site to a licensed disposal facility. An estimated 220 cubic feet of secondary waste would be generated weekly. DOE/EA-1393 (DOE 2002a) addresses transportation and disposal of secondary waste.

The volume of waste materials generated by facility modifications and process operations would be minimized through Best Management Practices and project waste management procedures. ORR, local, and off-site treatment and disposal facilities have adequate capacity to accommodate all forms of waste generated by construction of the 3166 Stack, Building 3019A modifications, and downblend operations. Waste management impacts would be small.

TWPC Option

The TWPC Option would necessitate facility modifications to the LLLW transfer system and the TWPC. These modifications have the potential to generate small volumes of LLW, LLLW, and RCRA waste. Radiologically contaminated waste materials would be transported to NTS or other suitable facility for disposal. Non-radioactive RCRA hazardous waste would be transported off-site to RCRA-permitted commercial treatment and disposal facilities. Non-radioactive construction debris would be sent to a local construction and demolition waste landfill for disposal. Other solid waste would be routed to a local municipal solid waste landfill for disposal.

When operations begin, downblended material (from the GC-1 process in Building 3019A) would be transferred via the ORNL LLLW pipeline system to the TWPC. The primary waste form generated by the TWPC process would be LLW in the form of cementitious grout monoliths. This material would be packaged in Type A containers for off-site disposal. The TWPC process would potentially generate a slightly larger primary waste volume than the GC-2 process (no more than 20 percent larger). Secondary solid LLW for the TWPC Option would include PPE, contaminated trash, and waste generated by maintenance and repair operations. Secondary waste would also be packaged in Type A containers for off-site transport. It is anticipated the quantity of secondary waste would not be significantly different than from the Annex Option. LLLW generated by the TWPC process would be transferred to the ORNL LLLW treatment facility.

ORNL, local, and off-site disposal facilities have adequate capacity to accommodate all forms of waste generated by the TWPC process. Waste minimization would be achieved through Best Management Practices and adherence to project procedures. Impacts would be small and additional mitigation is not anticipated.

3.13 HUMAN HEALTH

3.13.1 Affected Environment

Radionuclides and chemicals are present in the regional soils and waterbodies due to past activities on the ORR. The *Oak Ridge Reservation Annual Site Environmental Report for 2007* summarizes pollutant releases and environmental contamination levels of chemicals and radiation for year 2007. Chemical and radiological hazards also occur naturally in the soils and waterbodies, and the sun poses a natural source of background radiation. ORNL releases and natural background sources collectively pose the potential to cause chemical and radiological exposure, both on-site and off-site (DOE 2008b).

In general, human exposure pathways include direct contact, inhalation, and ingestion. Radiation exposure is commonly categorized as either external or internal (i.e. ingestion and inhalation). Ingestion of radionuclides can occur through the intake of water or food (e.g., vegetation and fish). DOE Order 5400.5, *Radiation Protection of the Public and the Environment* (DOE 1998), limits the annual radiological effective dose equivalent (EDE) that an off-site individual may receive through all exposure pathways and all radionuclides released from ORR to a maximum of 100 mrem. DOE regulations (10 CFR 835, *Occupational Radiation Protection)* establish radiation protection standards and program requirements for DOE and DOE contractor operations with respect to the protection of workers from harmful radiation. For all DOE facilities, occupational radiation exposure is administratively limited to a maximum of 2,000 mrem per person per year. As outlined in the Isotek Radiation Protection Program Plan, the U-233 Project will administratively control worker radiological exposure below 500 mrem per person per year.

To quantify the potential for adverse health effects from chemical exposure, noncarcinogenic hazards are reported as hazard quotients (HQs) such that an HQ of one or more represents a potential for adverse health effects, and an HQ less than one indicates an unlikely potential for

adverse health effects. The sum of more than one HQ for multiple toxicants and/or multiple exposure pathways is called a hazard index. Pathways of concern for noncarcinogens are defined as those with a hazard index greater than one. (DOE 2007)

3.13.2 No Action Alternative

Radiological Exposure to the Workers

The radiological hazards at the 3019 Complex are mainly attributable to the U-233 stored in containers within the storage vaults. The duration of the hazard is indefinite, given that the No Action Alternative is to continue long-term surveillance and maintenance of the facility. It should be noted that the facility was constructed more than sixty years ago. Aging structures and components increase the risk of a failure that could result in an environmental release and/or increased worker exposure. Facility upgrades would therefore be required to mitigate this risk.

The hazards associated with routine operations are predominantly radiation exposure to the facility worker, in particular, when containers of radioactive material are retrieved from storage. This exposure is maintained well below the DOE guidelines for radiation workers and is controlled through strict adherence to the Project Radiological Protection program. On-site workers and the public are shielded from external radiation exposure by engineered structures and by the physical structure of the process cells.

Another potential radiation exposure hazard for the worker from routine operations, particularly maintenance activities, is the disturbance of fixed radioactive contamination, which could produce a respirable hazard. The presence of fixed contamination is due to decades of facility operation and residue from a 1959 chemical explosion in the facility. The facility ventilation system continuously replaces the air to flush out airborne contaminants. In this way, the ventilation system provides mitigation for the potential exposure to respirable hazards. Therefore, it is anticipated that normal operations within the Building 3019 Complex would continue to have a negligible impact on operations personnel.

Radiological Exposure to the Public

Radiological exposure effects to the public for the No Action Alternative are described in DOE/EA-1574 (DOE 2007). For residents of the United States, the average background radiological exposure, in terms of the effective dose equivalent (EDE), from natural and man-made sources is 360 mrem per year. Natural sources (such as radon, cosmic radiation) represent 300 of the 360 mrem. Based on the national average, natural external radiation sources represent 55 of the 300 mrem of total natural background radiation exposure. In the State of Tennessee, the average background external radiation exposure from natural sources is about 42 mrem, slightly lower than the national average of 55 mrem (DOE 2007).

For year 2007, the calculated radiation dose to the maximally exposed off-site individuals attributable to ORNL airborne releases was 0.26 mrem for a receptor located 3.1 miles east of the 3039 Stack and 2.6 miles east northeast of the 7911 Stack. The majority of the total dose was attributable to the release of Ar-41 (54.2 percent), Cs-138 (22.9 percent), Pb-212 (12.2 percent),

and Kr-88 (4.2 percent). The contribution of ORNL emissions to the collective effective population dose within 50 miles of ORO was calculated at 17.2 person-rem. Combined radioactive airborne emissions from the 3020 Stack and the 3039 Stack represented less than 0.4 percent of the total stack emissions from ORNL (DOE 2008b) and represent only a small portion of the total dose to the public.

Chemical Exposure to Workers

The potential for chemical exposures to workers in the Building 3019 Complex for the No Action Alternative is described in DOE/EA-1574 (DOE 2007) and are summarized here. Chemical hazards present in the Building 3019 Complex include uncoated lead shields, lead paint, PCBs, asbestos, combustible foam insulation, and perchlorate contamination. RCRA hazardous wastes are generated in the course of routine operations and facility maintenance. A portion of the U-233 inventory is known to contain cadmium which was deliberately added to act as a neutron poison. Oversight for control of occupational chemical exposures at the Building 3019 Complex currently is under the responsibility of the Project Environment, Safety and Health Organization, which ensures compliance with the provisions of 10 CFR 851, Worker Safety and Health Program.

Chemical Exposure to the Public

The potential for chemical exposure to the public for the No Action Alternative is described in DOE/EA-1574 (DOE 2007) and summarized here. Health effects attributed to chemical exposures can be categorized as carcinogenic or noncarcinogenic. Chemical carcinogenic risks are reported as a lifetime probability to develop an excess cancer. EPA defines a target cancer risk range from 1 in 10,000 to 1 in 1,000,000. This range determines when remediation actions are to be considered under the CERCLA (DOE 2007).

DOE has estimated the human health risks from chemicals found in the environs of the ORR. The primary exposure pathways considered are ingestion of potable water and fish. For ingestion of potable water, HQs were estimated upstream (Clinch River kilometer [CRK] 70) and downstream (CRK 16) of ORR discharge points. HQs were less than one for detected chemical analytes for which there are reference doses or maximum contaminant levels (i.e., barium, manganese, zinc, etc.) (DOE 2007).

To evaluate the potential health effects from the fish consumption pathway, HQs were estimated for the consumption of noncarcinogens, and intake/chronic-daily-intake ratios, I/I(10^{-5}), were estimated for the consumption of carcinogens detected in sunfish and catfish collected both upstream and downstream of the ORR discharge points. For consumption of sunfish and catfish, an HQ greater than one was calculated for Aroclor-1260 (a PCB) at all three locations (CRK 70, CRK 32, and CRK 16). I/I (10^{-5}) ratios greater than one were calculated for the intake of Aroclor-1260 found in sunfish and catfish collected at all three locations. In catfish, an I/I (10^{-5}) ratio greater than one was calculated for aldrin at CRK 16 (DOE 2007).

3.13.3 Proposed Action Alternative

Radiological Exposure to the Workers

Construction of the Building 3019 Annex and the 3166 Stack would be expected to disturb a small area of land. It is possible that these soils could be radiologically contaminated. Before land preparation activities begin, characterization activities would be performed to identify the nature and extent of soils contamination (if any). If radiological contamination were found, measures would be applied to remove these soils in a safe manner in accordance with project safety and health procedures. Radiological exposure levels for site characterization workers and construction workers would be maintained within DOE administrative limits.

Radiological worker exposures associated with the GC-1 process (those involved in the U-233 Project) are described in DOE/EA-1574 (DOE 2007). Radiological worker exposures would also occur for GC-2 (Annex Option) process workers (or the TWPC process workers if the TWPC Option were to be selected). Dose rates would vary by activity and by location within the Building 3019 Annex. The highest worker dose rates are associated with preparation of a 10-160B cask for transport. As specified in the Isotek Radiation Protection Program Plan, the dose to each worker would be expected to remain below 500 mrem per year. This goal would be achieved through a combination of facility design features (radiation shields) and administrative controls (limited worker exposure times). To ensure the protection of site workers nearby, the facility design and operations would ensure that the average annual dose rate at the 3019 fence line would not exceed 0.025 mR per hour.

Radiological Exposure to Public

Construction activities that would disturb the soil and allow for the migration of any contaminants would be local and would not be expected to migrate to the extent that it would cause any radiological exposure to the public. Radiological emissions from operations in the 3019 Annex would be filtered and exhausted through the 3166 Stack. The maximum annual radiological exposure to any member of the public attributable to the downblend program would be expected to be no greater than 0.3 mrem. Radiological emissions from the 3019 Complex are expected to cease after the downblend operations are completed and D&D activities have been completed. The TWPC Option would require modifications to the existing ventilation systems to address radon-220 formation. After the modifications are applied, the impacts of radiological stack emissions would be expected to be comparable to the historical levels for this facility.

Chemical Exposure to the Workers

Bulk chemicals used in the GC-1 process are described in DOE/EA-1574 (DOE 2007) and is incorporated by reference. Bulk chemicals used in the GC-2 process include the downblended uranyl nitrate, sodium hydroxide, iron sulfate, and magnesium hydroxide. Under normal operations, these chemicals would be confined within closed tanks and pipelines, and any chemical exhaust fumes would be captured in the ventilation system. Project health and safety procedures would govern the receipt, storage, and use of these chemicals to ensure worker

safety. Similarly, normal operations at the TWPC would not expose workers to chemical hazards.

Chemical Exposure to Public

Chemicals used in the GC-2 process would be captured by the ventilation system, HEPA filtered, exhausted out the 3166 Stack, and dispersed in the atmosphere. Similarly, chemical releases to the public for normal operations at the TPWC would be filtered and routed out the facility ventilation system. Under normal operations, the quantities and concentrations of the chemicals involved for either option would not pose any chemical exposure hazard to members of the public.

3.14 TRANSPORTATION

In general, transportation impacts of a proposed action can include (1) traffic delays, (2) risk of injury from a traffic accident, or (3) the risk of a latent cancer fatality (LCF) to the truck drivers and to members of the public caused by radiation shine from routine transportation or by exposure to radioactive materials released in a traffic accident. The potential for traffic delays are determined based on current traffic levels, roadway capacities, and the anticipated changes in traffic levels. To determine the increased risk of injury from a traffic accident, regional traffic accident statistics are applied to the anticipated increase in traffic levels. DOE software RADTRAN and TRAGIS, developed by Sandia National Laboratories and ORNL, respectively, are applied to estimate the risk of latent cancer fatality from routine transportation activities and for the accidental release of radiological materials. Because all activities involve some level of risk, professional judgment must be applied to determine whether the calculated risks are acceptable relative to the expected benefits of the Proposed Action.

3.14.1 Affected Environment

ORNL main site locations are accessible only by road. Vehicle circulation at ORNL may be divided into two groups, off-site and on-site circulation. Off-site circulation consists of staff movements to and from work and among the various Oak Ridge installations for work assignments and to deliver materials. Off-site roads include State Route (SR) 95 (White Wing Road), which provides access to the west end of the Bethel Valley area, and SR 62 and Scarboro Road, which provide access to the eastern end of Bethel Valley and the ORNL facilities. On-site circulation consists of materials handling, movement of personnel between buildings and to and from parking lots, and contractor and vendor personnel movement. (DOE 2007)

The main ORNL access road in Bethel Valley is Bethel Valley Road, which is currently closed to non-authorized traffic. This east-west road provides access to the site and leads to all the parking lots. Completion of several construction and expansion projects has helped alleviate some of the chronic parking problems experienced at the Bethel Valley site. Several main roads and access roads provide on-site transportation. The primary north and south corridors are First, Second, Third, Fourth, and Fifth streets. The major east and west corridors are White Oak and Central Avenues. Materials are transported via the same routes used by employees and visitors. (DOE 2007)

The main roads in Melton Valley are Melton Valley Drive, Ramsey Drive, and Melton Valley Access Road. These roads lead to the principal experimental facilities, including the High Flux Isotope Reactor, the Consolidated Fuel Reprocessing Center, and the Robotics and Process Systems Complex. Several other access roads serve the numerous solid waste storage areas. (DOE 2007)

More than 4,000 workers commute to ORNL each day, and a small portion of these workers carpool. There are many delivery trucks that travel to and from ORNL each day to support the various site missions. The average round-trip commute of an ORNL site employee is about 35 miles. Peak traffic occurs between 7 a.m. and 8 a.m. with the arrival of workers at the site, and between 4 p.m. and 5 p.m. with their departure. Minimal traffic delays are experienced during these peaks since work shifts are staggered, car and vanpooling are practiced, and most deliveries to and shipments from ORNL are timed to avoid the rush hour. Road maintenance and the movement of heavy equipment or escorted shipments typically occur during the workday after traffic flow has subsided.

Transportation of hazardous substances or radioactive materials poses the risk of injury. There is the risk of an accident whereby the release of materials leads to hazardous exposure, and in the case of radiological materials, the radiological shine poses the potential for LCF in the exposed population. Sandia National Laboratories developed software packages to quantify transportation risk. Quantitative results are presented in terms of the probability of a fatality. If transportation involves carcinogenic or radioactive materials, there is the potential for risk from an LCF.

3.14.2 No Action Alternative

Transportation impacts for the No Action Alternative are described in DOE/EA-1574 (DOE 2007) and are summarized here. Under the No Action Alternative, the U-233 inventory would continue to be stored at the Building 3019 Complex at ORNL. Therefore, there would be no transportation or transportation risk other than normal shipment of waste generated from inspection and maintenance activities and from the transport of employees to conduct such activities. Traffic would likely continue to remain close to current levels, and no impacts would be expected to occur.

3.14.3 Proposed Action Alternative

Transportation associated with the Proposed Action is grouped into six general categories: (1) transport of construction materials and equipment; (2) transport of DUO from SRS to Oak Ridge; (3) transport of the DUO to NFS in Erwin Tennessee; (4) transport of DUN from NFS to ORNL; (5) transport of downblended material via underground pipeline to the TWPC; and (6) transport of the downblended U-233 off-site for off-site disposal to NTS or other licensed disposal facilities. Each of these transportation categories is described in more detail below.

Construction

The transport of materials and equipment associated with the limited construction and modification activities at the Building 3019 Complex would be over regional and local roadways to the site. Demolition and construction activities are expected to last over a period of 54 months with transportation of materials and equipment to the facility. Similar transportation of materials to and through the ORNL occurs routinely, however the Proposed Action would produce a minor increase in the overall traffic flow. The number of trucks that enter and leave the Building 3019 Complex would increase from the No Action Alternative over the 54 months of demolition and construction. The present fence line would be expanded to allow for safer and more secure truck access along Hillside Avenue. The destination for inbound deliveries would be moved from the north side of the Building 3019A to a proposed new delivery area that would be constructed south of Building 3001.

Compared to the traffic associated with daily material delivery trucks and the more than 4,000 workers who commute to ORNL, the increase in traffic from construction workers and delivery trucks for the Proposed Action would be small and would pose only a modest additional delay along the main roads, and would have little impact on the risk for a traffic accident. Construction workers generally begin work earlier in the day than much of the ORNL operations staff, which would also reduce the overall impact of construction traffic on peak traffic levels.

DUO From SRS to Oak Ridge

DUO for the project would be delivered via truck from SRS to Oak Ridge for interim storage before transport to the NFS facility in Erwin, Tennessee for conversion to DUN. The preferred route would use Interstates 26 and 40 and would pass through Columbia, South Carolina, and Asheville, North Carolina.

A maximum of 35 truckloads would be required to transport the required amount of DUO from SRS to Oak Ridge, a distance of about 340 miles. Each shipment would consist of about 23 drums of material inside a Sea-Land-type container. This transportation scenario is addressed in DOE/EA-1393 (DOE 2002a).

Transportation of DUO from Oak Ridge to NFS

Transportation of DUO from Oak Ridge to the NFS facility would require a maximum of 35 shipments (about 13,485 kg DUO per shipment) over a distance of about 145 miles. Each shipment would contain 23 drums secured within a Sea-Land type container.

The methods to determine radiological and non-radiological impacts for the transportation of radioactive materials are described in a calculation package (Tetra Tech 2009). The non-radiological impacts (including fatalities due to accidents and inhalation of emissions) of the 35 DUO shipments were estimated to be 1.27×10^{-4}. The incident-free radiological impacts were estimated to be 1.52×10^{-4} fatalities and the LCFs due to release of radioactive materials due to transportation accidents were estimated at 8.38×10^{-15} (Tetra Tech 2009).

Transportation of DUN from NFS to ORNL

An estimated 650,455 kg of aqueous DUN would be transported from NFS to the Building 3019 Complex at ORNL. The DUN solution would be transported from Erwin in liquid cargo tank trailers or other DOT-compliant IP-1 type packages. The NFS facility in Erwin is about 145 miles from ORNL. Transport of this product would require about 235 truckloads of DUN solution. Each truckload would contain around 2,768 kg of DUN on a dry weight basis. The increase in traffic levels from this small number of truckloads would pose no impact on traffic flow.

The non-radiological impacts (including fatalities due to accidents and inhalation of emissions) of the 235 DUN shipments were estimated at 8.50×10^{-3} fatalities. The incident-free radiological impacts were estimated to be 4.11×10^{-5} fatalities, and the LCFs due to release of radioactive materials due to transportation accidents were estimated at 3.57×10^{-14}. (Tetra Tech 2009).

On-site Transport of Downblended Material

The TWPC Option would transfer the material from Building 3019A to the TWPC through an existing underground LLLW pipeline system. Because the transfer would occur underground in a double-contained pipeline, and because material transfers would be periodic and would occur for a limited timeframe, the potential risk to ORNL personnel would be small. Engineering design, operational procedures, and Best Management Practices would provide the necessary mitigation for this activity.

Transportation of Downblended Material Off Site for Long Term Management

For the Annex Option, downblended U-233 material would be in the form of stable uranium salt monoliths and would be packaged into 55-gallon drums (IP-1 containers). Over the project period, approximately 3,667 drums of the downblended product would be expected to be generated. These drums would be loaded in shielded 10-160B casks. Each Type B cask would hold ten 55-gallon drums. Each truckload would consist of one 10-160B cask. Current plans call for delivery of three truckloads per week, for a total of 367 deliveries over the life of the project.

The downblended product would be transported to NTS or other licensed commercial LLW treatment and disposal facilities. The approximately 367 deliveries are expected to yield between 0.0137 to 0.0152 non-radiological fatalities (accident fatalities and deaths due to inhalation of diesel emissions). The incident-free radiological impacts were estimated to be 0.00569 fatalities and the LCF due to release of radioactive materials due to transportation accidents are estimated to be between 3.52×10^{-12} and 7.40×10^{-12} (Tetra Tech 2009).

For the TWPC Option, the final waste form would be cementitious grout monoliths. This material would be packaged in Type A containers for off-site disposal. Although the TWPC process would potentially generate a slightly larger primary waste volume than the Annex Option (GC-2), it is anticipated the number of shipment would be roughly equivalent to the Annex Option. As a result, the transportation impacts are judged to be not significantly different than for the Annex Option.

3.15 ACCIDENTS

3.15.1 Affected Environment

The accidental release of material stored in Building 3019A would pose radiological hazard and a chemical exposure hazard. Facility operations and the associated potential for accidents are identified and evaluated in the facility safety basis (ORNL 2004). The safety basis also identifies engineering and administrative controls to protect facility workers and to mitigate the potential for a release of radioactive or hazardous materials.

3.15.2 No Action Alternative

Under the No Action Alternative, the ORNL inventory of U-233 would remain stored within the Building 3019 Complex. Major facility upgrades and retrofits would be required to ensure the continued safe storage of the material, and an estimated 400 containers would have to be repackaged to ensure adequate protection against potential nuclear criticality accidents or theft of the material. A detailed discussion of potential accidents for the No Action alternative is provided in DOE/EA-1574 (DOE 2007).

3.15.3 Proposed Action Alternative

Most of the key elements of the Proposed Action have not changed since the issuance of DOE/EA-1574 (DOE 2007). The key difference between the DOE/EA-1574 (DOE 2007) Proposed Action and the current Proposed Action is the potential construction and operation of the 3019 Annex for the GC-2 process or the use of the TWPC process to dry and package the material for off-site disposal. DOE/EA-1574 (DOE 2007) provides a detailed description of accident scenarios and their impacts. The results of the DOE/EA-1574 (DOE 2007) accident analysis demonstrate that accidents do not pose an unacceptable risk of injury to the facility worker, ORNL workers, or the public. Accidents and their impacts for the current Proposed Action are not expected to be significantly different from the accidents presented in DOE/EA-1574 (DOE 2007).

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4.0 CUMULATIVE IMPACTS

4.1 INTRODUCTION

CEQ regulations that implement the procedural provisions of NEPA define cumulative impact as the "impact on the environment which results from the incremental impact of the action when added to past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR Part 1500-1508). A cumulative impact analysis is only conducted for those resource areas with potential for cumulative impacts. Resource areas identified for cumulative impact analysis in this EA include land use, infrastructure, air quality, socioeconomics, waste management, human health, transportation, and accidents. This cumulative assessment is conducted in accordance with CEQ NEPA regulations and the CEQ handbook, Considering Cumulative Effects Under the *National Environmental Policy Act* (CEQ 1997), on the preparation of cumulative impact assessments. To assess cumulative impacts, current and planned initiatives are identified and described below.

4.2 CURRENT AND PLANNED INDUSTRIAL ACTIVITIES IN THE REGION

Current, large-scale industrial activities in the region include demolition and site remediation activities at ETTP; normal operations at the Spallation Neutron Source facility in Bethel Valley and the TWPC in Melton Valley; normal operations, building demolition, and facility modernization and consolidation activities at ORNL and Y-12; operation of the 950 MW, coal-fired, Bull Run Utility Plant; operation of the 1456 MW, coal-fired, Kingston Utility Plant; and remediation activities for the 300 acres damaged by the Kingston Utility Plant ash spill from December 2008.

Significant future industrial activities are planned for ORNL and Y-12 as proposed by the Integrated Facility Disposition Project (IFDP). The main goals of the IFDP are to eliminate high risk legacies of the Manhattan Project and Cold War, achieve environmental remediation, and to modernize ORNL and Y-12. IFDP would be funded out of the EM budget, and may be accelerated by funds from the American Reinvestment and Recovery Act. The scope of work includes decontamination, deactivation, and demolition of contaminated facilities; restoration of soil and groundwater contamination areas; legacy waste disposal and facility operations; utility reroutes, non-mission equipment removal, and facility construction and improvements. Footprint reductions include the removal of 327 ORNL facilities (1.5 million square feet) and 112 Y-12 facilities (3.9 million square feet) for a total footprint reduction of 5.4 million square feet. The target completion range is 15 to 25 years. The estimated volume of debris would exceed 2 million cubic yards.

4.3 CUMULATIVE ASSESSMENT

4.3.1 Land Use

After downblend activities are completed and the material has been transported off-site, the U-233 Project would place the Building 3019 Complex in safe-shutdown for eventual demolition. The demolition of these facilities along with the IFDP would free an area of land for

substantial portion of the current ORNL workforce. The workforce available in the ROI would be adequate to satisfy the demand for additional workers. Housing, public services, hospital resources, and other socioeconomic resources are adequate to accommodate the anticipated workforce and their families. Therefore, it is not anticipated that the Proposed Action and other proposed activities in the region would yield any adverse cumulative socioeconomic impacts.

4.3.5 Transportation

Demolition and construction activities for the Proposed Action would yield a small net increase in the flow of traffic to and from ORNL. The Proposed Action would contribute approximately three truck shipments per week to the current traffic load for about two and one-half years. Proposed remediation, demolition, and construction activities identified by the IFDP would also yield a net increase in ORNL traffic levels; however, these activities would be performed over a 15 or 20 year time span, which would mitigate large increases in traffic. Based on the current ORNL traffic flow along Bethel Valley Road, it is not anticipated that the net increase in traffic levels from the Proposed Action and reasonably foreseeable actions would pose an adverse cumulative impact on transportation.

4.3.6 Waste Management

Remediation, demolition, and construction activities associated with proposed IFDP activities and the Kingston ash spill would generate large waste volumes. Local and off-site disposal facilities may need to develop additional capacity to accommodate these waste volumes. Demolition and construction activities for the Proposed Action would also generate waste, but the volume would be very small compared to other planned activities in the region, and would contribute little to the cumulative impact on available waste disposal capacity.

The downblended U-233 would represent an estimated 3,667 drums of waste. The proposed disposal facility (NTS) has adequate capacity to accept this waste; disposal of legacy waste from IFDP activities could contribute to this total. Cumulative impacts of the Proposed Action and other foreseeable actions may pose a large demand for waste disposal facilities, which could potentially lead to the need for additional disposal capacity.

4.3.7 Human Health

Operations included under the Proposed Action would pose a small increase in chemical and radiological emissions at ORNL. These emissions would combine with emissions from other regional sources; however, because the emission levels are very small compared to emissions from regional sources, the cumulative impacts would not be significant and would not require additional mitigation. Completion of the U-233 Project would have many positive impacts, including the elimination of need for safeguards, security, and nuclear criticality controls for the U-233 material. Placement of the facility in a safe and stable shutdown for D&D would also have a positive cumulative impact on human health for workers and the public.

4.4 CUMULATIVE IMPACTS SUMMARY

Although it is not possible to precisely determine all projects that may occur over the next several years, a good faith effort has been made to determine probable project possibilities and assess the impacts associated with those projects. When considered as a whole, the impacts of all of the above listed projects are not expected to substantially degrade environmental conditions. The areas with the most impacts would be waste generation and air pollution associated with demolition of legacy facilities and new construction activities. Most of the major activities remediate the environment and remove or stabilize future sources of contamination.

5.0 PERMITS AND ENVIRONMENTAL REGULATION

5.1 PERMITS

Federal, state, and local regulatory authorities have established requirements that govern demolition; construction; operations; treatment and release of effluents; waste management; transportation; and other aspects of the Proposed Action. Some of the proposed activities would require an approved permit from the regulatory authority. A permit is essentially a contract between the applicant (Isotek and/or DOE) and the agency with regulatory authority (e.g. TDEC) that describes the activity and the conditions and parameters by which the activity can legally be performed. The permit process ensures that all applicable regulatory requirements are satisfied. There are several permits already in place that cover current operations at the Building 3019 Complex, the LLLW transfer pipelines, and the TWPC. Proposed activities that fall outside the parameters of established permits must be modified; and similarly, a new permit must be obtained for activities not covered by current permits.

Isotek currently manages emissions (3020 Stack) from the 3019 Complex under the Title V Major Source Operating Permit Number 560898 issued by TDEC. Permit 560898 became effective July 27, 2009, and expires on July 26, 2014. Pursuant to the Rules of the TDEC Bureau of Environment, Division of Air Pollution Control in Chapter 1200-03-09-.01 (TDEC 2001), Isotek must submit an air construction permit application for the U-233 Project process, which is considered a new air contaminant source according to these provisions. The application must be submitted to TDEC at least 90 days prior to the estimated starting date of construction of the process. Construction can begin upon issuance of the construction permit by TDEC. After construction, Isotek will need to amend the Title V permit to include operating limits and conditions associated with the new process. A modification may also be required for National Pollutant Discharge Elimination System (NPDES) permit number TN0002941. This NPDES permit was issued by TDEC and became effective on August 1, 2008; the permit expires on July 30, 2013.

The U-233 Project would not proceed with construction or operations until all necessary permits and authorizations are established. Permits related to the U-233 Project would be routine, and no unusual circumstances are expected. Sufficient information exists to prepare applications, and it is expected that permits could be received in a timely manner.

5.2 ENVIRONMENTAL REGULATION

Activities conducted at ORNL are required to be in compliance with environmental standards established by Federal and state statutes and regulations, executive orders, DOE Orders, contract-based standards, and compliance and settlement agreements. Principal among the regulatory agencies are TDEC and the EPA. These agencies issue permits, review compliance reports, participate in joint monitoring programs, inspect facilities and operations, and oversee compliance with applicable regulations. In addition, DOE has an extensive set of Environmental Orders which identify programs to assure compliance with environmental regulatory requirements and safety for both the worker and members of the public.

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6.0 AGENCIES CONTACTED

Over the past 18 months the U-233 Project Team contacted the Tennessee State Historic Office on two occasions to describe the activities associated with the Proposed Action and to seek approval. Two separate response letters were provided from the SHPO, and each letter confirmed that impacts to the proposed activities are adequately mitigated pursuant to the requirements of Section 106 of the National Historic Preservation Act. These letters are included as Appendix A and B. No other agencies were contacted in the preparation of this EA. DOE/EA-1488 (DOE 2004) and DOE/EA-1574 (DOE 2007) contain relevant information about agencies contacted regarding the Proposed Action.

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USFA 2008 — Fire Stations and Fire Fighter Personnel. for year 2007 as listed by the United States Fire Association. Available at http://www.usfa.dhs.gov/applications/census/states.cfm.

U.S.C. 1954 — Atomic Energy Act of 1954, 42 U.S.C. § 2011 et seq.

US News 2009 — U.S. News and World Report - List of Hospitals in Tennessee, September. Available at http://health.usnews.com/health/best-hospitals/index/TN.

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TENNESSEE HISTORICAL COMMISSION
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
2941 LEBANON ROAD
NASHVILLE, TN 37243-0442
(615) 532-1550

April 1, 2008

Ms. Katatra C. Vasques
Oak Ridge Operations Office
Post Office Box 2001
Oak Ridge, Tennessee, 37831

RE: DOE, ORNL/BLDG. 3019A,3020, OAK RIDGE, ANDERSON COUNTY

Dear Ms. Vasques:

Pursuant to your request, received on Monday, March 24, 2008, this office has reviewed documentation concerning the above-referenced undertaking. This review is a requirement of Section 106 of the National Historic Preservation Act for compliance by the participating federal agency or applicant for federal assistance. Procedures for implementing Section 106 of the Act are codified at 36 CFR 800 (Federal Register, December 12, 2000, 77698-77739)

Based on the information provided, we find that the current documentation adequately mitigates project effects upon properties eligible for listing in the National Register of Historic Places as stipulated in the operations Programmatic Agreement. (PA)

Therefore, this office has no objection to the implementation of those project elements covered by the PA. Your continued cooperation is appreciated.

Sincerely,

E. Patrick McIntyre, Jr.
Executive Director and
State Historic Preservation Officer

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John Owsley, Tennessee Department of Environment and Conservation, DOE Oversight Division, Oak Ridge, Tennessee

No.	Section	Comment	Response
1	General	The document should discuss other disposition alternatives for the downblended waste, should DOE fail to satisfy the NTS disposition deadline of 2010. DOE should outline plans for other disposition outlets for the mixed waste, if the WIPP acceptance criteria are not met.	A design goal for the U-233 downblend project is to produce a waste form that does not exceed Toxicity Characteristic Leaching Procedure (TCLP) criteria for hazardous waste, and therefore will not meet the definition of mixed low level waste (MLLW). The waste form produced by the U-233 downblend project will be low-level waste (LLW). Consequently, the NTS deadline is not applicable.
2	General	DOE should have a detailed plan for the management of any unused DUO obtained for this project.	The project baseline (schedule, budget, and plan) will be revised at the 90% design maturity. Disposition of unused DUO will be included in the revised baseline. A statement is added to sections 2.2.9 and 3.12 to address disposition of unused DUO. It should also be noted that the SRS DUO is currently approved for disposition at the Energy*Solutions* Clive, Utah facility or NTS.
3	Section 2.2.5, Transport of DUN from NFS to ORNL	Because it is liquid, a spill of DUN would be difficult to recover. Identify the precautions taken to ensure tanker trucks will not leak in the event of an accident.	The project will use DOT compliant tanker trucks to transport DUN. Such shipping containers are designed to withstand impacts from accidents and are approved for use consistent with project requirements.
4	Section 2.2.6, Perform U-233 Downblend Activities at the Building 3019 Complex	DNFSB is not spelled correctly	[Concur] Correction applied.

No.	Section	Comment	Response
5	Section 2.2.7	Please add more discussion of the chemical species that would emerge from the two treatment options. Presumably, the annex option would result in a very low solubility salt and the TWPC option would produce uranyl nitrate absorbed in a cement block. Identify the specific salt that would be produced by the annex option and how the uranyl nitrate would perform in a leach test. It should be noted that the MVST waste is TRU waste and that a mixture of this waste with the U-233 could divert the MVST waste from the WIPP.	The annex option would produce a stable, low-solubility salt waste form. It is currently anticipated this salt will be primarily in the form of sodium diuranate; however, the current formulation has not been finalized. Although the final form of the waste salt may be slightly different from currently anticipated, it would still be in the form of a stable, low-solubility salt that is suitable for disposal. In the TWPC option, the uranyl nitrate material would be blended into the matrix of the cement, and the process/formulation would ensure a

No.	Section	Comment	Response
8	Section 3.4.1, Affected Environment	What are VOG emissions? The acronym is not included in the list of acronyms and may be a typographical error	[Concur] VOG is an acronym for Vessel off-gas. It is added to the acronym list.
9	Section 3.4.2, No Action Alternative	Identify the U-233 inventory operations that result in off-gas emissions?	Static storage requires the reliable operation of ventilation systems to ensure any off-gas emissions are captured and handled consistent with the applicable TDEC air permit.
10	Section 3.4.3 Proposed Action Alternative	Please explain how the 3166 stack would impact the TWPC option.	The design of the 3166 Stack would be a function of the anticipated emissions. Fewer emissions would be exhausted out the 3166 Stack if the TWPC alternative is selected due to the elimination of the Annex facility.

E. Patrick McIntyre, Jr., Tennessee Historical Commission – Department of Environment and Conservation, Nashville, Tennessee

No.	Section	Comment	Response
11	General	In response to your request, received on Monday, October 5, 2009, we have reviewed the documents you submitted regarding your proposed undertaking. Our review of and comment on your proposed undertaking are among the requirements of Section 106 of the National Historic Preservation Act. This Act requires federal agencies or applicant for federal assistance to consult with the appropriate State Historic Preservation Office before they carry out their proposed undertakings. The Advisory Council on Historic Preservation has codified procedures for carrying out Section 106 review in 36 CFR 800. You may wish to familiarize yourself with these procedures (Federal Register, December 12, 2000, pages 77698-77739) if you are unsure about the Section 106 process. You may find additional information concerning the Section 106 process and the Tennessee SHPO's documentation requirements at: http://www.tennessee.gov/environment/hsit/federal/sect106.shtml. Considering available information, we find that the project as currently proposed will NOT ADVERSELY AFFECT ANY PROPERTY THAT IS ELIGIBLE FOR LISTING IN THE NATIONAL REGISTER OF HISTORIC PLACES. Therefore, this office has no objection to the implementation of this project. Please direct any questions and comments to Joe Garrison (615) 532-1550-103.	Noted.

Oak Ridge Reservation Local Oversight Committee, Citizens' Advisory Panel

No.	Section	Comment	Response
12	General	The Citizens Advisory Panel (CAP) of the Oak Ridge Reservation Local Oversight Committee (LOC) has reviewed and commented on the Draft EA for the U-233 Material Downblend and Disposition Project at ORNL. We agree with the need to disposition this material, but we strongly disagree with the decision not to recover the thorium-229 that is the precursor for actinium-225 and bismuth-213, progeny isotopes used for medical purposes. Uranium-233 is the only source of Th-220, and the ORNL stockpile is the only significant amount of U-233 available in the country. Consequently, the CAP rejects both the permanent disposal options outlined in the EA and prefers instead that DOE keep the downblended material in safe storage.	DOE/EA-1574 titled "Environmental Assessment for U-233 Stabilization and Building 3019 Complex Shutdown at the Oak Ridge National Laboratory" proposed to downblend the U-233 inventory and place it in storage until a decision could be made regarding disposal. Subsequent studies have determined that the inventory can be safely processed to a stable form for disposal at the Nevada Test Site. The decisions that have been made regarding disposition of the material stored at Building 3019 are consistent with the November 2005, Conference Report for the Energy and Water Development and Related Agencies Appropriations Act for Fiscal Year (FY) 2006. In this report, Congress directed DOE to terminate promptly the Medical Isotope Production and Building 3019 Complex Shutdown Project and provided FY 2006 funds in the Defense EM appropriations for disposition of the material stored at Building 3019. To not pursue the permitted disposal of the material stored at Building 3019 would be contrary to Congressional direction.
13	General	A general comment is that the subject EA (DOE/EA-1651) should explicitly outline the proposed differences in approach from those stated in DOE/EA-1574.	The purpose of the EA is to analyze the potential environmental impacts of proposed operational changes associated with the U-233 downblending project. The proposed operational changes, the scope of the project, and the scope of the EA are explained in Section 1.4.

No.	Section	Comment	Response
14	Section 2.3	In May 2009, the Inspector General (IG) released Special Report DOE/IG-0795 "Meeting Medical and Research Needs for Isotopes Derived from Uranium-233" that criticizes the decision by DOE and the Congress to not recover the Th-229. The IG recognizes the national shortage of the progeny isotopes from Th-220 for medical uses. In August 2008, the Office of Science held a workshop "The National Needs for Isotopes: Present and Future" documented in Report DOE/SC-0107. A discussion of the projected needs for Ac-225 and Bi-213 derived from Th-229 begins on page 21 of this report. By year 2014 over 50,000 mCi of these isotopes will be needed to support medical research and development and clinical trials; this is an amount far in excess of what is available from existing research holdings of Th-229. The current status is that limited supplies are preventing clinical trials. The subject EA states in Section 2.3 "With the exception of an expression of interest from the National Nuclear Security Administration for a small quantity of U-233 in support of weapons test programs, there is no programmatic use for the U-233 inventory" citing the 2004 DOE/EA-1488. In fact, the 2008 ORNL report on the national need for isotopes documents that there is a pressing national need for U-233 progeny isotopes. Because the isotope production mission has been assigned to the Office of Science, Environmental Management must ensure that the Office of Science has the opportunity to make a formal determination of its need for U-233.	The reports on the need for medical isotopes not withstanding, the request from NNSA has been the only inquiry relative to the material stored at Building 3019. No other organization, agency, or DOE Program Office has expressed interest in receiving any of the material stored at Building 3019.

No.	Section	Comment	Response
15	General	In the prior EA on this project (DOE/EA-1574), the preferred DOE option was to put the downblended U-233 material into safe storage. At the public meeting for that EA, DOE officials assured the public that Th-229 could still be extracted from the downblended material. In the current EA, DOE proposes permanent and irretrievable disposal of the downblended material, which would prevent the extraction of Th-229. Consequently, the CAP is opposed to both of the disposal options in the subject EA.	As stated above, pursuant to a Congressional directive, DOE is executing the U-233 downblending project to disposition the material stored in Building 3019 and to affect the safe shutdown of the Building 3019 Complex.
16	General	Considering that the EA for the U-233 Material Downblend and Disposition Project proposes major changes to the action, DOE should hold a public meeting to explain the new approach and extend the comment period. Past public meetings on the U-233 project have had substantial stakeholder interest.	The EA is published to inform the public about the potential environmental impacts associated with the proposed operational changes associated with the U-233 downblending project. DOE has concluded the proposed operational changes and associated impacts do not rise to a level that would necessitate extending the comment period or holding additional public meetings. While DOE is not planning any public meetings regarding this EA, DOE is willing to meet with your organization to discuss project information.

Phillip H. Roush, Tennessee Department of Environment and Conservation, DOE Oversight Division, Oak Ridge, Tennessee

No.	Section	Comment	Response
17	Acronyms	Define AERMOD as American Meteorological Society/Environmental Protection Agency Regulatory Model	[Concur] Acronym added.
18	Acronyms	Define CAP88 as Clear Air Act Assessment Package 1988	[Concur] Acronym added.

No.	Section	Comment	Response
19	Acronyms	Define LLC as Limited Liability Corporation	[Concur] Acronym added.
20	Acronyms	Define VOG as Vessel off-gas	[Concur] Acronym added.
21	Page 2-3	Replace "Cell Off-Gas" with "Hot Cell Off-Gas"	The system is termed cell off-gas.
22	Page 2-3	Replace "previous disturbed" with "previously disturbed"	[Concur]
23	Page 2-4, Section 2.2.5, Second Paragraph	Replace "stainless steel tank located" with "stainless steel tank, encased in a concrete bunker, located"	No change. The tank is located in a concrete bunker; encased, in our opinion, gives a incorrect description.
24	Page 2-4, Section 2.2.5, Second Paragraph	Replace "high level alarm" with "high level alarm to assist in overflow prevention."	[Concur] Suggested change applied.
25	Page 2-5, Section 2.2.6, First Paragraph	Replace "DNSFB" with "DNFSB"	[Concur] Suggested change applied.
26	Page 2-5, Section 2.2.6, Second Paragraph	Replace "The process for this stage is termed GC-1, and a conceptual" with "The process for this stage is termed GC-1. A conceptual"	[Concur] Suggested change applied.
27	Page 2-5, Section 2.2.6, Third Paragraph	Replace "equipment change out" with "equipment change-out"	[Concur] Suggested change applied.
28	Page 2-5, Section 2.2.6, Fourth Paragraph	Replace "The storage containers" with "The old storage containers"	No change.
29	Page 2-7, Annex Option	Replace "Steam and nitrogen" with "Condensate and nitrogen"	Replaced with “Steam condensate and nitrogen,…”
30	Page 2-7, Annex Option	Replace "would include a means" with "would include technology"	[Concur] Suggested change applied.

No.	Section	Comment	Response
31	Page 2-7, Annex Option	Replace "would be placed into" with "would be placed in"	[Concur] Suggested change applied.
32	Page 2-8, Section 2.2.9	Replace "sample equipment" with "sampling equipment"	[Concur] Suggested change applied.
33	Page 2-9, Section 2.2.10	Replace "would be provided for the Building" with "would be provided for Building"	The complex is consistently called the Building 3019 Complex.
34	Page 3-1, Section 3.1, Last Paragraph	Is the word "cementitious" necessary	The word “cementitious” is deemed necessary, as it clarifies an important difference between the waste products generated by the Annex process (salt monolith) versus the TWPC process (cementitious grout monolith)
35	Page 3-5, Section 3.4.1, Last Paragraph	VOG is not defined	[Concur] Acronym added.
36	Page 3-5, Section 3.4.2, First Paragraph	The value "0.0000000324", is this a decimal or a real percent?	The value was calculated from data presented in Table 5.14 (pages 5-33 through 5-37) of the *Annual Site Environmental Report for the Oak Ridge Reservation*, DOE/ORO-2261, September 2008. The value shown in the draft EA is a percentage.
37	Page 3-5, Section 3.4.2, Second Paragraph	Replace "confinement systems" with "confinement system"	[Concur] Suggested change applied.
38	Page 3-8, Section 3.4.3	Replace "offsite" with "off-site"	[Concur] Change applied globally
39	Page 3-21, Section 3.11.1	Replace "shortleaf and loblolly pine" with "Shortleaf and Loblolly Pine"	Shortleaf and loblolly pines are types of pine trees and do not require capitalization. Suggested change is not applied.

No.	Section	Comment	Response
40	Page 3-21, Section 3.11.1	Add a comma after "VRM Class IV"	[Concur] Suggested change applied.
41	Page 3-22, Section 3.11.3	Replace "After construction of the facilities is complete, construction materials and equipment would be removed, construction debris would be removed, and construction laydown areas would be graded and seeded." With "After construction of the facilities, construction materials, equipment, and construction debris would be removed, and construction laydown areas would be graded and seeded.	[Concur] Suggested change applied.

John Wojtowicz, Tennessee Department of Environment and Conservation, DOE Oversight Division, Oak Ridge, Tennessee

No.	Section	Comment	Response
42	Page ii, Table of Contents	3.12.3 Proposed Action Alternative; Listed as pg. 3-24, should be pg 3-23	[Concur] Correction applied.
43	Page 1-1, Introduction, Paragraph 1, Line 3	The Atomic Energy Act of 1954 should be placed in Section 7.0 References	[Concur] Reference added
44	Page 1-2, Paragraph 2, Line 6	EM is not in the list of acronyms	[Concur] EM added to acronyms
45	Page 1-2, Paragraph 2, Lines 10-12.	"Management of U-233 Stored at Building 3019, ORNL, Preliminary Report to Congress" dated Feb 08, 2006, to The honorable Pete V. Domenici, et al) (DOE 2007) is not included in Section 7 References section	This information came from DOE/EA-1574, cited as DOE 2007.
46	Page 1-2, Paragraph 3, Line 6	DOE 1994 is not in Section 7.0 References	[Concur] Reference added

No.	Section	Comment	Response
47	Page 1-2, Paragraph 4, Line 2	"associated with U-233 Project" should read "associated with **the** U-233 Project"	[Concur] Correction applied.
48	Page 1-2, Last Paragraph, Lines 9 and 12:	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
49	Page 1-3, Paragraph 1, Line 4:	"DOE/EA-1488 and DOE/EA-1574 give additional information . . . " , using DOE 2004, and DOE 2007b here would make it easier for the reader to find what references are meant	[Concur] Reference callouts added.
50	Page 1-6, Second Bullet, Line 3.	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
51	Page 1-7, Paragraph 1, Line 4.	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
52	Page 1-7, Paragraph 3, Chapter 1, Line 1	"Introduction, Purpose and Need for Action, and Scope" should be more appropriately titled "Introduction and Purpose and Need as Stated in the Table of Contents	[Concur] Correction applied.
53	Page 1-7, Paragraph 4, Chapter 2, Line 1	"The Proposed Action and Alternatives" should be more appropriately titled "Proposed Action and Alternatives" as stated in the Table of Contents	[Concur] Correction applied.
54	Page 1-7, Paragraph 5, Chapter 3, Line 1	"Affected Environment and Environmental Consequences" should more appropriately be titled "Affected Environment and Environmental Impacts" as stated in the Table of Contents	[Concur] Correction applied.
55	Page 1-7, Appendix A, Line 1	The Acronym SHPO should be defined here	[Concur] Acronym added.
56	Page 2-1, Paragraph 1, Line 1	DOE/EA-1574 should be cited here as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.

No.	Section	Comment	Response
57	Page 2-1, Paragraph 1, Lines 10 & 11	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
58	Page 2-1, Paragraph 2, Lines 1-3	"On February 17, 2006, DOE informed Congress of its intent to safely process and stabilize the U-233 inventory stored in Building 3019A." This should probably appear in Section 7.0 References	DOE 2007 citation added.
59	Table 2.2-1	Evaluation Column. For the sake of clarity, the Documents listed here should be cited appropriately. DOE/OR/01-2407&D1 as DOE 2009a DOE/EA-1651 as Current Document DOE/EA-1393 as DOE 2002a DOE/EA-1574 as DOE 2007b	[Concur] Corrections applied.
60	Page 2-4, Paragraph 1, Line 4.	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
61	Page 2-4, Paragraph 2, Line 4	DOE/EA-1393 should be cited as DOE 2002a	[Concur] Correction applied.
62	Page 2-4, Paragraph 5, Lines 1-4	The first two sentences of this paragraph should be rewritten (perhaps combined) to eliminate redundancy and flow more clearly	No change made.
63	Page 2-7, Paragraph 2, Line 12	"contact handled" here should be "contact-handled" to make it consistent with the usage in the line above	[Concur] Correction applied.
64	Page 2-7, Paragraph 2, Line 14	DOE 2007 should be DOE 2007b	Citation is removed.
65	Page 2-8, Paragraph 1, Line 2	Should DOT-NRC (both acronyms appear in the acronym list) be clarified here as Department of Transportation – Nuclear Regulatory Commission (DOT-NRC)?	[Concur] Correction applied.

No.	Section	Comment	Response
66	Page 2-8, Paragraph 3, Last Line	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
67	Page 2-9, Paragraph 2, Last Line	"in Section 2.3 of DOE/EA-1574" should be cited as DOE 2007b for clarity	Citation DOE 2007 added.
68	Page 3-1, Paragraph 1, Line 3	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
69	Page 3-2, Last Paragraph 1, Line 10	DOE/EA-1574 should be DOE 2007b	Citation DOE 2007 added.
70	Page 3-5, Paragraph 1, Line 1	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
71	Page 3-5, third bullet line 1	VOG is not in the list of acronyms	[Concur] VOG added to acronyms list.
72	Page 3-5, Paragraph 3, Line 3	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
73	Page 3-5, Paragraph 4, Line 1	DOE/EA-1574 should be cited as DOE 2007b to facilitate location in the References section	Citation DOE 2007 added.
74	Page 3-6, Paragraph 1, Line 2	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
75	Page 3-6, Last Paragraph 1, Line 6	DOE/EA-1574 should be DOE 2007b	Citation DOE 2007 added.
76	Page 3-7, Last Paragraph, Line 1.	Should AERMOD be included in the Acronyms as American Meteorological Society / Environmental Protection Agency Regulatory Model?	[Concur] AERMOD is added to acronyms list.
77	Page 3-7, Last Paragraph 1, Line 1	Should CAP88 be included in the Acronyms as Clear Air Act Assessment Package 1988	[Concur] CAP88 is added to acronyms list.

No.	Section	Comment	Response
78	Page 3-10, Paragraph 4, Line 3	DOE-STD-1021-93 is named in the text of the document and the reader is referred to DOE 2002b; however, the Reference for DOE 2002b does not specifically mention that it is DOE-STD-1021-93	Reference callout modified as appropriate.
79	Page 3-12, Paragraph 1, Line 3	DOE/EA-1574 should be DOE 2007b	Citation DOE 2007 added.
80	Page 3-13, Paragraph 2, Line 7	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
81	Page 3-13, Paragraph 3, Lines 1 & 8	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
82	Page 3-14, Paragraph 4, Line 4	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
83	Page 3-14, Last Paragraph, Lines 10 & 11	CERCLA TCRA Memorandum should be cited as DOE 2009a	[Concur] Correction applied.
84	Page 3-15, Paragraph 1	Why is the SHPO letter cited in the references, but the DOE letter in the first line not?	[Concur] Letter added to the references and citation added to the paragraph as DOE 2008c
85	Page 3-15, Paragraph 2, Line 1.	Is this the same plan as ORNL 2005 in the References? If so, should it not be cited as such? Otherwise, should there be an additional reference?	[Concur] ORNL 2005 citation added.
86	Page 3-16, Last Paragraph, Line 7	USCB is not in the Acronyms list.	[Concur] USCB added to acronyms.
87	Page 3-17, Last Paragraph, Line2	"Table 4.10.2-2" should be "Table 3.10-2"	[Concur] Correction applied.
88	Page 3-17, Last Paragraph, Line 7.	USCB 2000 is not found in the Section 7.0 References	[Concur] Reference callout corrected to USCB 2001

No.	Section	Comment	Response
89	Page 3-19, Paragraph 1, Line 4.	IES is not found in the list of acronyms	[Concur] Acronym added.
90	Page 3-19, Paragraph 2, Line 2	FBI is not in the list of acronyms	[Concur] Acronym added.
91	Page 3-19, Paragraph 2, Line 2	USFA is not in the list of acronyms	[Concur] Acronym added.
92	Page 3-21, Last Paragraph, Line 1	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
93	Page 3-22, Paragraph 2, Line 4	CERCLA TCRA Memorandum should be cited as DOE 2009a	[Concur] Citation added.
94	Page 3-22, Paragraph 3, Line 4.	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
95	Page 3-22, Paragraph 4, Line 6.	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
96	Page 3-22, Paragraph 5, Line 1	DOE/EIS-0305-F should be cited as DOE 2000	[Concur] Citap48t8(ion)]DOE(20)-3,)64790130[illegible] Paragraph 5, Line 1 Paragraph 3 Line 3

No.	Section	Comment	Response
101	Page 3-25, Last Paragraph, Last Line	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
102	Page 3-26, Paragraph 1, Line 4	"Aging structures and components increases the risk of a failure" should read "Aging structures and components **increase** the risk of a failure"	[Concur] Correction applied.
103	Page 3-26, Paragraph 4, Line 2	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
104	Page 3-26, Paragraph 4, Line 8	DOE 2007 should be DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
105	Page 3-26, Paragraph 5, Lines 2 & 3	Would the statement "located 3.1 miles east of X3039 and 2.6 miles east northeast of X-7911" be more clearly stated as "located 3.1 miles east of the 3039 stack and 2.6 miles east northeast of the 7911 Stack?	[Concur] Correction applied.
106	Page 3-27, Paragraph 2, Line 2	DOE/EA-1574 should be cited here as DOE 2007b	Citation DOE 2007 added.
107	Page 3-27, Paragraph 2	Should Uranium and Plutonium be included in this discussion for their chemical toxicity?	In the context of this project, the radiological aspects of exposure are considered to govern for these elements.
108	Page 3-27, Paragraph 2, Line 9	10 CFR 851 is not included in the Section 7.0 References.	[Concur] Citation added to Section 7.0 references
109	Page 3-27, Paragraph 3, Line 2	DOE/EA-1574 should be cited here as DOE 2007b	Citation DOE 2007 added.
110	Page 3-27, Paragraph 3, Line 6	DOE 2007 should be cited here as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
111	Page 3-27, Paragraph 4, Line 6	DOE 2007 should be cited here as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.

No.	Section	Comment	Response
112	Page 3-27, Paragraph 5, Line 2	I/I(10-5) should probably be included in the list of Acronyms	[Concur] Acronym added.
113	Page 3-27, Paragraph 5, Line 8	DOE 2007 should be cited here as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
114	Page 3-28, Paragraph 2, Line 2	DOE/EA-1574 should be cited as DOE 2007b	Citation DOE 2007 added.
115	Page 3-28, Paragraph 4, Line 1	DOE/EA-1574 should be cited as DOE 2007b	Citation DOE 2007 added.
116	Page 3-29, Paragraph 1, Line 8	Should RADTRAN and TRAGIS be added to the list of acronyms?	[Concur] Acronyms added.
117	Page 3-29, Paragraph 2, Line 8	RADTRAN is a Sandia National Lab product, but isn't TRAGIS an ORNL product?	[Concur] Correction applied.
118	Page 3-29, Paragraph 3, Line 8	DOE 2007 should be cited as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
119	Page 3-29, Paragraph 4, Line 8.	DOE 2007 should be cited as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
120	Page 3-30, Paragraph 1, Line 5	DOE 2007 should be cited as DOE 2007b	This information came from DOE/EA-1574, cited as DOE 2007.
121	Page 3-30, Paragraph 4, Line 1	DOE/EA-1574 should be cited as DOE 2007b	Citation DOE 2007 added.
122	Page 3-31, Paragraph 4, Line 4	DOE/EA-1393 should be cited as DOE 2002a	[Concur] Correction applied.
123	Page 3-33, Paragraph 2, Line 6	DOE/EA-1574 should be cited as DOE 2007b	Citation DOE 2007 added.

No.	Section	Comment	Response
124	Page 3-33, Paragraph 3, Lines 2, 5, 6, & 9	DOE/EA-1574 should be cited as DOE 2007b	Citation DOE 2007 added.
125	Page 4-1, Paragraph 1, Line 10	CEQ 1997 is not cited in 7.0 References	Citation added to Section 7.0 references.
126	Page 5-1, Paragraph 2, Lines 3 & 4	The statement "Pursuant to the TDEC regulations in 1200-3-9-01" might be better stated as "Pursuant to the Rules of the TDEC Bureau of Environment, Division of Air Pollution Control in Chapter 1200-03-09-01" This reference should also be placed in 7.0 References	[Concur] Correction applied.
127	Page 6-1, Paragraph 1, Lines 6 & 7	DOE/EA-1488 and DOE/EA-1574 should be cited as DOE 2004 and DOE 2007b, respectively.	[Concur] Correction applied.
128	Page 7-2	DOE 2008a. More information should be provided than "EAD 2008-0004".	[Concur] The following title is added to DOE 2008 reference: “Environmental Assessment Determination for Proposed Uranium-233 Project Operational Changes and Facility Modifications at ORNL”.