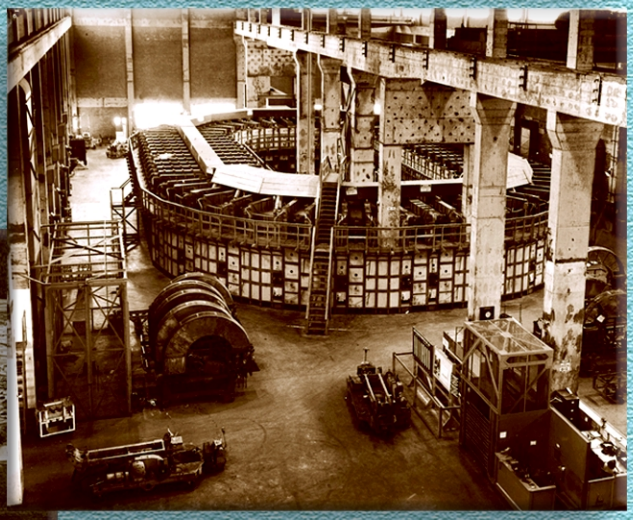
DOE/ORO 2085

Cultural Resource Management Plan

DOE Oak Ridge Reservation Anderson and Roane Counties, Tennessee



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CULTURAL RESOURCE MANAGEMENT PLAN
DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE
ANDERSON AND ROANE COUNTIES, TENNESSEE

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TABLE OF CONTENTS

APPENDICES xi

LIST OF FIGURES xiii

LIST OF TABLES xv

ACRONYMS AND ABBREVIATIONS xvii

ACKNOWLEDGEMENTS xix

EXECUTIVE SUMMARY xxi

1. INTRODUCTION 1-1

2. CRM GOALS 2-1
   2.1 SHORT-TERM GOALS 2-1
   2.2 LONG-TERM GOALS 2-2

3. EXISTING CONDITIONS 3-1
   3.1 FACILITY OR PROGRAM DESCRIPTIONS 3-1
      3.1.1 Current Physical Setting 3-1
         3.1.1.1 Location 3-1
         3.1.1.2 Physiography and Topography 3-1
         3.1.1.3 Geology, Soils, and Hydrology 3-2
         3.1.1.4 Climate 3-10
         3.1.1.5 Vegetation and Wildlife 3-11
      3.1.2 Current Operational Context 3-11
         3.1.2.1 Oak Ridge National Laboratory 3-12
         3.1.2.2 ETTP 3-13
         3.1.2.3 Y-12 Plant 3-14
         3.1.2.4 Other Department of Energy Oak Ridge Operations Missions 3-16
            3.1.2.4.1 Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education 3-16
            3.1.2.4.2 Office of Scientific and Technical Information 3-17
            3.1.2.4.3 East Tennessee Mechanical Contractors 3-17
            3.1.2.4.4 Enterprise Advisory Services, Inc. 3-18
      3.1.3 Potential Impacts to Cultural Resources 3-18
         3.1.3.1 Past Practices 3-18
         3.1.3.2 Planned Activities 3-19

3.1.4 Summary of Current Planning Procedure 3-20
3.1.5 Funding 3-20
3.2 CULTURAL AND HISTORICAL SETTING 3-21
3.2.1 Historic and Prehistoric Natural Environments 3-21
3.2.2 Prehistory and History 3-23
3.2.2.1 Paleo-Indian Period (10,000 B.C. to 8,000 B.C.) 3-23
3.2.2.2 Archaic Period (ca. 8000 B.C. to 900 B.C.) 3-24
3.2.2.3 Woodland Period (900 B.C. to A.D. 1000) 3-26
3.2.2.4 Mississippian Period (ca. A.D. 900 to A.D. 1600) . . . 3-30
3.2.2.5 Exploration and Settlement 3-36
3.2.2.6 The Tennessee Valley Authority 3-38
3.2.3 Traditional Lands and Resource Uses 3-39
3.2.4 Treaties, Executive Orders, and Land Grants 3-39
3.2.5 Recent Scientific Significance 3-40
3.2.5.1 Manhattan Project 3-40
3.2.5.1.1 Los Alamos, New Mexico—"Site Y" 3-45
3.2.5.1.2 Hanford, Washington—"Site W" 3-46
3.2.5.1.3 Oak Ridge, Tennessee—"Site X" 3-46
3.2.5.1.4 Bomb Production 3-49
3.2.5.2 Oak Ridge, Tennessee—The Postwar Era to Present 3-51
3.2.5.2.1 Oak Ridge National Laboratory 3-52
3.2.5.2.2 K-25 Site (present-day ETTP) 3-60
3.2.5.2.3 Y-12 Plant 3-64
3.2.5.2.4 Oak Ridge Associated Universities 3-71
3.2.5.2.5 Incorporation of the City of Oak Ridge 3-74
3.3 KNOWN CULTURAL RESOURCES 3-75
3.3.1 Prehistoric Properties 3-75
3.3.1.1 Districts, Sites, and Structures 3-75
3.3.1.2 Objects 3-77
3.3.1.3 Other Important Properties 3-78
3.3.2 Historic Properties 3-78
3.3.2.1 Districts, Sites, Buildings, and Structures 3-78
3.3.2.2 Objects 3-84
3.3.2.3 Other Important Properties 3-84
3.3.3 Resources of Ethnic Importance 3-85
3.3.3.1 Sacred Sites 3-85
3.3.3.2 Traditional-Use Resources 3-87
3.3.3.3 Native American Cultural Items 3-87
3.3.3.4 Other Resources of Ethnic Importance 3-87
3.3.4 Properties of Recent Scientific Significance 3-87
3.3.4.1 Districts, Sites, Buildings, Structures, and Other Facilities 3-87

3.3.4.1.1 City of Oak Ridge 3-89
3.3.4.1.2 ORNL 3-90
3.3.4.1.3 ETTP 3-98
3.3.4.1.4 Y-12 Plant 3-102
3.3.4.1.5 Oak Ridge Associated Universities 3-111
3.3.4.2 Objects 3-111
3.3.4.3 Other Properties 3-112
3.4 CRM ACCOMPLISHMENTS 3-112
3.4.1 Cultural Resource Records and Reports 3-112
3.4.1.1 Cultural Resource Site Records 3-112
3.4.1.2 Cultural Resource Project Records 3-113
3.4.1.3 Other Cultural Resource Records 3-113
3.4.1.4 Cultural Resource Reports 3-114
3.4.1.4.1 Standardized Report Outlines 3-114
3.4.1.4.2 Report Library 3-114
3.4.2 Inventory 3-114
3.4.2.1 Archival Searches 3-114
3.4.2.2 Ethnographic Fieldwork 3-114
3.4.2.3 Structure and Facility Surveys 3-115
3.4.2.4 Structure and Facility Survey Status 3-117
3.4.2.5 Archeological Surveys 3-117
3.4.2.6 Archeological Survey Status 3-121
3.4.2.7 Other Inventory Activities 3-121
3.4.3 Excavation 3-121
3.4.3.1 Test Excavations 3-121
3.4.3.2 Large-Scale Excavations 3-123
3.4.3.3 Excavation Status 3-123
3.4.4 Structure and Facility Management 3-123
3.4.4.1 Structure and Facility Documentation 3-123
3.4.4.2 Structure and Facility Maintenance 3-125
3.4.4.3 Structure and Facility Mitigation 3-125
3.4.4.4 Structure and Facility Management Status 3-125
3.4.5 Laboratory Treatment and Curation 3-126
3.4.5.1 Processing 3-126
3.4.5.2 Analysis 3-126
3.4.5.3 Curation Facilities and Procedures 3-126
3.4.6 Preservation 3-126
3.4.6.1 Protection from Natural Forces 3-126
3.4.6.2 Protection from Human Forces 3-127
3.4.6.2.1 Authorized Actions 3-127
3.4.6.2.2 Illegal Acts 3-127
3.4.6.3 Preservation Status 3-127
3.4.7 Research 3-128
3.4.8 Outreach 3-128

3.4.8.1 Activities on the DOE Site 3-128
3.4.8.2 Activities Not on the DOE Site 3-131
3.4.8.3 Outreach Status 3-132
3.4.9 Other CRM Accomplishments 3-132
3.5 LEGAL COMPLIANCE ACCOMPLISHMENTS 3-132
3.5.1 NHPA, Executive Order 11593, and 36 CFR Part 800 3-132
3.5.1.1 NHPA, Sections 106 and 110(f), and 36 CFR Part 800 3-132
3.5.1.2 NHPA, Sections 110(a)-(e) and (g)-(j), and Executive Order 11593, Section 2 3-137
3.5.2 American Indian Religious Freedom Act 3-138
3.5.3 Archaeological Resources Protection Act (ARPA) 3-138
3.5.3.1 ARPA, Section 10(c) 3-138
3.5.3.2 ARPA, Section 14 3-138
3.5.4 Native American Graves and Repatriation Act (NAGPRA) . . 3-138
3.5.4.1 NAGPRA, Section 5 3-138
3.5.4.2 NAGPRA, Section 6 3-139
3.5.4.3 NAGPRA, Section 7 3-139
3.5.5 36 CFR Part 79 3-139

4. CRM METHODS 4-1
4.1 RECORDS AND REPORTS 4-1
4.1.1 Cultural Resource Site Records 4-1
4.1.2 Cultural Resource Project Records 4-2
4.1.3 Other Cultural Resource Records 4-3
4.1.4 Cultural Resource Reports 4-3
4.1.4.1 Standardized Report Outlines 4-3
4.1.4.2 Report Library 4-4
4.2 INVENTORY 4-5
4.2.1 Archival Searches 4-5
4.2.2 Ethnographic Field Work 4-6
4.2.3 Structure and Facility Surveys 4-6
4.2.4 Archeological Surveys 4-7
4.3 EXCAVATION 4-8
4.3.1 Test Excavations 4-8
4.3.2 Large-Scale Excavations 4-9
4.4 STRUCTURE AND FACILITY MANAGEMENT 4-9
4.4.1 Structure and Facility Documentation 4-9
4.4.2 Structure and Facility Maintenance 4-9
4.4.3 Structure and Facility Mitigation 4-9
4.5 LABORATORY TREATMENT 4-10
4.5.1 Processing 4-10
4.5.2 Analysis 4-11

4.6 CURATION 4-11
4.6.1 Preservation 4-11
4.6.2 Inventory, Accession, Labeling, and Cataloging 4-12
4.6.3 Identification, Evaluation, and Documentation 4-13
4.6.4 Storage and Maintenance 4-13
4.6.5 Periodic Inspection and Remedial Preservation 4-14
4.6.6 Study 4-14
4.7 PRESERVATION 4-14
4.7.1 Protection from Natural Forces 4-14
4.7.2 Protection from Human Forces 4-15
4.7.2.1 Authorized Actions 4-16
4.7.2.2 Illegal Acts 4-16
4.8 OUTREACH 4-16
4.8.1 Activities on the DOE Site 4-16
4.8.2 Activities Not on the DOE Site 4-16

5. CRM PROCEDURES AND ADMINISTRATION 5-1
5.1 COMPLIANCE PROCEDURES—NHPA, EXECUTIVE ORDER 11593, 36 CFR PARTS 60, 63, 65, 79, AND 800 5-1
5.1.1 Compliance Procedures for Undertakings 5-1
5.1.1.1 Preconstruction Project Planning and Evaluation 5-1
5.1.1.2 Identification of Projects That May Affect Cultural Resources 5-4
5.1.1.3 Determination of Extent of Section 106 Review Responsibilities 5-4
5.1.1.4 CERCLA Actions and Section 106 Review Responsibilities 5-8
5.1.2 Cultural Resource Exclusions 5-9
5.1.3 Conducting Surveys and Other Field Studies 5-12
5.1.4 Assessing and Avoiding or Reducing Effects on Cultural Resources 5-13
5.1.4.1 Assessing Effects 5-13
5.1.4.2 Identifying Ways to Avoid or Reduce Effects 5-14
5.1.5 Consultation and Documentation 5-15
5.1.5.1 Consultation 5-15
5.1.5.2 Documentation 5-17
5.1.6 Unanticipated Discoveries of Cultural Resources 5-18
5.1.7 National Register of Historic Places Nominations 5-20
5.1.8 National Historic Landmarks Designation and Recognition 5-20

5.2 ARCHAEOLOGICAL RESOURCES PROTECTION ACT COMPLIANCE PROCEDURES 5-21
5.2.1 Increasing Public Awareness 5-21

5.2.2 Planning and Scheduling Archeological Surveys 5-21
5.2.3 Reporting Suspected Violations 5-21
5.3 AMERICAN INDIAN RELIGIOUS FREEDOM ACT PROCEDURES 5-22
5.4 NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT COMPLIANCE PROCEDURES 5-22
5.4.1 Intentional Excavation and Removal of Native American Cultural Items 5-23
5.4.1.1 Consultation or Consent 5-23
5.4.1.2 Ownership and Right of Control 5-24
5.4.2 Inadvertent Discovery of Native American Cultural Items 5-24
5.4.2.1 Discovery 5-24
5.4.2.2 Disposition and Control 5-24
5.4.3 Inventory for Native American Human Remains and Associated Funerary Objects 5-25
5.4.3.1 Inventory Compilation 5-25
5.4.3.2 Consultation 5-26
5.4.3.3 Supplemental Documentation 5-26
5.4.3.4 Notification 5-26
5.4.4 Summary of Native American Unassociated Funerary Objects, Sacred Objects, and Cultural Patrimony 5-26
5.4.4.1 Summary 5-26
5.4.4.2 Consultation 5-26
5.4.4.3 Access 5-26
5.4.5 Repatriation of Native American Cultural Items 5-26
5.4.5.1 Repatriation of Culturally Affiliated Native American Human Remains and Associated Funerary Objects 5-26
5.4.5.2 Repatriation of Culturally Affiliated Native American Unassociated Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony 5-28
5.4.5.3 Repatriation of Culturally Unaffiliated or Uninventoried Native American Human Remains and Funerary Objects 5-29
5.4.5.4 Sharing of Information 5-30
5.5 36 CFR PART 79 COMPLIANCE PROCEDURES 5-30
5.5.1 Management and Preservation of Collections 5-30
5.5.1.1 Pre-existing Collections 5-30
5.5.1.2 New Collections 5-31
5.5.1.3 Administrative Records 5-31
5.5.2 Methods of Securing Curatorial Services 5-32
5.5.3 Methods of Funding Curatorial Services 5-32
5.5.4 Terms and Conditions of Contracts, Memoranda, and Agreements for Curatorial Services 5-33

5.5.5 Repository Standards 5-33
5.5.6 Use of Collections 5-33
5.5.6.1 Scientific and Educational Uses 5-33
5.5.6.2 Religious Uses 5-33
5.5.6.3 Terms and Conditions of Uses 5-34
5.5.6.4 Written Agreements for Use 5-34
5.5.7 Conduct of Inspections and Inventories 5-34
5.6 PROTECTION PROCEDURES 5-34
5.6.1 Natural Forces 5-34
5.6.1.1 Monitoring 5-34
5.6.1.2 Consultation 5-35
5.6.1.3 Restoration and Repair 5-35
5.6.2 Authorized Actions 5-36
5.6.2.1 Project Screening and Tracking 5-36
5.6.2.2 Monitoring 5-36
5.6.2.3 Consultation 5-36
5.6.2.4 Restoration and Repair 5-36
5.6.3 Illegal Acts 5-37
5.6.3.1 Detection 5-37
5.6.3.2 Investigation 5-37
5.6.3.3 Prosecution 5-38
5.6.3.4 Consultation 5-38
5.6.3.5 Restoration and Repair 5-38
5.6.3.6 Prevention 5-38
5.7 TREATY RIGHTS PROCEDURES 5-38
5.7.1 Technical Actions 5-38
5.7.2 Regulatory Compliance 5-38
5.7.3 Administrative Procedures 5-38
5.8 CRM ADMINISTRATION 5-39
5.8.1 Staffing and Contracting 5-39
5.8.2 Training 5-39
5.8.3 Permitting 5-39
5.8.4 CRM Facilities 5-40
5.8.5 Consultation on Administration 5-40

6. REFERENCES 6-1

APPENDICES

A GLOSSARY A-1

B LEGISLATION GOVERNING THE MANAGEMENT OF CULTURAL RESOURCES B-1

C U.S. DEPARTMENT OF ENERGY CRM DOCUMENTS AND OTHER RELATED DOCUMENTS C-1

D CHECKLISTS AND FORMS D-1

E STANDARDIZED OUTLINES E-1

F PRE–WORLD WAR II STRUCTURES ON THE DEPARTMENT OF ENERGY OAK RIDGE RESERVATION F-1

G PROGRAMMATIC AGREEMENT AND CORRESPONDENCE WITH NATIVE AMERICAN TRIBES G-1

H ARTIFACTS CURATED AT UTK H-1

LIST OF FIGURES

3.1 Location of the Department of Energy Oak Ridge Reservation 3-3
3.2 Location of Department of Energy facilities in the Oak Ridge, Tennessee, area 3-5
3.3 Generalized physiographic map of Tennessee 3-7
3.4 Generalized geologic map of the Department of Energy Oak Ridge Reservation and surrounding area 3-9
3.5 Location of cemeteries on the Department of Energy Oak Ridge Reservation 3-88
3.6 Location of the DOE ORO–owned Atmospheric Turbulence and Diffusion Laboratory, the Turnpike Building (55 Jefferson), and the location of the historic districts within the city of Oak Ridge 3-91
3.7 Location of the Oak Ridge National Laboratory (ORNL) Historic District and other ORNL properties included or eligible for inclusion in the National Register of Historic Places 3-93
3.8 Location of contributing properties within the Oak Ridge National Laboratory Historic District 3-95
3.9 Location of the ETTP Main Plant Historic District and properties outside the district determined to be eligible for inclusion in the National Register of Historic Places 3-103
3.10 Location of contributing properties within the ETTP Main Plant Historic District 3-105
3.11 Location of the Y-12 Plant Historic District, properties that contribute to the district, and properties outside the district that are eligible for inclusion in the National Register of Historic Places 3-107
3.12 Location of areas on the Department of Energy Oak Ridge Reservation that have undergone recent systematic intensive surveys for prehistoric and historic archeological sites 3-122
5.1 Review process for determining Section 106 consultation requirements 5-6
G.1. Review process for determining the level of Section 106 documentation and consultation required for actions impacting extent structures G-14
G.2. Review process for determining the level of Section 106 documentation and consultation required for actions involving ground-disturbing activities G-15

LIST OF TABLES

3.1. Soil groups and their respective soil series found on the ORR 3-8
3.2. Cultural chronology for the Woodlands and Mississippian periods of East Tennessee 3-27
3.3. Revised culture chronology for the Woodland and Mississippian periods of East Tennessee 3-28
3.4. Prehistoric archeological sites on the ORR 3-76
3.5. Pre–World War II structures on the ORR included in and individually eligible for inclusion in the NRHP [After DuVall and Souza (1996)] 3-79
3.6. Pre–World War II structures contained within and that contribute to the Wheat Community and Gravel Hill historic districts 3-82
3.7. Cemeteries on the ORR 3-86
3.8. ORNL properties included or eligible for inclusion in the NRHP 3-96
3.9. DOE ORO properties at the ETTP eligible for inclusion in the NRHP 3-98
3.10. DOE ORO properties at the Y-12 Plant eligible for inclusion in the NRHP . . 3-109
3.11. A Subset of Ratified MOAs that have involved removal or demolition of structures and facilities 3-124
3.12. DOE ORO actions that have involved consultation with the SHPO and Advisory Council 3-133
3.13. List of three-party MOAs involving DOE ORO actions 3-135

ACRONYMS AND ABBREVIATIONS

Advisory Council	Advisory Council on Historic Preservation
AEC	Atomic Energy Commission
AHR	Archeological and Historical Review
AMSE	American Museum of Science and Energy
ANP	Aircraft Nuclear Propulsion Project
ARPA	Archaeological Resources Protection Act
ARL	University of Tennessee–Atomic Energy Commission Agricultural Research Laboratory
ATDL	Atmospheric Turbulence and Diffusion Laboratory
AVLIS	Atomic Vapor Laser Isotope Separation
BJC	Bechtel Jacobs Company LLC
BWXT	BWXT Y-12
CROET	Community Reuse Organization of East Tennessee
CARL	Comparative Animal Research Laboratory
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm	centimeter
Corps	U.S. Army Corps of Engineers
CRBRP	Clinch River Breeder Reactor Project
CRM	Cultural Resources Management
CRMP	Cultural Resource Management Plan
D&D	Decontamination and Decommissioning
DOE	U.S. Department of Energy
DOE ORO	U.S. Department of Energy Oak Ridge Operations
EA	Environmental Assessment
EC	Environmental Compliance
EIS	Environmental Impact Statement
EM/EF	Environmental Management/Environment Facilities
EPA	U.S. Environmental Protection Agency
ERWM	Environmental Restoration and Waste Management
ETEC	East Tennessee Economic Council
ETMC	East Tennessee Mechanical Contractors
ETTP	East Tennessee Technology Park
FFA	Federal Facilities Agreement
FHA	Federal Housing Administration
FR	Federal Register
GIS	Geographical Information System
ha	hectare
HABS	Historic American Buildings Survey

HAER	Historic American Engineering Record
HFIR	High Flux Isotope Reactor
LLLW	liquid low-level waste
LMES	Lockheed Martin Energy Systems, Inc.
m	meter
mg	milligram
M&I	Management and Integration
M&O	Management and Operating
MOA	Memorandum of Agreement
MW	megawatt
NAGPRA	Native American Graves and Repatriation Act
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act of 1969
NHL	National Historic Landmark
NHPA	National Historic Preservation Act of 1966, as amended
NNSA	National Nuclear Security Administration
NRHP	National Register of Historic Places
ORAU	Oak Ridge Associated Universities
ORCMT	Oak Ridge Centers for Manufacturing Technology
ORGDP	Oak Ridge Gaseous Diffusion Plant
ORINS	Oak Ridge Institute of Nuclear Studies
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
OSTI	Office of Scientific and Technical Information
PA	Programmatic Agreement
R&D	research and development
RMO	Reservation Management Organization
RNA	ribonucleic acid
SDP	Site Development Plan
SNAP	Space Nuclear Auxiliary Power
SHPO	State Historic Preservation Officer
TDOA	Tennessee Division of Archaeology
THC	Tennessee Historical Commission
TSCA	Toxic Substances Control Act of 1976
TSI	Technical Site Information
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
UTK	The University of Tennessee, Knoxville
WAG	Waste Area Grouping

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EXECUTIVE SUMMARY

The U.S. Department of Energy Oak Ridge Operations (DOE ORO) recognizes its stewardship responsibilities for managing cultural resources on DOE ORO-owned property and taking into account the effects DOE ORO undertakings could have on other properties. The principal cultural resources statutes that apply to DOE ORO undertakings include the Antiquities Act of 1906, the Historic Sites Act of 1935, the National Historic Preservation Act of 1966 as amended, the Archeological and Historic Preservation Act of 1974, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. The purpose of the DOE ORO CRMP, in addition to ensuring DOE ORO compliance with cultural resources statutes, is to ensure that cultural resources are addressed in the early planning process of undertakings and that needed protection is provided or the appropriate documentation is prepared before an undertaking is initiated. The CRMP is also intended to serve as a tool for managers within DOE ORO and its prime contractors with environmental compliance, contract management, and budgetary responsibilities.

1. INTRODUCTION

The purpose of this CRMP is to provide the mechanism by which the DOE ORO can comply with cultural resources statutes, address cultural resources in the early planning process of its undertakings, and implement necessary protective measures for its cultural resources prior to initiating undertakings The CRMP is the basis of the DOE ORO cultural resources management (CRM) program and is intended to strike a balance between DOE ORO's missions and its cultural resources planning and preservation responsibilities. The CRMP was prepared pursuant to the *Programmatic Agreement Among the Department of Energy Oak Ridge Operations Office, the Tennessee State Historic Preservation Officer, and the Advisory Council on Historic Preservation Concerning Management of Historical and Cultural Properties at the Oak Ridge Reservation (PA).* The CRMP was also prepared in accordance with the DOE *Environmental Guidelines for Development of Cultural Resource Management Plans* (DOE/EH-0501), the *Secretary of the Interior's Standards and Guidelines for Preservation Planning* (48 FR 44716-20), the *Section 110 Guidelines* (52 FR 4727-46), and the Advisory Council on Historic Preservation's recent report to Congress, *Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities.*

The structure of the CRMP is based on DOE's guidance document for the preparation of CRMPs (i.e., DOE/EH-0501) and includes six chapters. Chapter 1 contains the Executive Summary and this Introduction. Chapter 2 provides a discussion of DOE ORO short- and long-term goals for achieving regulatory compliance with cultural resource laws and regulations and for ensuring that its stewardship responsibilities (e.g., improved decision making; outreach; and protection, preservation, and/or documentation of cultural resources) are being met. Chapter 3 provides a synopsis of background environmental, prehistorical, and historical information relevant to DOE ORO resources and lands in the Oak Ridge, Tennessee, area. Chapter 3 also provides a discussion of known DOE ORO cultural resources and significant accomplishments in cultural resources identification, evaluation, preservation, and regulatory compliance activities. Chapter 4 outlines the methods DOE ORO will employ in the preparation and maintenance of records and reports, inventory, excavation, laboratory treatment, curation, preservation, and public outreach activities. Chapter 5 details cultural resource compliance procedures developed to implement the methods described in Chapter 4 and to ensure that regulatory requirements are met. Chapter 6 contains appendices to the CRMP.

In the late 1980s to early 1990s, as Manhattan Project-period facilities in the Oak Ridge area approached 50 years of age, DOE ORO began to place an increased emphasis on cultural resource compliance and management activities. Before this time, the significance of cultural resources owned by DOE ORO and its predecessor agencies (e.g., the Atomic Energy Commission) had been recognized, and efforts were made to identify and evaluate these resources. For example, immediately following the passage of National Historic Preservation Act (NHPA) in 1966, the Graphite Reactor, located at the Oak Ridge National Laboratory (ORNL), was identified as a historic property having national and even worldwide significance. The Graphite Reactor was subsequently

included in the National Register of Historic Places (NRHP) and designated a National Historic Landmark. In the mid 1970s, prehistoric archeological sites and Historic period house sites on the DOE Oak Ridge Reservation (ORR) were identified and evaluated (Fielder 1974; Fielder, Ahler, and Barrington 1977). In the 1980s, several Phase II investigations involving test excavations were conducted on the ORR (e.g., GAI 1981; Faulkner 1988). However, aside from the inventories and evaluations conducted by Fielder (1974) and Fielder, Ahler, and Barrington (1977), very few ORR-wide or large-scale cultural resource surveys and inventories were performed, and no systematic surveys were conducted that involved evaluating DOE ORO properties against established NRHP criteria.

Beginning in the early 1990s, DOE ORO's increased emphasis on cultural resource compliance and management activities resulted in more closely scrutinized reviews of proposed actions under Section 106 of the NHPA, the initiation of a phased approach to systematic surveys and inventories of DOE ORO Manhattan Project and later scientific facilities, and the assembly of an ORR cultural resources task team. During the same time frame, DOE ORO drafted and ratified a PA among DOE ORO, the Tennessee State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation (Advisory Council). The PA provides for a more streamlined NHPA Section 106 review and consultation process than that prescribed at 36 CFR 800 and details DOE ORO's commitments toward conducting systematic intensive surveys, inventories, and reviews of its properties and the development of this CRMP. Even before the ratification of the PA, the architectural/historical assessment of ORNL was completed and plans were made to begin assessments of the K-25 Site and the Y-12 Plant.

The ORR cultural resources task team consists of Cultural Resources Coordinators representing the primary installations and/or DOE ORO prime contractors in Oak Ridge (i.e., ORNL, the K-25 Site, the Y-12 Plant, and Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education), representatives of the major DOE ORO programs [e.g., Defense, Energy Research, Environmental Management Enrichment Facilities (EM\EF)], and the DOE ORO Cultural Resource Management Coordinator (DOE ORO CRM Coordinator). The task team was assembled to promote communication within the DOE ORO system, to standardize and improve upon cultural resource compliance and management activities, to avoid duplication of effort, and to prepare and implement this CRMP. The ORR cultural resources task team forms the core of the DOE ORO CRM program by serving as the focal point of cultural resources (1) compliance and management activities and (2) education and training within the DOE ORO system.

DOE ORO has made great strides in recent years towards establishing an effective and efficient CRM program. The background information, methods, and procedures described within this CRMP are a prime example of the accomplishments of this program. Cultural resources goals continue to be set and achieved through the CRM program, of which the CRMP will form the foundation in the future.

The ORR consists of 13,968 ha (34,516 acres) of DOE ORO owned lands within Anderson and Roane counties, Tennessee, most of which is within the corporate limits of the city of Oak Ridge, Tennessee. DOE ORO also owns property in the city of Oak Ridge that is not located within the boundary of the ORR proper. For the purpose of discussion, and to simplify references made in this CRMP to DOE ORO property, however, the term ORR shall mean all DOE ORO property in the Oak Ridge area, including that which is on the ORR and that which is located within the city of Oak Ridge (not within formal ORR and that which is located within the city of Oak Ridge (not within formal ORR boundaries).

On February 21, 1997, DOE issued a press release stating that the K-25 Site has been officially renamed the East Tennessee Technology Park (ETTP). The name change was made as part of the DOE vision to partner with local industry and businesses in an effort to bring new work and new life to ETTP. This name change is indicative of the new direction for the site and marks another significant milestone in the site's 50-plus-year history. The historic building survey and the majority of the discussions contained in this document were prepared well before the K-25 Site was renamed ETTP. However, a word search has been performed and this document revised to reflect the name change. When the words "K-25" and "K-25" Site were used to discuss the entire site, the words have been revised to "East Tennessee Technology Park" or to "ETTP" Where the word "K-25" was used to describe the building at the site known as "K-25," the word K-25 was not changed.

2. CRM GOALS

Attention to cultural resources protection and preservation in the project planning and implementation process is not a new concept within the DOE ORO. Surveys to identify and evaluate cultural resources under the jurisdiction of DOE ORO and its predecessor agencies began in the mid 1970s. Prior to this, archeological surveys and excavations were conducted by the Tennessee Valley Authority (TVA) during construction of the Norris and Melton Hill dams in areas now owned by DOE ORO. In recent years, DOE ORO has placed a great deal of emphasis on identifying and evaluating all cultural resources under its jurisdiction, including properties of recent scientific significance.

This CRMP represents the next phase of cultural resources management. During development of this plan, significant accomplishments and deficiencies or areas in need of attention were noted. The following goals have been developed to implement this plan.

2.1 SHORT-TERM GOALS

Short-term goals are established to satisfy immediate concerns and to meet existing regulatory compliance requirements. Short-term goals that have been identified include:

(1) nominating DOE ORO properties and/or districts to the National Register of Historic Places (NRHP);
(2) identifying NRHP-included and -eligible properties in need of preservation and maintenance;
(3) determining which NRHP-included or-.eligible properties will not be maintained due to programmatic reasons and completing the necessary Section 106 and 110 consultations and documentation;
(4) developing a maintenance/preservation plan for NRHP-included and -eligible properties that takes into account the architectural, archeological, and/or scientific elements that contribute to the properties' eligibility;
(5) compiling a comprehensive catalog listing of DOE ORO-owned historical and archeological collections;
(6) identifying and using existing buildings as internal depositories of historical artifacts;
(7) reviewing external repository facilities presently curating DOE ORO collections; and
(8) developing and maintaining a comprehensive cultural resource site records system;

The first short-term goal will involve a review of cultural resource surveys that have included an evaluation of **DOE ORO** properties for NRHP eligibility to identify those eligible properties and/or districts that warrant inclusion in the NRHP. Nominations prepared by DOE ORO must be reviewed and approved by the DOE Federal Preservation Officer and the SHPO and ultimately accepted by the Keeper of the National Register.

Short-term goals 2, 3, and 4, although different in scope, are part of a single process that involves the proper management and disposition of historical and archeological

properties in accordance with the National Historic Preservation Act (NHPA). Short-term goals 5, 6, and 7 are also part of a single process and will involve compliance with the Archaeological Resources Preservation Act and regulations set forth at 36 CFR 79. Finally, short-term goal 8 will involve the development of a NHPA computable database system.

2.2 LONG-TERM GOALS

Long-term goals are established to ensure the proper management of DOE ORO cultural resources, compliance with cultural resource laws and regulations, and the implementation of this CRMP. Long-term goals that have been identified include:

(1) maintaining compliance with cultural resource laws and regulations through the implementation of the methods and procedures contained in this CRMP;

(2) continuing to improve the effectiveness and efficiency of **DOE ORO's** cultural resources management program established by this CRMP; and

(3) reevaluating DOE ORO properties for NRHP eligibility on a periodic basis.

Compliance with environmental laws and regulations that provide for protection of sensitive resources, including cultural resources, continues to be a major concern of DOE ORO and its management. Once finalized and implemented, the CRMP will serve as the standard for cultural resource compliance activities and the mechanism by which DOE ORO will maintain regulatory compliance at its facilities on the Oak Ridge Reservation. The process of implementing the CRMP is anticipated to stimulate changes in the cultural resources management program to meet DOE ORO needs and missions, thereby creating an environment in which the second long-term goal will be satisfied. The third long-term goal will involve reevaluating DOE ORO properties for NRHP eligibility as the age of the properties begins to reach the 50-year age criterion of the NRHP and publication of additional scholarly research into the history of DOE and its facilities to provide an adequate context with which to evaluate NRHP eligibility.

3. EXISTING CONDITIONS

3.1 FACILITY OR PROGRAM DESCRIPTIONS

3.1.1 Current Physical Setting

3.1.1.1 Location

The Oak Ridge Reservation (ORR) consists of 13,968 ha (34,516 acres) of federally owned lands within Anderson and Roane counties, Tennessee. Most of the ORR is within the corporate limits of the city of Oak Ridge, Tennessee, and is located approximately 3.2 km (2 miles) southwest of the population center of Oak Ridge (Fig. 3.1). The ORR is bordered on the north and east by the city of Oak Ridge and on the south and west by the Clinch River/Melton Hill Lake impoundment. Knoxville, the largest city in East Tennessee, is located approximately 24 km (15 miles) east of the ORR.

The ORR contains more than 1200 U.S. Department of Energy (DOE)-owned buildings and structures that are primarily located at three physically isolated industrial complexes: the Oak Ridge National Laboratory (ORNL), the ETTP, and the Y-12 Plant. In addition, DOE owns a number of buildings and facilities within the city of Oak Ridge, commonly referred to as off-site DOE facilities, including the Atmospheric Turbulence and Diffusion Laboratory (ATDL), the Office of Scientific and Technical Information (OSTI) (Building 1916T1), and the American Museum of Science and Energy (Fig. 3.2).

3.1.1.2 Physiography and Topography

The ORR is located in the Valley of East Tennessee, a part of the Valley and Ridge Physiographic Province extending from New York State to central Alabama. The Valley of East Tennessee is characterized by numerous elongated ridges and intervening valleys located between the Cumberland Plateau to the northwest, which forms the southern portion of the physiographic province known as the Appalachian Plateau, and the Great Smoky Mountains to the southwest, a pant of the Blue Ridge Physiographic Province-Fig. 3.3 shows the location of the ORR within these physiographic provinces.

The Valley of East Tennessee generally lies along a southwest-northeast line; its floor has a mean elevation of approximately 270 m (891 ft) above mean sea level (MSL) and is highly corrugated with broken ridges approximately 90 m (297 ft) to 140 m (462 ft) in height. The average height of the Cumberland Mountains and Plateau west and north of Oak Ridge is approximately 900 m (2970 ft) above MSL, with the highest elevation along this range being the top of Cross Mountain, with an elevation of 1060 m (3498 ft) above MSL. The lowest elevation in the area is 228 m (760 ft) above MSL along both the Clinch River and Melton Hill Lake impoundment.

3.1.1.3 Geology, Solid, and Hydrology

The ORR is located in the Valley and Ridge Physiographic Province, which forms part of the southern Appalachian fold and thrust belt-a foreland fold and thrust belt characterized by a complex structure with regional and local thrust faults, normal faults, tear faults, and widespread fracture development. The structure of the province is characterized by a succession of northeast-striking and southeast-dipping thrust faults that offset and stack the stratigraphic units. It is this structure that largely controls the topography of the province. In general, in response to erosion and weathering over time, the more resistant rock units such as siltstone, sandstone, and dolomite form the ridges, and the less resistant units such as shales and shale-rich carbonates underlie the valleys (Kornegay et al. 1992).

The principal rock groups that underlie the ORR range in age from Lower Cambrian to Upper Ordovician and include the Rome Formation, the Conasauga Group, the Knox Group, and the Chickamauga Group (Fig. 3.4). Younger rock units, including the Reedsville Shale, Sequatchie Formation, Rockwood Formation, Chattanooga Shale, and the Fort Payne Formation, are also found on the ORR within the East Fork Ridge syncline but are of lesser abundance. The stratigraphic units that underlie the ORR are overlain by a mantle of regolith (weathered, unconsolidated materials formed in place), which is in turn overlain by a veneer of residuum, alluvium, and/or colluvium.

Residuum or residual soils are formed in place through the decomposition of the underlying rock. Alluvium or alluvial soils consist of materials that have been transported and deposited by water and, therefore, occur principally in floodplains and along stream beds. Colluvium or colluvial soils cover hillsides wherever concave landforms are found and at the base of slopes. Table 3.1 lists the soil groups and their respective soil series found on the ORR. These soil groups are generally derived from geologic rock groups of similar title. Rome soils are usually on steep slopes and have a very high erosion potential if vegetation is removed and the surface is left bare. Mass earth or mud flows can occur on steep slopes of Rome soil. Knox soils are potentially good for construction sites, forestry, and wildlife preservation. Chickamauga soils are shallow but have fair potential for forest production. Alluvial soils are in the rich bottomlands and are generally excellent for forestry, wildlife, and agriculture.

The surface hydrology in the Valley of East Tennessee is characterized by a trellis pattern in which the Tennessee River is the primary receiver of many secondary rivers and their tributaries (e.g., the Powell, Clinch, Holston, French Broad, Little Tennessee, Hiwassee, Tellico, and Ocoee rivers). The ORR is located in the Clinch River watershed, which comprises about 11 % of the Tennessee River watershed. The Clinch River originates in southwestern Virginia and flows 563 km (350 miles) to join the Tennessee River at Kingston, Tennessee (Kornegay et al. 1992).

Five dams operated by the Tennessee Valley Authority (TVA) control the flow and level of the Clinch River. Norris Dam, located approximately 50 km (31 miles) upstream from the ORR, was built in 1936 (the first TVA dam constructed) to provide electric power and prevent severe flooding along the Clinch River. Melton Hill Dam (completed in 1963) controls the flow of the Clinch River near the ORR, its primary purpose being

power generation rather than flood control. Fort Loudon and Tellico dams, on the Tennessee and Little Tennessee rivers upstream of the Tennessee's confluence with the Clinch River, control water flow into Watts Bar Lake, which is formed by Watts Bar Dam (Kornegay et al. 1992). Watts Bar Dam, on the Tennessee River, affects flow on the lower reaches of the Clinch.

Typically, a close relationship exists between surface water and groundwater drainage patterns. Groundwater in the Oak Ridge area flows generally from higher elevations to lower elevations, discharging into streams and the Clinch River, thus sustaining base flow to these systems. A stream will typically gain and lose flow as subsurface water seeps into the stream channel. Where streams flow over carbonate bedrock units in which solution or karst features exist, loss of stream water to the subsurface can occur.

In the Valley of East Tennessee, groundwater occurs in bedrock, in regolith, and in a few alluvial aquifers along the largest rivers (Kornegay et al. 1992). Aquifers are subsurface geologic units with sufficient porosity and permeability to provide adequate storage for groundwater that can be recovered relatively easily when the aquifer is penetrated by wells. Carbonate aquifers, made from limestone and dolomite, are the most common aquifers in the Valley of East Tennessee and are among the most prolific water supplies in the U.S.

3.3.3.4 Climate

The climate classification of the area is the mesothermal hot summer (Koeppe and Delong 1958). Regionally, air movement in the summer is from the southwest, which results in strong convection currents and locally intense thunderstorms. Although heavy thunderstorms are frequent, the maximum rainfall occurs in the winter and summer months. Precipitation records for the area indicate that about 53 inches occurs annually with a mean annual temperature of 57' F. Temperatures below 0 ° F and above 100' F are rare, and periods of prolonged very hot or very cold are unusual.

3.1.1.4 Vegetation and Wildlife

The general vegetation cover on the ORR is about 80% forest. Plant communities on and near the ORR are characteristic of those found in the intermountain regions of central and southern Appalachia. The dominant forest is of oak/hickory association and is most widely distributed on ridges and dry slopes. Other hardwoods such as yellow poplar, beech, buckeye, and white ash are found in coves interspersed along the dissected ridge system. Yellow poplars often form nearly pure stands on well-drained bottomlands, in sinkholes, and on lower slopes. Willow, sycamore, box elder, red maple, sweetgum, and ironwood are found along stream banks and are dominant on poorly drained floodplains (Cunningham et al. 1993).

Coniferous forests are largely cedar, white pine, and shortleafpine. Many open fields on the ORR were planted in shortleaf, loblolly, white, and Virginia pine in the late 1940s and 1950s. Smaller areas have since been planted in white ash, black locust,

red maple, eastern red cedar, black walnut, river birch, sycamore, and poplar. Pine plantations on the ORR primarily exist on lower slopes; relatively level, wide ridgetops; and well-drained bottomlands. Cedar barrens, though small in area, are found on the ORR in primarily shallow, flaggy, limestone soils (Cunningham et al. 1993). Much of the pine forest on the ORR has been logged to manage infestation by the pine bark beetle and is, primarily, being allowed to revegetate naturally.

Twenty-eight plant species known to be present on the ORR are listed by the Tennessee Department of Environment and Conservation as either endangered, threatened, or of special concern (Awl et al. 1996). Protection of threatened and endangered species is mandated by law and is best achieved through the protection of natural habitat (Cunningham et al. 1993). The major threat to rare plant species on the ORR is habitat alteration. Forest maturation, severe fire, changes in hydrologic regime, maintenance of right-of-ways, decrease of habitat size, and changes in adjacent land use can all significantly impact rare plant populations.

The habitats found on the ORR can accommodate a variety of wildlife species typical of East Tennessee. Six animal habitat types are identified on the ORR: old fields and grasslands, hardwood/ mixed hardwood forests, pine plantations, aquatic and riprarian areas, caves, and buildings. Wildlife species found in these habitats include small and large mammals, birds, and various forms of aquatic life.

3.1.2 Current Operational Context

Current DOE ORO operations in the Oak Ridge, Tennessee, area are guided by the missions of its three primary installations/sites on the ORR: ORNL, the ETTP, and the Y-12 Plant. UT-Battelle, LLC (UT-Battelle) manages ORNL and the National Environmental Research Park for DOE ORO. BWXT, manages the Y-12 Plant for DOE ORO. Bechtel Jacobs Company, LLC, manages the facilities at the ETTP. Other DOE ORO programs and/or prime contractors with missions directly related to the ORR and DOE ORO activities in the Oak Ridge area include OSTI, Oak Ridge Associated Universities (ORAU)/Oak Ridge Institute for Science and Education (ORISE), and East Tennessee Mechanical Contractors (ETMC). Details of the DOE ORO operations performed at these sites and/or by these prime contractors are contained in Sections 3.1.2.1 through 3.1.2.4.

3.1.2.1 Oak Ridge National Laboratory

ORNL is one of DOE's largest multiprogram national laboratories whose primary mission is to perform leading-edge research and development (R&D) in support of the nonweapons roles of DOE. Important elements of ORNL's mission can be summarized, along with their associated strategic objectives, by the following major R&D and service functions:

- energy technology R&D\
- conservation and renewable resources

- energy technologies for developing nations
- fusion
- fission
- fossil energy
- waste technologies
- basic and applied research in life sciences
- global environmental studies
- mammalian genetics
- basic science in support of waste technology development
- energy and environmental assessment
- measurement and assessment of the impact on human helath of radiological and chemical substances
- basic and applied research in physical sciences
- materials science and engineering
- high-temperature superconductor R&D
- neutron science
- grand challenges in computing using parallel computer technologies
- robitics, intelligent systems, and remote technologies
- heavy-ion physics
- services in support of DOE's missions
- education
- design, construction, and operation of unique research facilities
- work for others on DOE-approved tasks

3.1.2.2 ETTP

During the time frame of the cultural resource survey, the ETTP has served as the home of the DOE Center for Environmental Technology and Center for Waste Management; but also ETTP has served as the base of operations for the Environmental Restoration and Waste Management (ERWM) Program and the Reindustrialization Program. The primary mission of the ERWM Program has been to provide innovative leadership and cost-effective management of environmental restoration, waste management, technology development and demonstration, education and training, and technology transfer programs for DOE, other federal agencies, and the public. Specifically, the ERWM Program managed:

- the Toxic Substances Control Act (TSCA) Incinerator (a unique mixed-waste treatment facility);
- risk-based cleanup programs for contaminated facilities and natural resources;
- compliant and safe waste management at the DOE ORO sites, including waste minimization, treatment, storage, and disposal for all programs and activities;
- centers at the ETTP for the demonstration of advanced environmental technologies, decontamination and decommissioning (D&D), and waste management;

- research, development, and demonstration of innovative technologies for environmental restoration and waste management, leading to the most technically efficient and cost-effective programs;
- the Hazardous Waste Remedial Actions Program for DOE sites and other federal sites; and
- effective support services to all ETTP users and other customers, including enrichment, engineering, computing, and business operations.

As previously mentioned, in 1997 the K-25 Site was renamed the East Tennessee Technology Park to reflect the current mission of the site, which is to reindustrialize and reuse site resources through leasing of vacated facilities and incorporation of commercial industrial organizations as partners in the ongoing Reindustrialization Program activities.

Facilities being leased include manufacturing, laboratory, and office space. The Community Reuse Organization of East Tennessee (CROET) was created to move the Oak Ridge Complex's resource toward private management quickly and efficiently. The organization leases the federally owned properties and subleases them to private industry.

3.1.2.2 Y-12 Plant

Y-12 Plant U.S. Department of Energy Defense Programs assignments include manufacturing and reworking nuclear weapon components, dismantling nuclear weapon components returned from the national arsenal, serving as the nation's storehouse of special nuclear materials, and providing special production support to programs. Another mission of long standing is the support of other federal agencies through the Work-for-Others program. A more recent focus, implemented through the Oak Ridge Centers for Manufacturing Technology (ORCMT), is to apply unique expertise, initially developed for highly specialized military purposes, to a wide range of manufacturing problems to support the capabilities of the U.S. industrial base. Y-12's expertise includes concept development, design and specification capabilities, and an ability to build prototypes and configure integrated manufacturing processes.

ORCMT, located on the Y-12 Plant site, applies skills, capabilities, and facilities developed over the 50- year history of the Oak Ridge Complex to a variety of peacetime missions. Y-12 expertise in all aspects of manufacturing technology when combined with research and development capabilities available at the Oak Ridge National Laboratory and environmental restoration and waste management expertise available at the ETTP forms a formidable resource for the nation's industrial community. ORCMT core competencies include precision manufacturing, metrology and quality assurance, energy- and environment-conscious manufacturing, and manufacturing and materials technology development.

The three services provided by ORCMT include the rapid development/deployment of new products and services, guidance for solving tough manufacturing problems, and

training for modern manufacturing skills through the Manufacturing Skills Campus. For small companies, these are often carried out through technical assistance programs supported by DOE and the National Institute of Standards and Technology, and in strategic partnerships between ORCMT and the states of Tennessee and Florida. Work for large and midsized companies is performed on a full cost-recovery basis.

June 1993 saw the opening of the nation's first DOE Defense Programs deployment/user facility. That designation allows easier access to the centers, where manufacturers can conduct their own research, using unique machinery available at Y-12, and tap into manufacturing expertise available through the Oak Ridge Complete.

Manufacturing and Reworking Nuclear Weapon Components

Work in this area includes the manufacture of unique components for the nation’s long-term defense capabilities. Precision fabrication services are supported by mature management and safeguards systems.

Weapons Dismantlement, Storage, and Evaluation

Work in this area includes primarily the disassembly of returned weapons components and quality evaluation for the existing weapons stockpile. Minimum processing is used to reach a state of safe, secure, legally compliant, and economical storage of the materials.

Enriched Uranium Material Warehousing and Management

This area of work oversees the secure storage of special nuclear materials and processing of enriched uranium for various applications.

Process Technology and Development Support

The area of nuclear weapons process technology and development support maintains core personnel and technology for assigned technologies. This area also provides design laboratory component fabrication services.

National Security Programs

This office provides support to DOE in the development and monitoring of arms control and nonproliferation. The group also provides support for implementation and operates the Nuclear Materials Management and Safeguards System.

Work for Others

Work for various federal agencies and the private sector (through ORCMT) is conducted on DOE-approved tasks to provide unique capabilities and technologies not commonly found in other agencies or in the private sector.

Industrial Partnerships

Industrial partnerships are based on Oak Ridge research and development collaborations with companies and industrial consortia to enhance the nation's manufacturing capabilities.

Y-12 Site Management

BWXT employees at Y-12 provide landlord services for the site and its occupants, including DOE, the Transportation and Safeguards Division, and the ORNL. Other responsibilities include environmental restoration and waste management; putting facilities into a safe, legally compliant condition for shutdown; and providing protection of government property.

Contributions to National Security

Facilities and expertise developed and maintained in Oak Ridge are essential to the National Security Program, downsized to meet a reduced global threat. Capability for nuclear weapons production and quality evaluation is maintained, as well as that for dismantling and storing nuclear materials from retired weapons. The Centers for Manufacturing Technology leverage and capitalize on this national security expertise to support industrial manufacture of highly intricate equipment and prototypes.

3.1.2.3 Other Department of Energy Oak Ridge Operations Missions

DOE ORO manages other sites and facilities; however, this document pertains to the ORR.

3.1.2.4.1 Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education

ORAU is a private, nonprofit consortium of 86 colleges and universities that was established in 1946 to provide and develop capabilities critical to the nation's technology infrastructure, particularly in energy, education and training, health, and the environment. For over 50 years, ORAU has functioned as an effective synthesis of the federal laboratory system and of public and private colleges and universities. The two main missions of ORAU are to serve the needs of its member colleges and universities and to serve the needs of DOE as the contractor for ORISE. ORAU provides its member colleges and universities with (1) access to federal research facilities; (2) information about opportunities for fellowship, scholarship, and research appointments; and (3) opportunities to participate in research alliances with other members in areas where their collective strengths can be focused on issues of national importance.

The mission of ORISE is to develop and provide research and operational capabilities in workforce health and safety; national security; environmental assessments; science

education; technical training; and associated management systems for DOE through a performance-based contract with ORAU. ORISE's core competencies are in the areas of:

- fellowship and research participation program;
- workforce health, safety and security research and training;
- integrating scientific and technical resources;
- creating collaborative research partnerships;
- radiation site characterization and cleanup verification; and
- technical training systems.

ORISE creates opportunities for collaboration through partnerships with other DOE facilities, other federal agencies, the academic community, and industry in a manner consistent with DOE guidelines and the ORISE mission.

3.1.2.4.2 **Office of Scientific and Technical Information**

The mission of OSTI is to provide DOE with information management support and direction for DOE's scientific and technical information program. OSTI's mission includes a centralized capability to assist departmental elements in accomplishing DOE's missions related to economic growth, national security, and environmental protection through the following objectives:

- program direction;
- provide direction for development, communication, and coordination of policy, procedures, and standards for the handling of scientific and technical information;
- management of information;
- acquire, manage, and provide access to civilian energy and national defense scientific and technical information;
- consultation and assistance;
- provide consultation and assistance to DOE elements in planning, developing, and implementing scientific and technical information activities; and
- represent DOE and participate in interagency, international, and domestic scientific and technical information activities.

3.1.2.4.3 **East Tennessee Mechanical Contactors**

The mission of ETMC is to (1) operate and maintain vehicle maintenance and repair facility, (2) maintain various paved and unpaved roads and grounds (including cemeteries) outside the fenced areas of ORNL, the K-25 Site, and the Y-12 Plant; and (3) maintain a variety of DOE office, storage, and production facilities.

3.1.2.4.4 **Enterprise Advisory Services, Inc.**

Enterprise Advisory Services, Inc., manages and maintains the exhibits at the Museum of Science and Energy for DOE ORO.

3.1.3 **Potential Impacts to Cultural Resources**

3.1.3.1 Past Practices

Various past practices have had their effect on cultural resources on the ORR. When the government acquired properties in 1942, the acquired portions of Anderson and Roane counties consisted of many small farms. Except for the ridgetops, the area was mostly cleared to serve for grazing and cropland. As the government obtained the land, demolition began immediately, with existing structures being bulldozed to make way for the Manhattan Project. However, many structures were left in the more remote areas of the ORR. Some structures provided a temporary use (such as storage) until more permanent structures could be built.

Until 1942 the largest impact to the region had been the establishment of reservoirs by TVA. Many prehistoric archeological sites were inundated and subjected to erosion. In the early 1960s, that portion of the ORR bordered by the Clinch River was affected by TVA construction of Melton Hill Dam. Before the dam was completed and the area inundated, archeologists performed surveys and excavations.

Construction planning practices began to include more archeological considerations in the 1970s. Under terms of the National Environmental Policy Act (NEPA), the Federal Antiquities Act, and the Tennessee Natural Areas Preservation Act, the federal government and research institutions were obligated to preserve important historic, cultural, and natural aspects of our national heritage. As a result, some archeological surveys were conducted in the 1970s in areas where large construction projects were planned. An archeological survey was performed as part of the Environmental Impact Statement (EIS) for the Clinch River Breeder Reactor Project (CRBRP). Also, the first large-scale historic and prehistoric surveys of the ORR were conducted in the mid-1970s. These cultural resource surveys provided the primary guidance for project planning and development throughout the 1970s and most of the 1980s. In general, only projects that would involve disturbance of a large tract of land were surveyed. Projects that involved the sale, transfer, or lease of DOE ORO property were surveyed, such as the proposed Exxon Nuclear Facility and the proposed CRBRP.

Sensitivity to cultural resources considerations grew again during the mid 1980s with the establishment of the ORR Resource Management Organization (RMO). Projects that had the potential for impacting sensitive resources on the ORR, such as wetlands, rare plants, rare animals, and historic and prehistoric sites, were presented to the RMO. The RMO conducted and continues to conduct reviews of potential project impacts based primarily on information in Technical Site Information (TSI) documents and other available resources. During the late 1980s, increased emphasis was placed on environmental compliance, including NEPA and the National Historic Preservation Act (NEPA). More attention was placed on increasing the awareness of management and project managers of the requirements of cultural resource laws and regulations. An increase in consultation

between DOE ORO and the State Historic Preservation Officer (SHPO) regarding ongoing and proposed projects also occurred during this period.

As properties on the ORR approached 50 years in age, DOE ORO placed an increased emphasis on historic preservation planning, which resulted in overall improvements in cultural resources management. DOE ORO appointed a Cultural Resources Management (CRM) Coordinator, and the M&O contractor at each of the three industrial complexes on the ORR and key programs (e.g., Environmental Restoration) appointed Cultural Resources Coordinators to provide for a more complete and streamlined Section 106 process. In recent years, changes have occurred in the area of program management of cultural resources through the implementation of new DOE ORO policies and procedures. Data management of cultural resources information has greatly improved with the wider use of computer databases and geographical information systems (GISs).

Current use of both disturbed and undisturbed areas of the ORR has been studied through a DOE ORO land use review known as the Common Ground Process. This process allowed public participation that permitted input from stakeholders as to how the land and resources can best be managed.

3.1.3.2 Planned Activities

The DOE order for life cycle asset management requires that all DOE cites have in place a process to plan for and develop real property holdings to support their mission. As part of the continuing effort to maintain resources on the **ORR, DOE ORO** prepares, or causes to have prepared, the ORR TSI documents and/or Site Development Plans. These documents contain information about the resources and facilities on the ORR and serve as planning references by identifying the primary development issues that face the ORR and providing possible methods for resolving the issues.

Construction projects planned on the ORR for the near term (5-year planning period) are included in the TSI document along with a brief description of the processes used to conceive and implement the projects. Some changes to planned activities occur due to the iterative nature of the budget process, and other projects may never materialize due to more urgent programmatic needs that are yet unknown. The 5-year plan consists of budgeted, funded, and proposed projects.

3.1.4 Summary of Current Planning Procedure

Current planning procedures for the management ofDOE ORO cultural resources are included in the following:

> DOE orders that establish environmental protection program requirements, authorities, and responsibilities for DOE ORO operations for ensuring compliance with applicable federal, state, and local environmental laws and regulations, Executive Orders, and internal DOE policies.

DOE Oak Ridge Implementation Guidance, *Cultural Resources Management Program*, which assigns responsibility and accountability for cultural resources management and provides administrative and contractual guidance to DOE ORO, UT-Battelle, BWXT, and Bechtel Jacobs Company, respectively.

Site Development Plans for ORNL, the ETTP, and the Y-12 Plant provide practical and conceptual development strategies for each site and the ORR based on facility missions and environmental resources concerns, laws, regulations, and DOE orders.

TSI documents for ORNL, the ETTP, the Y-12 Plant, and the ORR provide baseline information on the resources present at the industrial complexes and on the ORR, including, but not limited to, cultural resources, plant and animal species, wetlands, and technically advanced facilities.

3.1.5 Funding

Cultural resource management planning and program implementation is integrated into the normal operating budget process and is funded within the environmental category. Funding fog 1hr, DOE ORO CRM Coordinator is provided by the DOE ORO Office of the Assistant Manager for Environment, Safety, and Quality similar to funding for oversight of compliance with NF-PA, the Clean Water Act, and the Clean Air Act. Similarly, funding for each prime-contractor Cultural Resources Coordinator is integrated into the prime-contractor budgets.

Funding for specific "one-time" costs are requested separately, evaluated, and prioritized using the risk-based prioritization process. For example, funds to conduct historic building surveys were requested through prime-contractor Cultural Resources Coordinators working through their management and the same risk-based prioritization process. When specific capital or general plant projects are planned that require cultural resources evaluation such as an archeological survey or the preparation of Section 106 documentation, funding to perform the work is usually borne by the project.

The above funding process provides a base level of funding to ensure that cultural resource activities are managed the same as other sensitive resources activities within the environmental arena. As new projects are planned, funding must include monies to comply with all applicable laws, regulations, and requirements, including cultural resources.

3.2 CULTURAL AND HISTORICAL SETTING

3.2.1 Historic and Prehistoric Natural Environments

The geology of the eastern Tennessee region records a history that spans over one billion years, and it was not until recently in this history that the region achieved the physical appearance or landscape with which we are familiar. Although the geology of the ORR is

addressed in Section 3.1.1.3 above and the focus of this CRMP is on the history of occupation of the eastern Tennessee region by Native Americans and peoples of European descent (comprising only a small fraction of the region's geologic history), one must understand a little of the geologic processes that shaped the region and affected the natural environment (Chapman 1985b).

The earth's crust is a dynamic system consisting of plates that move or float around very slowly, interacting with each other at their edges to form features such as mountain chains, oceans, and rift basins. Over several billion years, the plates have collided, joined, separated or split apart in a continuous cycle forming various land masses and oceans. Through studying the geologic record, geologists believe that approximately 450 million years ago, or during the Paleozoic Era (between approximately 570 and 240 million years ago), a collision occurred between the continents of North America and Africa. This collision caused the Paleozoic sedimentary rocks on the fringe of the North American continent to fold, fracture, and over thrust, forming the Appalachian Mountains and Appalachian fold and thrust belt-the foreland fold and thrust belt that underlies the Valley and Ridge Physiographic Province. Following the North America-Africa collision, a rift formed which reversed the collisional forces and eventually grew to form a considerable portion of what is now the Atlantic Ocean.

During the Mesozoic Era (between approximately 240 and 63 million years ago), or the Age of the Dinosaurs, the eastern Tennessee region experienced significant erosion of the newly formed Appalachian Mountains, which, for the most part, prevented any evidence of the existence of dinosaurs and other creatures or organisms from being preserved in the geologic record in the region. During the Cenozoic Era (from approximately 63 million years ago to the present), the rate of evolution and diversification of mammals grew considerably, producing the present distribution of organisms in the world. During this era, periods of glaciation brought the erosional forces that helped shape the landscape with which we are familiar and allowed humans to come to inhabit the New World.

Evidence in the geologic record indicates that beginning around 3 million years ago oscillations in global temperatures began a series of "ice ages" characterized by the advance and retreat of major continental glaciers or ice sheets that spread from the earth's polar regions down into lower latitudes. Geologists refer to this period in the earth's history as the Pleistocene Epoch. The last of the ice ages, which is referred to in North America as the Wisconsin glaciation, began around 70,000 years ago and lasted until approximately 10,000 years ago. Four advances or full glacial conditions and five retreats or partial deglaciation (interstadials) occurred during the Wisconsin glaciation. At the peak of the Wisconsin glaciation, two glacial systems, one centered over the Hudson Bay area called the Laurentide Ice Sheet and the other centered over the Canadian Rockies called the Cordilleran Glacier Complex, combined to form an enormous ice sheet. The ice sheet is estimated to have been over 15 million square miles in area and nearly two miles in thickness. Glacial landforms indicate that the ice sheet extended down into the United States as far south as Long Island and the Upper Ohio Valley during the greatest glacial maximum (Chapman 1985b).

During the Wisconsin glaciation, the upper elevations of the Smoky Mountains-although not covered with glaciers-were affected by much colder temperatures, with the result that the ground remained frozen and tundra conditions prevailed. In the valleys, Boreal forests dominated by spruce and jack pine (tree species common in the forests of northern Canada) were inhabited by animals such as the spruce grouse, rock ptarmigan, yellow-checked vole, herds of caribou (animal species whose habitation range today is no farther south than Canada) and now-extinct species such as the ground sloth, mammoth, mastodon, giant beaver, and long-nosed peccary (Chapman 1985b).

Extensive erosion on mountain tops and hillsides and sediment deposition in river valleys resulted from climatic oscillations in the region. During the colder periods or glacial maximums, frost action helped break down large quantities of rock in the higher elevations. During interstadial periods, rock debris was washed down the relatively unvegetated slopes by flood waters created by thawing and increased rain and was deposited as sediment on floodplains or river terraces in the bottomlands. As time passed and colder weather again prevailed, the rivers and streams cut down through the floodplains only to form other floodplains or terraces during the following interstadial period. The most recent period of floodplain development, at least in the Tennessee and Little Tennessee River valleys, occurred between 15,000 and 7,000 years ago, approximately the same time Native Americans entered the eastern Tennessee region (Chapman 1985b).

Modern vegetation dominated the eastern Tennessee region by about 10,000 years ago. However, the distribution of vegetation today is clearly not what it was then, when Native Americans first arrived in the region and much of the area was covered by lush deciduous forests dominated by oak, hickory, tulip poplar, and chestnut trees. Although Native Americans must have had an impact on the forests surrounding their camps and villages, the result clearly could not have rivaled that brought on by nineteenth and twentieth century agriculture, land clearing, and modern development.

3.2.2 Prehistory and History

Archeological investigations in the Eastern Woodlands of North America demonstrate that the area has been occupied at least as far back as 14,000 (perhaps even 17,000) years ago (Adovasio et al. 1975). A series of changes in the material culture, subsistence activities, and social organization of Native American cultures has been documented over this period and are referred to as "cultural traditions" (Willey and Phillips 1958). This basic framework has withstood subsequent information and investigations and continues to be used as a basic chronological framework by prehistoric archeologists in the East. These traditions, along with their approximate temporal boundaries, are Paleo-Indian (10,000 B.C.-8,000 B.C.), Archaic (8,000 B.C.-1,000 B.C.), Woodland (900 B.C.-A.D. 900), Mississippian (A.D. 900 to A.D. 1600), and Overhill Cherokee (A.D. 1600 to A.D. 1838).

3.2.2.1 Paleo-Indian Period (10,000 B.C. to 8,000 B.C.)

Archeological research has documented the presence of Native Americans in eastern Tennessee beginning at least 10,000 years ago with occupation fairly continuous until historic times. It is widely accepted that the aboriginal inhabitants of the New World reached the North American continent from Asia by crossing a land bridge formed across the Bering Strait during the last glaciation, though the precise-timing and nature of these migrations are still open to question (Meltzer 1989).

The earliest cultural complex recognized is Clovis (Meltzer 1989). The surviving material artifacts characteristic of the Clovis complex are lanceolate-fluted projectile points. The Paleo-Indians also made unfluted lanceolate-shaped projectile points, bifacial knives, bifacial drills, bipolar cores and flakes, retouched and unretouched blades, and a variety of unifacial tools made from debitage- gravers, spokeshaves, beaks, wedges (pieces esquillees), and end scrapers. These were often made of local materials, though high-grade nonlocal materials were occasionally used.

A number of Paleo-Indian sites have been recorded in eastern North America, but the most Significant sites reported for the southeastern United States are from (1) Kentucky: die Adams (Sanders 1988), Henderson, Roach, Morris, and Parrish sites (Rolingson and Schwartz 1966); (2) Tennessee: Wells Creek (Dragoo 1973); and (3) western Virginia: Thunderbird (Gardner 1974).

Paleo-Indian subsistence patterns remain poorly understood due to the poor preservation of faunal and archeobotanical material within the context of Paleo-Indian sites. Initially it was thought that the subsistence economy of the earliest inhabitants of the Americas was based largely on a big-game hunting strategy which exploited Pleistocene megafauna. Meltzer (1988), however, proposes that there were two Paleo-Indian subsistence adaptations in eastern North America designed to deal with differing local contemporary biotic communities. The environment of the northeast consisted of northern tundra and spruce parkland that contributed to a concentration of caribou as "the only species that would yield sufficient economic return to allow humans to survive there" (Meltzer 1988). The boreal-deciduous forest of the South, including the middle and lower Ohio River Valley, the Middle South, and the Southeast, supported "generalists, who exploited a variety of subsistence resources, including seeds, nuts, small mammals, and perhaps an occasional deer or mastodon" (Meltzer 1988).

3.2.2.2 Archaic Period (ca. 8000 B.C. to 900 B.C)

The archeological record of the Archaic period is characterized by aboriginal adaptation to the warming post-glacial climate of the Holocene period. The hunting and gathering of modern animal and plant resources found in the emerging deciduous forest communities have been well documented (Asch, Ford, and Asch 1972; Chapman 1975, 1977; Chapman and Shea 1981). The primary faunal resources exploited include bear, white-tailed deer, elk, turkey, and raccoon, as well as a variety of small mammals, birds, fishes, and invertebrates (Lewis and Kneberg 1961; Chapman 1985a, 1985b; Breitburg 1986, 1989; Barker and Breitburg 1992).

The Archaic period was broken into the Early (8000 B.C. to 6000 B.C.), Middle (6000 B.C. to 4000 B.C.), and Late Archaic (4000 B.C. to 700 B.C.) by Griffin (1967), a division which has been followed in recent syntheses by Steponaitis (1986) and Smith (1986).

During the Archaic period, a shift occurred from lanceolate-fluted projectile points to side- and corner-notched projectile point forms. The Early Archaic phases have been defined on the seriation of these changing projectile point morphologies. The Kirk Cluster is dated to the time between 8000 B.C. and 7000 B.C. and the Bifurcate Cluster between 7000 B.C. and 6100 B.C. (Chapman 1985a). Early Archaic flaked-stone tools are similar to those of the preceding Paleo-Indian period. However, the greater frequency of grinding stones suggests an increased importance of arboreal seeds in the diet (Chapman 1985b).

Early Archaic peoples appear to have preferred a floodplain environment, as indicated by the number of such occupations that have been documented in eastern Tennessee. Early Archaic components have been identified in deeply buried stratigraphic contexts at such sites as Rose Island, Icehouse Bottom, Bacon Farm, and Calloway Island (e.g., Chapman 1975,1977, 1978, 1979). Rock shelters, however, were also occasionally used, though probably in a seasonal context (Fowler 1959; Styles, Ahler, and Fowler 1983). Since the identification of credible postholes from this period is still questionable (cf. Chapman 1979), it has been postulated that Early Archaic structures consisted of skin or hide or mat constructions using domed saplings (Kimball 1985; Chapman 1985b).

Evidence for reconstruction of Early Archaic subsistence patterns is not as conclusive as for subsequent periods, which are better documented, though existing data suggest that such patterns basically resembled those of later groups. However, certain plants that in subsequent periods were intensively utilized and/or domesticated (such as chenopodium sunflower, gourd, squash, etc.) were not represented, and mollusks were not as intensively exploited as in later times. The inhabitants of the Early Archaic period lived in base camps from which they ranged during foraging activities (Chapman 1985b).

Permanent architecture is observed for the first time in the Middle Archaic period, an indicator of the shift from a mobile to a sedentary residential adaptation. Brown and Vierra (1983) suggest that this development arises from both environmental pressures and those relating to population increase and/or territorial competition. As a result, more permanent base camps were established, representing a greater investment of energy in associated facilities and portable technology. People lived in base camps for the greater part of the year, while specialized economic activities and overnight encampments were made in field camps. Subsistence patterns basically resemble those of the Early Archaic period, with the addition of shellfish as an important constituent of the Middle Archaic diet.

A major technological innovation that was apparently made during this time is the atlatl, or spear thrower, as evidenced by the appearance in the archeological records of ground-stone atlatl weights and (occasionally) the hook and handle. The variety of flaked stone

tools decreased, while the number of tools made from bone and antler increased. New projectile point types appear in a greater diversity than in earlier periods (Kimball 1985; Brown and Vierra 1983). Stemmed projectile points associated with the Kirk Stemmed (6000 B.C. to 5800 B.C.) and Stanley (5800 B.C. to 5500 B.C.) phases appear. Stone net sinkers that became common are assumed to have been used to weight the bottom of nets used for fowling and fishing.

The late Middle Archaic and Late Archaic periods are characterized by an increasing variety of projectile point forms, as well as a more sedentary lifestyle. Permanent structures appear along with a greater differentiation of site types. Squash, gourd, chenopodium, and sunflower were domesticated for the first time (Chapman and Shea 1981). A greater investment of energy was made in less portable objects such as stone bowls, which would have been heavier than skin bags or nets and baskets. In addition, development of a complex mortuary ritual suggests the attachment of corporate groups to specific areas (Chapman 1985b; Charles and Buikstra 1983).

Two Late Archaic phases, Savannah River (3000 B.C. to 1800 B.C.) and Iddins (1800 B.C. to 1200 B.C.), have been defined for eastern Tennessee in investigations in the Tellico Reservoir basin. Savannah River is earlier and is known chiefly from excavations at the Bacon Bend site (where the earliest known evidence for the domestication of squash in eastern Tennessee was documented). No evidence of architecture was observed in Stratum 7, though several rock-filled basins or hearths were recorded. Lithic artifacts include Savannah River stemmed projectile points made of slate and quartzite and an atlatl weight fragment (Chapman 1981).

The Iddins phase was documented through excavations at the Harrison Branch, Patrick and Iddins sites (Schroed11975, 1978; Chapman 1981). The best context investigate for this phase is Stratum III at the Iddins site, which contained a row of rock-filled hearths along the front edge of the first terrace. Associated artifacts include Iddins Undifferentiated Stemmed projectile points, several notched-pebble net sinkers, grooved ax fragments, and pieces of carved soapstone bowls (Chapman 1981).

Evidence for regional exchange between the groups of eastern Tennessee and those to the south and east is demonstrated by the appearance in the archeological record of objects made of soapstone or steatite. Marine shell from both the Gulf of Mexico and Atlantic coast, as well as copper from the Lake Superior region, are also recovered in Late Archaic contexts and provide further evidence for regional exchange networks (Chapman 1985b).

3.2.2.3 Woodland Period (900 B.C. to A.D. 1000)

The Woodland period is characterized by obvious changes in both belief systems and material culture, as demonstrated by the appearance of pottery, burial mounds, and the first signs of agriculture. Archeologists customarily divide the Woodland period into Early (ca. 800 B.C. to ca. A.D. 0), Middle (ca. 0 to A.D. 600) and Late (A.D. 600 to A.D. 900). These divisions are based primarily on differences in technology and

changes in mortuary treatment. The establishment of an elaborate mortuary complex, thought to have been developed by groups to the northeast of the Tennessee Valley region, indicates the development of a nonegalitarian social order. Wide-ranging trade networks are evident in the distribution of both raw materials and finished objects found throughout the Southeast far from their points of origin. The domestication of plants advanced with the addition of sumpweed *(Iva annua L.),* sunflower *(Helianthus annuus L.),* and squash *(Cucurbita pepo)* by the beginning of the Middle Woodland period (Yarnell 1976). In addition, corn appears in the archeological record during Woodland times. Currently, the earliest widely accepted evidence for the presence of maize *(Zea mays)* in the Southeast comes from a late Middle Woodland context (Yarnell 1989) at Icehouse Bottom in East Tennessee, where corn was dated to A.D. 439 (Chapman and Shea 1981).

The original Woodland chronology for East Tennessee, as proposed by Lewis and Kneberg (1941, 1946), evolved from their salvage excavations conducted in the Chickamauga Reservoir during the 1930s and is based primarily on ceramic technology. They envisioned a three-part division composed of Watts Bar, Candy Creek, and Hamilton foci (Table 3.2). Kneberg (1961) further refined the limestone-tempered ceramic series, breaking them into Greeneville, Candy Creek, Hamilton, and Roane-Rhea complexes. Additional revisions to this scheme have more recently been suggested (McCollough and Faulkner 1973; McCollough 1973; Kimball 1985; Schroedl, Davis, and Boyd 1985). The Early Woodland Watts Bar Focus was considered earliest and was identified by the presence of crushed-quartz or quartzite-tempered potsherds with fabric-marked or cord-marked surfaces (Lewis and Kneberg 1946). The Watts Bar people "lived in compact villages in circular houses, dug kettle-shaped storage and cooking pits and buried their fully flexed dead in circular graves" (Kneberg 1952).

Table 3.2 Cultural Chronology for the Woodlands and Mississippian Periods of East Tennessee. Based on Lewis and Kneberg (1946); Kneberg (1961)

Period	Culture	Dates
Cherokee	Overhill	A.D. 1700 to A.D. 1838
Late Mississippian	Dallas, Mouse Creek	A.D. 1200 to A.D. 1600
Early Mississippian	Hiwassee Island	A.D. 1000 to A.D. 1200
Late Woodland	Hamilton, Roane-Rhea	A.D. 600 to A.D. 900
Middle Woodland	Candy Creek	A.D. 200 to A.D. 600
Early Woodland	Watts Bar, Long Branch	900 B.C. to A.D. 200

More recently, McCollough and Faulkner (1973) defined an Early Woodland sequence for East Tennessee based on ratios of crushed-quartz-tempered shards to limestone-tempered shards, consisting of (from earliest to latest) Watts Bar, Greeneville, and Long Branch phases. The Watts Bar component is represented by pottery that is quartz or sand-

tempered and fabric or cord-marked. The Greeneville phase is defined by the presence of both Watts Bar quartz-tempered and Long Branch limestone-tempered wares, with the Watts Bar wares comprising the greater quantity. Finally, the Long Branch phase is characterized by the predominance of Long Branch Fabric Marked limestone-tempered wares (McCollough and Faulkner 1973).

Kimball (1985) has proposed a revised chronology (Table 3.3) for the lower Little Tennessee River Valley in which the Early Woodland Watts Bar designation is replaced by a Woodland I, Bacon Bend ceramic cluster dating between 1000 B.C. to A.D. 250. Greeneville and Long Branch units are likewise redefined as Woodland II, affiliated with the Patrick I and II ceramic clusters, dating between A.D. 200 to A.D. 350.

Table 3.3 Revised Culture Chronology for the Woodland and Mississippian Periods of East Tennessee. Based on Kimball (1985).

Period	Culture	Dates
Mississippian IV	Overhill Cherokee	A.D. 1600 to A.D. 1838
Mississippian III	Dallas, Mouse Creek	A.D. 1300 to A.D. 1600
Mississippian III	Hiwassee Island	A.D. 1000 to A.D. 1300
Mississippian II	Martin Farm	A.D. 900 to A.D. 1000
Mississippian II Woodland III	Icehouse Bottom, Westmoreland-Barber	A.D. 350 to A.D. 900
Woodland II	Patrick I, II	200 B.C. to A.D. 350
Woodland I	Bacon Bend	900 B.C. to 200 B.C.

The Middle Woodland Candy Creek Focus of Lewis and Kneberg (1941, 1946) was dated at A.D. 200 to A.D. 600 and was considered to follow Watts Bar. Ceramically, it was identified with assemblages comparable to those from the type site of Candy Creek (40BY14). Candy Creek pottery is predominantly limestone-tempered, with cord marking composing the main surface treatment. Fabric marking is also a common finish; plain; check-stamped; complicated-stamped, and simple-stamped finishes also occur, although less commonly. Sand-tempered, plain; fabric-marked; complicated-simple, and checked-stamped shards were also considered important constituent types.

Chapman (1973) initially proposed that Candy Creek be divided into early and late components, but Connestee, the well-known Late Woodland cultural unit from western North Carolina (Keel 1972, 1976), has become accepted in lieu of a formal designation for a late Candy Creek occupation (McCollough and Faulkner 1973). Kimball (1985), however, replaces both Candy Creek and Connestee phase designations with Wonritand T1 T, stated A.D. 350 to A.D. 600 and associated with the Icehouse Bottom and Westmoreland-Barber ceramic assemblages. Investigations at Icehouse Bottom (40MR23) (Chapman 1973; Cridlebaugh 1981), the Patrick Site (40MR40) (Schroedl 1978), and the Higgs Site (40LO45) (McCollough and Faulkner 1973), viewed in

comparison to Connestee phase sites in western North Carolina (Keel 1972, 1976), inspired an examination of the cultural and temporal relationships of limestone- and sand-tempered ceramics. Studies of the Higgs and Patrick site materials suggested that sand-tempered pottery postdates limestone-tempered ceramics; consequently, the Candy Creek phase is succeeded by the Connestee phase, thus constituting two distinct Middle Woodland cultures in East Tennessee (Schroedl, Boyd, and Davis 1990).

The Late Woodland cultural component for East Tennessee was first defined and described by Lewis and Kneberg (1946) as consisting of the Hamilton Focus. The Hamilton Focus was characterized ceramically by the predominance of cord-marked, plain, and brushed, as well as incised and punctate-decorated, surface treatments, with limestone tempered pastes (Lewis and Kneberg 1941). The presence of burial mounds was considered to be another defining characteristic of the Hamilton Focus. Kneberg (1961) later added another Late Woodland cultural unit, distinct from Hamilton, called Roane-Rhea, named after the East Tennessee counties in which it most frequently occurred.

Hamilton mounds tend to be conical or round in shape and located near a major waterway. Mound construction was begun by an initial burial over which the mound was built (Cole 1975). The most common grave goods associated with Hamilton burials are small, triangular projectile points and drilled conch columellae beads (Lewis and Kneberg 1946). Gender seems to make little difference in the distribution of grave goods, with males and females seemingly receiving comparable items (Cole 1975). Only about half of the individuals interred receive grave furniture, a disparity suggesting that age may have been a factor in determining an individual's status-though the preservation of most burials is apparently too poor to make age distinctions other than that between subadults and adults. The fact that few subadults are accorded mound burial supports this conclusion (Cole 1975).

Hamilton burial mounds are now known to date to a much wider time span than originally thought. A suite of radiocarbon dates indicates that the mounds were in use between A.D. 700 and A.D. 1200 (Schroedl 1973; Schroedl, Boyd, and Davis 1990). For this reason, Hamilton mounds can no longer be considered to be associated exclusively with the Late Woodland period and, therefore, are more properly referred to as the Hamilton burial mound complex.

The Hamilton culture is known almost entirely from its mortuary complex, since no occupation sites have been conclusively identified. Lewis and Kneberg (1941, 1946) described several shell heaps in the Chickamauga and Watts Bar basins as "individual household middens" attributed to the Hamilton culture. No structures were identified as being associated with a Hamilton occupation, however, which prompted Lewis and Kneberg to suggest that the constructions were of such a light nature that they left no observable archeological evidence. According to Lewis and Kneberg, the general Hamilton settlement pattern hypothetically consisted of households "strung out along the riverbanks" (1946) with burial mounds located away from the river. In addition, burial mounds were considered focal points in a settlement system that was otherwise "rather

loosely organized" (Lewis and Kneberg 1946). Subsistence was based primarily on fresh-water mussels as the chief source of protein, augmented by the collection of plants. Agriculture was considered to be either unlikely or, at best, to have formed a minimal part of the Hamilton culture diet (Lewis and Kneberg 1946).

Though attempts have been made to evaluate the settlement-subsistence model proposed by Lewis and Kneberg, only two other Hamilton shell middens have been investigated in East Tennessee since the 1930s. Though no evidence of structures was found in association with shell mounds either at the Doughty Site (40LD46) or at Site 40RH62, perspectives on Hamilton subsistence patterns were broadened by faunal and botanical studies (McCollough and Faulkner 1973; Prescott 1977), which suggest a more diverse subsistence base than that envisioned by Lewis and Kneberg (1941, 1946). McCollough and Faulkner (1973) suggest that the Hamilton shell middens represent seasonal winter-spring occupations rather than permanent settlements. Prescott (1977), on the other hand, interprets faunal and botanical evidence from 40RH62 to indicate a spring-summer-fall occupation of the site.

The wide spread of radiocarbon dates associated with Hamilton burial mounds and the fact that Dallas burials are intrusive to many Hamilton mounds suggest that the Hamilton and Mississippian cultures are closely related. In fact, Schroedl (1978) suggests that Hamilton is an incipient form of Early Mississippian; likewise, Kimball (1985), as well as Schroedl, Davis, and Boyd (1985), places the Hamilton mortuary complex in a Mississippian I phase. This would explain the absence of Hamilton occupation sites in association with mounds, at least for the more recent period.

Indeed, the existence of a separate Late Woodland cultural unit for East Tennessee is now in question (Keel 1976; Kimball 1985). Kimball (1985) and Chapman (1990) see a Middle Woodland-Late Woodland continuum from A.D. 350 to A.D. 900. It is clear that many difficulties yet remain in understanding the latter part. of the Woodland period in East Tennessee, such as whether there was a distinct Late Woodland period culture (as first proposed by Lewis and Kneberg and endorsed by Keel) or a ceramic continuum and (by implication) no distinct Late Woodland culture (Schroedl, Boyd, and Davis 1990).

Contributing to the confusion are a number of factors, including the re-evaluation of burial mounds as defining criteria of Late Woodland occupation, as well as the occurrence of Middle Woodland ceramic diagnostics in apparent Late Woodland contexts (Schroedl, Boyd, and Davis 1990). Further, relatively few radiocarbon dates from Late Woodland occupations (Schroedl, Boyd, and Davis 1990) are not as well documented as the burial mounds.

3.2.2.4 Mississippian Period (ca. A.D. 900 to A.D. 1600)

The Mississippian cultures at their apex are generally regarded as having achieved the highest level of sociocultural and political complexity known to North America north of Mexico. The designation "Mississippian" has been used to refer to a number of

prehistoric human populations in the Eastern Woodlands, based on the presence or absence of a number of material culture traits, including shell-tempered pottery and rectangular, truncated, substructural pyramidal mounds. Smith (1978) describes the term "Mississippian" as referring to those prehistoric human populations existing in the eastern deciduous woodlands during the period A.D. 800 to A.D. 1500 that had a ranked form of social organization and had developed a specific complex adaptation to linear, environmentally circumscribed floodplain habitat zones. Further, this adaptation involved the practice of maize horticulture, as well as the utilization of a limited number of wild plants and animals (Smith 1978). This cultural adaptation developed in the Mississippi Valley and spread-through both the migration of people and the transmission of ideology-throughout a large portion of the Southeast. The Mississippian culture is marked by a dependence on horticulture for its subsistence base. This adaptation fostered territoriality and competition for suitable land and also provided an economic surplus that allowed the growth of large populations and the development of craft specialization and related exchange networks. In addition, complex rituals involved with the horticultural cycle also evolved.

The Mississippian horticultural complex consisted of several varieties of maize, squash, pumpkin, gourd, sunflower, and beans. These were supplemented by a wide assortment of wild plant foods (nuts, fruits, berries, tubers, etc.) as well as wild game, providing an ample food supply. The extensive exploitation of animal species is demonstrated at Mound Bottom (40CH8), located on the Harpeth River west of Nashville, where some 38 species of wild animals were consumed. In addition, at least 60 species, including mollusks, are represented from excavations at the Stone Site (40SW23) in the Lower Tennessee-Cumberland region.

The major focus of Mississippian culture was in the Mississippi Valley between St. Louis, Missouri, and Vicksburg, Mississippi. Significant numbers of Mississippian settlements are also found in southeast Missouri, eastern Arkansas, western Tennessee, and Kentucky. In addition, Mississippian settlements extend northward up the Ohio Valley into Indiana, as well as along the Illinois River Valley of central Illinois.

Many of the larger Mississippian centers were fortified by a defensive stockade encompassing large areas (cf. Clay 1976). These sites are considered the main focal point of Mississippian populations and the residence of the elite. Mississippian mortuary patterns indicate a ranked society, with each individual having a place in the hierarchy and differential access to both resources and power. The organization of major centers and the distribution of certain classes of artifacts found within tend to support this model. The focal point of the major centers was a large, open plaza bordered by flat-topped mounds, which were the substructures for various buildings that probably served both civic and religious functions as well as being the residence of the elite of Mississippian society. The bulk of the population lived in small wattle and daub structures with thatched roofs that stretched beyond the center.

Mississippian ceramics are far more diversified than those of the prior Woodland periods. Tempering is predominantly shell, followed by grog, in frequency. Effigy wares appear

modeled in the forms of both human and animal shapes, while other wares are painted with decorative elements. Utilitarian wares, used for the preparation and storage of food, are also present.

The large centers are also considered to have been the nexus of a trade network that dealt with the exchange of both exotic and utilitarian items-chiefly salt, copper, and various chert types. Copper and exotic cherts were often used for the production of special ceremonial items. In addition, the ideology of the culture is portrayed in the symbolism engraved, painted, and sculpted in other materials such as shell, wood, copper, and stone.

The Mississippian period is the best-explored and most visible period of prehistoric occupation in Tennessee. The interest in Mississippian mounds and cemeteries dates to the beginning of European settlement of the area. Despite this curiosity and the number of previous investigations much remains to be understood of the Mississippian adaptation.

The cultural chronology developed by Lewis and Kneberg (1941, 1946) for the Mississippian period of eastern Tennessee was divided into three parts: (1) the initial Hiwassee Island component, considered to date between A.D. 1000 and A.D. 1200; (2) the chief cultural phases of the Late Mississippian period, A.D. 1200 to A.D. 1600, consisting of an earlier Dallas component followed by a later Mouse Creek phase which existed through the time of European contact; and (3) a Cherokee period, A.D. 1700 to A.D. 1838. The chronology of East Tennessee for the Mississippian period has been revised as a result of more recent research (Kimball 1985; Schroedl, Boyd, and Davis 1990).

Investigations at Martin Farm, along with additional comparative studies in the lower Little Tennessee River Valley, have contributed to a greater understanding of the emergence of Mississippian culture in East Tennessee (Schroedl, Davis, and Boyd 1985; Schroedl, Boyd, and Davis 1990). Schroedl, Boyd, and Davis (1990) choose to emphasize demographic and economic variables in explaining the transition from the Woodland to Mississippian periods, as evidenced by agricultural intensification and increased settlement size, accompanied by greater social stratification.

The initial Mississippian cultural unit in eastern Tennessee is now called Martin Farm and dates from A.D. 900 to A.D. 1000 (Schroedl, Davis, and Boyd 1985; Kimball 1985; Schroedl, Boyd, and Davis 1990). Martin Farm ceramics are predominantly limestone-tempered plain (30-35%), limestone-tempered cord-marked (20-25%), and shell-tempered plain (35-40%) (Schroedl, Davis, and Boyd 1985; Schroedl, Boyd, and Davis 1990). Limestone-tempered loop handles also occur in the Mississippian I ceramic assemblage.

Once considered anomalous (Salo 1969; Schroedl 1978), the Mississippian I component of the Martin Farm Site (40MR20) is known to occur at a number of sites in the lower Little Tennessee River Valley (Schroedl, Boyd, and Davis 1990: Fig. 70, 188). In

addition, a Mississippian I component has been recognized at Hiwassee bland (cf. Lewis and Kneberg 1946) and probably also at the Hixson, Sale Creek, Dallas, and Davis sites in the Chickamauga Basin (Kimball and Baden 1985). The ceramic assemblage of the Lee Farm Site (40AN 17) (Griffin 1938) in the Norris Basin also suggests a Mississippian I component (Schroedl, Boyd, and Davis 1990).

Material manifestations of the Martin Farm culture unit include "shell- and limestone-tempered pottery, Mississippian style structures, and the earliest evidence of temple mounds in the region" (Schroedl, Boyd, and Davis 1990). The chief technological difference between Martin Farm and the later Hiwassee Island culture unit is the expanded and refined use of shell-tempered pottery (Schroedl, Boyd, and Davis 1990). Major social and economic changes, however, are also indicated by the shift in settlement location, accompanied by increasing size and complexity. Based on radiocarbon dates, it is assumed that these changes occurred relatively rapidly, probably in less than 100 years (Schroedl, Boyd, and Davis 1990).

Greater ceramic diversity is demonstrated in the Mississippian II or Hiwassee Island assemblage (A.D. 1000 to A.D. 1300) (Schroedl, Boyd, and Davis 1990). Shell-tempered plain (65-85%) comprises the greatest part of the Hiwassee Island ceramic assemblage, followed by. cord-marked (1-15%), fabric-marked (3-5%), red-filmed (1-3%), limestone-tempered plain (5-11%), and cord-marked (3-6%) shards, with limestone-tempered handles absent. Though shell-tempered types are dominant, limestone-tempered ceramics continue to be well represented (Schroedl, Boyd, and Davis 1990).

Examination of stone artifacts revealed no differences in the lithic assemblages of Mississippian I and II components, with the characteristic projectile points for both being small, triangular Hamilton, Madison, and incurvate blade types (Schroedl, Davis, and Boyd 1985; Schroedl, Boyd, and Davis 1990).

Subsistence patterns also appear to show little change between Mississippian I and II occupations at Martin Farm, with one distinction being the apparent absence of bear remains during Mississippian I. Otherwise, faunal assemblages are similar for Mississippian I and II occupations and demonstrate extensive exploitation of aquatic habitats, as indicated by the number and diversity of mollusk, fish, and turtle remains. Terrestrial species represented in the assemblages of both occupations include deer, raccoon, and squirrel (Bogan and Bogan 1985). The Martin Farm faunal assemblage is similar to that of other Mississippian sites, including Jones Ferry (40MR76) (Bogan and Bogan 1985).

The botanical assemblage also is essentially the same between Mississippian I and If at Martin Farm, with hickory nut shell, acorn shell, walnut shell, and maize (both eightand ten-rowed varieties) all represented in comparable amounts. Squash, gourd, chenopodium, sunflower, smartweed, and sumpweed **also form parts** of both assemblages (Schroedl, Davis, and Boyd 1985). Subsistence patterns at Martin Farm during Mississippian I and II, in general, resemble those documented from other

Mississippian sites in the lower Little Tennessee River Valley (Schroedl, Davis, and Boyd 1985).

At least 42 sites with Mississippian I or II components, including Martin Farm, have been identified in the lower Little Tennessee River Valley (Schroedl, Boyd, and Davis 1990). Mississippian I components have been identified at 17 sites, based on the composition of associated ceramic assemblages. The majority (13) of these sites are located on the first alluvial terrace, with the remainder (4) being situated on higher and older river terraces.

Mississippian II or Hiwassee Island phase occupations have been documented at 30 sites in the lower Little Tennessee River Valley (Schroedl, Boyd, and Davis 1990). Platform mounds have been found at Martin Farm (40MR20), Mayfield II (40MR27), Toqua (40MR6), and Bat Creek (40LD24); the earliest stages of mound construction at Citico (40MR7) and Bussell Island (40LD 17) may also date to Mississippian II occupations.

The Mississippian II period is marked by a shift in residence away from the alluvial floodplain to higher ground. Additional characteristics distinguishing the Mississippian I and II periods include increased site size, complexity, and sedentism. The higher river terraces are strategically protected from periodic flooding and are thus more favorable for permanent settlement. Further, this tendency to move settlement off the rich bottom soils of the first terrace may indicate increased competition for agricultural lands prompted by population growth (Schroedl, Boyd, and Davis 1990).

The Late Mississippian Dallas phase left the most visible physical remains of all the prehistoric cultures of eastern Tennessee. Each of the largest sites, such as Citico, Toqua, and Bussell Island, covered several acres, with one or more platform mounds surrounded by thick midden deposits formed by the accumulation of domestic debris from densely occupied villages. Further characteristics of Dallas material culture include platform mounds with associated plazas; evidence of one or more palisades along the site perimeter; rectangular houses of single-post construction; shell-tempered pottery with chiefly plain and cord-marked exteriors, strap and lug handles, and decorations consisting of incising or modeling; and flexed pit burials usually accompanied by grave offerings consisting of small pots or other grave goods (Lewis and Kneberg 1941, 1946). The Dallas lithic assemblage, with the exception of Dallas excurvate triangular projectile points and perhaps Celts, resemble those of Martin Farm and Hiwassee Island phases (Davis 1990).

The Dallas phase was first defined (as a focus) by Lewis and Kneberg in *The Prehistory of the Chickamauga Basin in Tennessee -A Preview* (1941) and was later elaborated on in their classic work *Hiwassee Island* (1946). Dallas was considered to follow Hiwassee Island culture. The characteristics of the Dallas culture were described in terms of community plan, subsistence, architecture, and burial customs, as well as other forms of material culture (Lewis and Kneberg 1946).

Though several more Dallas Phase sites have been investigated since then, Lewis and Kneberg's work remains the definitive source on Dallas (Polhemus 1987). More recently, Polhemus, in his report on investigations at Toqua, considers the term "Dallas phase" as referring to "a recognizable cultural entity, defined in fact by a unique combination of traits and relationships, found within the Ridge and Valley physiographic province during the time from the middle of the thirteenth century to the end of the sixteenth century" (Polhemus 1987).

The Dallas settlement pattern is characterized by the distribution of compact towns along major alluvial bottomland systems within the Valley and Ridge physiographic province. The majority of Dallas towns have a single substructure mound topped by a single primary structure, and only a few towns such as Toqua (40MR6) have more than one structure on a mound or more than one mound (Polhemus 1987). At least 50 archeological sites with Dallas components have been identified (Polhemus 1987).

Subsistence patterns during the Dallas phase are similar to those of other Mississippian groups. Deer, bear, and turkey form the predominant part of the faunal assemblage, along with a wide range of supplementary mammals, fishes, birds, and reptiles (Polhemus 1987). However, it was noted at Toqua that the remains of the most productive cuts of meat tended to be concentrated in high-status areas, implying differential access to food (Bogan and Polhemus 1978). In addition, certain species of birds and small animals were found in high-status burials, suggesting that these animals represented specific totems (Polhemus 1987).

The Mouse Creek focus was also originally defined by Lewis and Kneberg (1941, 1946) during their work in the 1930s in the Chickamauga Basin as a brief occupation dating to the fifteenth century (Kneberg 1952). More recently, radiocarbon dating has confirmed this chronological placement (Sullivan 1987).

According to Lewis and Kneberg (1946), the floors of Mouse Creek structures were excavated 18 to 24 inches below ground surface, and the walls were banked with clay. Mouse Creek communities were often palisaded and had large community structures but no substructure mounds. Pottery was shell tempered; in contrast to the Dallas ceramic assemblage, however, the occurrence of cord-marked surface treatments is minimal. The dead were buried in a fully extended position as opposed to the semiflexed position of Dallas burials (Lewis and Kneberg 1946).

The Mouse Creek ceramic assemblage resembles Dallas in that shell-tempered plain shards predominate, with virtually all the decorations and surface treatments found in the Dallas assemblage represented. However, the frequencies of cord-marked, fabric-marked, red-painted, and complicated- stamped surfaces sharply decrease, while the frequencies of plain and decorated (all motifs) increase. The number of grit-tempered shards, of all surface treatments, also increase (Qualla types). Salt pans, which are exclusively fabric-marked in the Hiwassee Island and Dallas assemblages, are predominantly plain with some fabric-marking. Shell-tempered Overkill check-stamped and complicated-stamped begin to show up in the Mouse Creek assemblage in contexts that are presumably late

prehistoric or early contact period. Further characteristics include the usage of strap and lug handles (cf. Lewis and Kneberg 1941, 1946; Kimball 1985).

The relationship between Mouse Creek and Dallas phases is unclear, though some evidence suggests that it is a transitional phase between Dallas and the Historic period (Schroedl 1986; Boyd 1984; Sullivan 1989). However, there is also some indication of contemporaneity, since it appears that the Dallas culture continued uninterrupted well into the Historic period in some areas such as Toqua (40MR6) (Polhemus 1987). Garrow (1975) on the other hand, has suggested that Mouse Creek sites served as "frontier" sites for the sixteenth century Barnett phase in northern Georgia. The spatial boundaries of the Mouse Creek phase are unclear, though it has been reported as occurring along the lower Hiwassee River and on the main channel of the Tennessee River in southeastern Tennessee (Sullivan 1987).

The lower Little Tennessee River Valley was occupied by the Overhill Cherokee during the Historic period (A.D. 1600 to A.D. 1838). The exact relationship between the Overhill and Dallas phases is still disputed, though Dickens (1976) considers them related and Kimball (1985) treats the Overhill Cherokee occupation of the Tellico Reservoir area as a terminal Mississippian complex. Polhemus, on the other hand, found a lack of continuity between the Dallas phase and Overhill phase occupations of Toqua (40MR6) (Polhemus 1987).

Extensive excavations have occurred at sites with Overhill components, including those at Tomotley (Baden 1983), Toqua (Polhemus 1987), and Chota-Tanasee (Schroedl 1986). Archeological investigations, though of a less intensive nature, have been conducted at Wear Bend (Chapman 1980b), Citico (Chapman and Newman 1979), Tuskegee (Guthe and Bistline 1978), and Mialoquo (Russ and Chapman 1983).

Overhill phase structures, as described during the eighteenth century, consisted of vertical-post construction with both summer and winter houses. Large town houses were constructed at major villages, which had a more dispersed settlement pattern in comparison to Dallas. In addition, Overhill communities were unpalisaded (Polhemus 1987).

Overhill ceramics are predominantly shell tempered with some grit and mixed tempers. Smooth- and scraped-surface treatments are most common, with stamped surfaces second in frequency. Cord marking is absent. No effigy wares exist in the Overhill assemblage, and incised decoration is rare, as is the presence of handles (those that do occur are plugged). Compared to Dallas ceramics, less variation in form occurs, with a tendency toward larger sizes, jars, both open and closed bowls, and pans (Polhemus 1987).

3.2.2.5 Exploration and Settlement

The land between Walden Ridge and the Clinch River was first opened to white settlers by treaty with the Cherokee Indians in 1798. The region had been trapped in the late

seventeenth and early eighteenth centuries by French and English "long hunters," who established trade relations with natives. The French tended to be most interested in Indian trade, while the English became focused on long-term settlement. The construction of Fort Loudon in 1756 on the Tellico River, about 15 miles from present-day Oak Ridge, communicated to the Cherokees and French alike that the English had come to stay. The English finally established claim to this area over the French when they won the French and Indian War in 1763.

In 1792, the region gained additional military strength when the American government established a military post, Fort Southwest Point, a mile from the community of Kingston. Located along a major stage route from Nashville to Washington and ideally situated on or near the Tennessee, Clinch, Emory, and Little Emory rivers, Kingston played a pivotal role in East Tennessee's development. Roane County, formed from neighboring Knox County, was established in 1801, with Kingston named as county seat.

In the early days of settlement, the valleys in the ORR area were sparsely populated and supported four small villages located in southern Anderson and northern Roane counties: Scarboro, Robertsville, Wheat, and Elza. These villages, inhabited by approximately 1000 families, served primarily as gathering centers and usually contained one or two churches and a general store.

The valleys were characterized by a scattering of small, self-sufficient farms with little expressed need for slavery. The pioneers who settled along Poplar Creek and on the banks of the Clinch River were farmers who grew just enough food and raised just enough livestock on which to subsist. Corn was the staple crop, but oats, wheat, and vegetables were also grown. Some farmers supplemented the family's income by light timbering until the woodstands were eventually depleted. Fruit orchards were cultivated at the turn of the nineteenth century, but overproduction devalued the crops and the endeavor never became as profitable as farmers had hoped. The sparsely settled region remained rural and agrarian throughout the nineteenth and early twentieth centuries. Industry did not come to the valley until 1942, when the Manhattan Project was begun.

Collins Roberts was the region's first settler, and in 1804 he acquired land grants totaling 4000 acres in what is now the center of Oak Ridge. This acreage, situated near the present-day Oak Ridge Mall, became the community of Robertsville and consisted of three or four stores, a school, a few churches, a blacksmith shop that operated as a grist mill on weekends, and a few farmsteads. Census records indicate a steady population growth throughout the nineteenth century. Because of the cold and sweet water at Cross Springs (near present-day Grove Center), Robertsville became a stopping point on the road from Clinton to Oliver Springs and Kingston. The community's sentiments lay strongly with the Union during the Civil War, and a trail was established at the crest of Walden Ridge to aid runaway slaves. Many churches existed in the area, and revivals became the center of community activity. Although most Robertsville inhabitants were farmers, a few worked in the nearby coal mines of the Cumberland Mountains.

Scarboro, founded in the early nineteenth century, was named for the Scarborough brothers who came to the area from Virginia in the early 1800s. The community was located along Bethel Valley Road near the former site of the Agricultural Research Laboratory of The University of Tennessee, Knoxville (UTK). There were three country stores in the valley, an elementary school, and four churches: Cumberland Presbyterian (which was also attended by members of the Wheat community), New Bethel Baptist, New Hope Baptist, and Mt. Vernon Methodist. New Bethel Baptist Church, the only remaining church of the Scarboro Community, is now maintained by DOE. The people of Scarboro, like other farming families in the valley, were subsistence farmers. Early family names include McCoy, Brimer, Ford, Harrell, and Freels (Jim Freels was among the last to evacuate the valley in 1942). The large Freels family was represented in almost all of the communities throughout the valley.

The beginnings of the community of Wheat existed even before Tennessee's entrance into the Union in 1796. Two eighteenth-century grist mills are known to have existed on Poplar Creek in the early days of settlement. Located in Roane County at the present ETTP and named for its first postmaster, Frank Wheat, the nineteenth century community became a thriving trade center. The community included a Methodist church, Mt. Zion Baptist Church, Cumberland Presbyterian Church, and George Jones Memorial Baptist Church (the only remaining extant building from the Wheat community). A 1942 inventory recorded a Masonic Lodge, Robinson's School, Wheat High School (formerly Roane College and Poplar Creek Seminary), Adam's Store, a post office, and several frame residences. A ferry also operated on the Clinch River at the site of Gallaher Bridge. The community was made up of farmers who grew tobacco and corn.

Born of the railroad, Elza is the youngest of pre-Oak Ridge communities. Located at the northern border of the ORR, the community was a flag stop along the Louisville and Nashville Railroad. Paul Elza was a construction engineer when the railroad constructed a bridge over the Clinch River and an underpass near Dossett. Lumber and materials for the projects were marked "Elza" and left at a shed near the tracks owned by Mr. Elza. Copeland's Country Store served the area, but a village was never established. Residents received their mail in Dossett.

While farming was the region's primary occupation, coal mining became an economic factor during the late 1800s. Coal is the region's most abundant natural resource, with the western third of Anderson County situated in the Cumberland coal fields (Jones 1987). As an outgrowth of the industrial revolution, groups of investors, hoping to capitalize on the abundant natural resources along the Cumberland Mountains, built company towns all along the mountain range (two of these, Rockwood and Harriman, are located in Roane County). Subsequently, many of the region's workers found employment in the coal fields.

3.2.2.6 The Tennessee Valley Authority

As were most areas in the United States, Anderson and Roane counties were hard hit by the Great Depression, perhaps more so due to their partial dependence on the coal

industry. An event that dramatically changed the region and greatly affected employment in the area was the creation in 1933 of TVA. The TVA legislative mandate was to solve many of the economic problems in the Tennessee River Watershed (including areas in seven states) through development of a multi-state plan that would involve the proper use, conservation, and development of Tennessee Valley natural resources. Within this context, the implementation of flood control and the production of inexpensive hydroelectric power were two of the major directives of the agency. As a result, TVA built a series of dams along the Tennessee River. The first project by this unique agency was construction of Norris Dam crossing the Clinch River in the northern tip of Anderson County. Built between 1933 and 1936, this dam resulted in the inundation of 34,000 acres of land in Anderson, Campbell, Claiborne, Grainger, and Union counties. The construction of Norris Dam and Watts Bar Dam (in 1939) had dramatic and far-reaching effects on the area as well as the entire Southeast.

Though dam construction brought beneficial results to the region, it was also a frustrating and enraging experience for those forced to leave farms owned and worked by the same families for generations. Dam construction displaced (relocated to comparable properties) thousands of land owners and flooded much of the region's arable river-bottom land (TVA acquired the easements to thousands of acres of land at an average price of $300 per acre). As one of President Franklin D. Roosevelt's New Deal programs, TVA's mission was twofold: to provide (1) work and (2) cheap electricity for a part of the country that had not yet embraced the industrial nature of the twentieth century.

It is ironic that Norris Dam, only six years after its construction, became a pivotal component of the decision to select the area for "Site X" of the top-secret Manhattan Project. Like dam construction, the selection of East Tennessee as part of the Manhattan Project brought benefits to the area while embittering many residents.

3.2.3 Traditional Lands and Resource Uses

No known traditional lands or resources are used by Native Americans or other ethnic groups on the ORR.

3.2.4 Treaties, Executive Orders, and Land Grants

No evidence now exists that any Native American groups retain legal rights to lands within the ORR.

The first involvement of the ORR with treaties occurred in 1791 with the Treaty of the Holston. The Cherokee surrendered lands from east of the Clinch River to a line from near Kingston to the North Carolina boundary.

The second treaty involving the ORR area was the First Treaty of Tellico, signed at the Tellico Blockhouse on October 2, 1798. In effect, this treaty ceded two tracts of land to the U.S. Government. The first tract was located between the Hawkins County line and the Tennessee and Little Tennessee River valleys, while the second tract, which

encompasses all or portions of the ORR, lay between the Clinch River and the eastern edge of the Cumberland Plateau.

The Third Treaty of Tellico (1805) encompassed a large tract of land including the Cumberland Plateau and the lands north of the Duck River to the Tennessee River in the western valley (Corlew 1981).

3.2.5 Recent Scientific Significance

Most DOE ORO properties in the Oak Ridge area are considered to be of recent scientific significance based on their association with the Manhattan Project, Cold War Era, and/or scientific achievements made at the facilities that have had widespread effects on the nation and the world.

3.2.5.1 Manhattan Project

On September 19, 1942, U.S. Army Corps of Engineers (Corps) Brigadier General Leslie R. Groves met with Colonel James Marshall, commander of the Manhattan Engineer District, to inspect the Clinch River Valley as a potential production site for the creation of a war-related atomic bomb. Termed the "Manhattan Project" in reference to the project's original New York City-based headquarters, the effort sought to initiate uranium fission research for potential weapons use before similar German experimentation occurred.

The U.S. interest in fission research was led by Eugene Wigner and Leo Szilard, Hungarian nuclear physicists who had immigrated to the United States. As a youngster, Wigner had witnessed Hungary's enfeebled monarchy overpowered by brutal communist and then fascist governments. From personal experience, Wigner developed an immutable enmity toward totalitarian regimes. When he learned in early 1939 that two German chemists had discovered nuclear fission in uranium, Wigner recognized that this discovery could lead to both weapons of mass destruction and abundant energy for mass consumption.

In July 1939, Wigner and Szilard enlisted the aid of Albert Einstein in approaching President Franklin D. Roosevelt. The following October, President Roosevelt appointed a committee of prominent scientists and government administrators to manage federally funded scientific research. Wigner, Szilard, and Edward Teller met with committee members and requested $6000 to purchase graphite for fission experiments. They listened as an Army officer expounded at length upon his theory that civilian and troop morale, not experimental weapons, won wars. Szilard later recalled that "suddenly Wigner, the most polite of us, interrupted him. He said in his high-pitched voice that it was very interesting for him to hear this, and if this is correct, perhaps one should take a second look at the budget of the Army, and maybe the budget should be cut." The officer, a committee member, glared in silence at Wigner. The committee then agreed to provide $6000 for uranium fission experimentation.

The bombing of Pearl Harbor by the Japanese in December of 1941 provided the United States with an additional incentive to develop an atomic weapon; and on December 8 of that year, Arthur Compton, a Nobel Laureate at the University of Chicago, contacted Wigner to discuss the possibility of consolidating nationwide plutonium research efforts in Chicago. At meetings conducted in January 1942, Compton brought together scientists experimenting with nuclear chain reactions at Princeton and Columbia universities with that investigating plutonium chemistry at the University of California to outline the plutonium project's objectives. Compton's schedule called for determining the feasibility of a nuclear chain reaction by July 1942, achieving the first self-sustaining chain reaction by January 1943, extracting the first plutonium from irradiated uranium-238 by January 1944, and producing the first atomic bomb by January 1945. In the end, all of these deadlines were met except the last, which occurred six months later than planned.

To accomplish these objectives, Compton formed a "Metallurgical Laboratory" as cover at the University of Chicago and brought scientists from the East and West coasts to this central location to develop chain-reacting "piles" for plutonium production, devise methods for extracting plutonium from the irradiated uranium, and design a weapon. Remaining in charge of the overall project, Compton selected Richard Doan as director of the University of Chicago Metallurgical Laboratory (Metallurgical Laboratory).

Compton also placed Glenn Seaborg in charge of the research on plutonium chemistry and assigned him the task of devising methods to separate plutonium from irradiated uranium in quantities sufficient for bomb production. To coordinate the theoretical and experimental phases of research associated with a chain reaction, Compton chose Wigner, Enrico Fermi, and Samuel Allison. Fermi continued his experiments with ever larger piles of, uranium and graphite. Samuel Allison directed a cyclotron group which included Canadian Arthur Snell, a scientist who assessed nuclear activities in uranium and graphite piles. Wigner and Snell later joined the X-10 (ORNL) staff.

Wigner headed the theoretical physics group which was crowded into Eckart Hall on the University of Chicago campus. His "brain trust" of 20 scientists studied the arrangement, or lattice, of uranium and control materials for achieving a chain reaction and planned the design of nuclear reactors.

Having a chemical engineering background, Wigner also offered advice to Glenn Seaborg and his staff of University of California chemists who were seeking to separate traces of plutonium from uranium irradiated in cyclotrons. This task was particularly challenging because to that point no one had isolated even a visible speck of plutonium. By September 1942, the team had obtained a few micrograms of plutonium for experimentation but needed much more for additional analyses.

In 1942, Compton brought Martin Whitaker, a North Carolinian who chaired New York University's physics department, to Chicago to help Enrico Fermi and Walter Zinn build suberitical uranium and graphite piles. He later put Whitaker in charge of a laboratory under construction in the Argonne forest preserve on Chicago's southwest side. It was here that Compton initially planned to bring the first nuclear pile to critical mass. A strike

by construction workers, however, prevented the laboratory's timely completion. As a result, Compton and Fermi decided to build a graphite pile housed in a squash court under the stands of the University of Chicago's stadium. Leo Szilard, and later Norman Hilberry, was placed in charge of supplying materials for the pile experiments. They obtained impurity-free graphite from the National Carbon Company in Cleveland, Ohio, and the purest uranium metal available from Frank Spedding's research team at Ames, Iowa. George Boyd and chemists at Chicago analyzed the materials to ensure the absence of impurities that might interfere with a nuclear reaction. Fermi and his colleagues then put the materials into a series of subcritical uranium and graphite piles built in what was to become the world's most famous squash court. Fermi called them piles because, as the name implies, they were stacks or piles of graphite blocks with lumps of uranium interspersed between them in specific lattice arrangements. Uranium formed the core or source of neutrons, and graphite served as a moderator, slowing the neutrons to facilitate nuclear fission. In truth, the piles were small, subcritical nuclear reactors cooled by air, but the name reactor did not replace pile until 1952. Fermi gradually built larger subcritical piles, carefully measuring and recording neutron activity within them, edging toward the point at which the pile would reach "critical mass" and the reaction would be self-sustaining.

On December 2, 1942, Fermi, Whitaker, and Zinn piled tons of graphite and uranium on the squash court to demonstrate a controlled nuclear reaction for visiting dignitaries standing on a balcony. Controlling the reaction with a rod coated with cadmium, a neutron absorbing material, Fermi directed the phased withdrawal of the rod, carefully monitoring the increased neutron flux within the pile. The pile went "critical," achieving self-sustaining status at 3:20 p.m., an event later hailed as the dawn of the Atomic Age.

Also in 1942, scientists who had fled Hitler's Europe in the 1930s joined British, Canadian, and American scientists to work on the Manhattan Project. Several processes for separating fissionable material were developed by different laboratories at universities across the country. The processes included the following:

- electromagnetic separation;
- centrifugal separation;
- thermal diffusion
- gaseous diffusion (separating uranium-235 from the heavier uranium-238)
- production of plutonium by a uranium chain reaction in enriched piles of graphite or heavy water

Few scientists were sure which method would produce the amount of material needed to create enough energy to explode a bomb. They recognized the importance of choosing the most efficient and the most likely methods, as the wrong choices could have caused American scientists to fall behind the progress of German and Soviet scientists. Ultimately, it was General Groves who decided that electromagnetic separation and gaseous diffusion would be developed, since these were the most productive methods of separating uranium. Groves also decided that the extraction of plutonium from uranium was to be carried out using a graphite reactor (as an atomic pile came to be called).

As the Metallurgical Laboratory's research continued, studies began of potential sites for the planned industrial-scale uranium separation plants and pilot plutonium production and separation facilities. An isolated inland site with plenty of water and abundant electric power was desired.

At the recommendation of the War Production Board, Thomas Moore (Compton's chief of engineering) and two consulting engineers visited East Tennessee in April 1942. They found a desirable site bordering the Clinch River between the small towns of Clinton and Kingston that was served by two railroads and TVA electric power. Arthur Compton then inspected the site, approved it, and visited David Lilienthal, chairman of TVA, to describe the unfolding plans to purchase the land.

Lilienthal was dismayed by news that land near Clinton would be taken. Lilienthal objected to the site because it included land selected for an agricultural improvement program and proposed instead that Compton choose a site in western Kentucky near Paducah. Compton refused to consider Lilienthal's proposal and advised him that the land in East Tennessee would be taken through court action for immediate use. He urged Lilienthal not to question his judgement or inquire into the reasons for the purchase. "It was a bad precedent," Lilienthal later complained. "That particular site was not essential; another involving far less disruption in people's lives would have served as well, but arbitrary bureaucracy, made doubly powerful by military secrecy, had its way."

In June 1942, President Roosevelt assigned the Army the management of uranium and plutonium plant construction and nuclear weapons production. High-ranking Army officials, in turn, delegated this duty to Colonel James Marshall of the Corps. Because Fermi at this point had not yet achieved a self-sustaining chain reaction, Marshall and Army authorities postponed their efforts to acquire the land. The delay disturbed some scientists because they were eager not to lose ground to the Germans. It also perturbed the hard-driving deputy chief of the Corps, General Groves.

During the summer and fall of 1942, while scientists were thoroughly debating which methods to pursue in developing an atomic bomb, the Corps turned its attention to selecting and developing a construction site for the production plants that would be appropriate for whichever methods were ultimately chosen. One of the first decisions involved choosing a contractor, and in June 1942, the Corps selected Stone and Webster Engineering Corporation as the principal contractor for the entire project (Hewlett and Anderson 1962). Various individual components of the project would be let to other firms; for instance, the firm of Skidmore, Owings and Merrill of Boston was selected to develop plans for the Oak Ridge Townsite.

On August 16, 1942, a new Corps district-the Manhattan Engineer District-was formally established (Jones 1985). However, this district broke tradition in that it had no geographic boundaries but was rather bounded by the common theme of producing an atomic bomb. Taking its name from the Corps designation, the project soon became

known as the Manhattan Project. In general terms, the Manhattan Engineer District was a national district with facilities scattered across the United States.

Given full command of the Manhattan Project in September 1942, General Groves ordered on September 19, 1942, the immediate purchase of the area now known as the Oak Ridge Reservation, which was first given the code name "Kingston Demolition Range" after the town southwest of the ORR but was later renamed the "Clinton Engineering Works" after the town to its northeast. The Army sent an affable Kentuckian, Fred Morgan, to open a real estate office near the site and purchase the land through court condemnation, thereby securing clear title for its immediate use. About 1000 families on the ORR were paid for their land and forced to relocate. Existing structures were demolished or converted to war related uses.

Accustomed to dealing with TVA, farmers were faced with offers of approximately $34.26 per acre in Roane County and approximately $44.10 per acre in Anderson County. The Army's condemnation procedures did not include relocation expenses and required that land owners not be compensated until the property had been vacated. Often compensation arrived six months following property condemnation. The Army moved swiftly, with some residents receiving only a two-week notice of eviction.

Unlike TVA, whose purpose was the social and economic uplifting of people who lived in the Tennessee Valley, the Army's objective was to manufacture an atomic bomb and thereby end World War II as quickly as possible. The Army's greatest fear, not unfounded, was that Hitler's scientists were already far ahead of American and British scientists in their atomic quest. The Army was involved in a scientific race that they were not certain they could win and operated under a different set of priorities than TVA.

Between October 1942 and March 1943, the Corps purchased a total of 866 tracts of land (approximately 56,000 acres) in Anderson and Roane counties. The ORR would eventually encompass 58,574.97 acres of land with an acquisition cost of $2.6 million. In 1943, Tennessee Governor Prentiss Cooper declined to cede sovereignty over the land to the federal government, perhaps in part because of the amount of state land already lost to TVA and the Great Smoky Mountain National Park and perhaps disturbed over the secrecy of the project and the absence of coordination with state officials. Thus, this area was not legally a military reservation but rather a militarily restricted area (Robinson 1950).

The Manhattan Engineer District, eventually headquartered in Oak Ridge, was intended to be an organizational district within the Corps. This arrangement allowed the Corps to efficiently oversee the operation of the atomic weapons program while restricting knowledge of the program to a few individuals. The mission of the Manhattan Project was to produce an atomic weapon that could end the war by 1945. The three-year task was in retrospect called by Engineering New Record (December 13, 1945) "the equivalent of building a Panama Canal each year" (Robinson 1950). Three key areas were pivotal to the project's success: (1) the plutonium plant in Hanford, Washington, code-named "Site W"; (2) the headquarters and production plant site near Clinton,

Tennessee (the Clinton Engineer Works), code-named "Site X" and containing the four components of Townsite (present-day city of Oak Ridge), X-10 (present-day ORNL), K-25 (present-day ETTP), and Y-12; and (3) a weapons research center at Los Alamos, New Mexico, code-named "Site Y."

All three Manhattan Project sites were highly secure and surrounded by guarded fences and gates. The immense area of Hanford (780 square miles) mandated that only the individual reactor sites be fenced and controlled. The townsites at Los Alamos and Oak Ridge, on the other hand, were located within the government reservations and for this reason were tightly controlled. The location of Los Alamos atop a mesa provided an effective natural boundary that was nonetheless fortified by a guarded fence. The townsite at Oak Ridge probably tolerated the strictest security measures of the three cities. Because it was located in the far more densely populated eastern United States and because of its proximity to the cities of Knoxville and Clinton, Oak Ridge was more securely controlled than Hanford and Los Alamos.

3.2.5.1.1 Los Alamos, New Mexico, "Site Y"

Even as the land was being purchased in Tennessee for "Site X," the Corps began its search for a site in which the bomb would be assembled, a facility code-named "Site Y." Unlike the ORR or Hanford, which were production sites to deliver raw material, Site Y was a scientific center designed to coordinate the weapons program. The task of those working at Los Alamos was to design and assemble a bomb or bombs using the enriched uranium and plutonium produced at the ORR and Hanford.

Throughout 1942 there were discussions on how to coordinate the military applications of an atomic bomb. Dr. J. Robert Oppenheimer, a Berkeley professor who spearheaded construction of the bomb, proposed that the scientists work together in a single facility where theoretical and experimental work could be done rather than continuing to conduct their research at individual universities. For security reasons, Oppenheimer suggested that the bomb laboratory be located secretly in an isolated area so that the scientists could freely exchange ideas (Gosling 1990). This *free flow-of-ideas* approach was radically different from the *need-to-know* approach that permeated Hanford and the ORR. The associate director at Los Alamos was Enrico Fermi.

General Groves approved this approach, and he and Oppenheimer developed site criteria. The criteria dictated that the site be surrounded by hills in a thinly settled area of the southwest where a community of 250-400 persons could live in isolation. It also had to meet the basic generic requirements of the U.S. Army, which included good rail and motor transportation, adequate water, isolated areas for testing, and a climate suitable for year round construction. Corps personnel evaluated several sites (visiting some on horseback) and narrowed the study area to the Santa Fe region. Jemez Springs, the first site shown to General Groves and Oppenheimer, was rejected by both.

The 790-acre Los Alamos Ranch School for Boys sat on a mesa overlooking the upper Rio Grande Valley. The campus, comprised of 50 log and stone buildings, adjoined

45,000 acres owned by the U.S. Forest Service, land easily obtained through federal transfer agreements. The site pleased Oppenheimer, and the only fault General Groves found was an inadequate road (later rebuilt as part of the project) leading to the facility. This site of about 54,000 acres was thus acquired with few problems (Jones 1985).

3.2.5.1.2 Hanford, Washington, “Site W”

Like Oak Ridge, the Hanford Reservation was located in a remote and sparsely populated region along the Columbia River. The Hanford Reservation was constructed on 500,000 acres of desert in the southeastern section of Washington. Originally, General Groves had planned to locate the electromagnetic separation plants and a gaseous diffusion plant at the Oak Ridge site, where the ridges and valleys formed natural barriers between the plants. However, in the project's early months, he realized that plutonium production "would proceed at such a scale and generate so vast a quantity of potentially dangerous radioactivity that it would require a separate reservation of its own." Hence the designation of Hanford, Washington, as the plutonium production facility (Rhodes 1986). The uranium refined at Oak Ridge and the plutonium manufactured at Hanford fueled the world's first atomic bombs, which were designed and assembled at the Los Alamos laboratory.

3.2.5.1.3 Oak Ridge, Tennessee, “Site X”

Site X in East Tennessee was easily the most complex of the three Manhattan Project sites. The facilities constructed at Oak Ridge included the nuclear reactor (X-10), the electromagnetic separation facility (Y-12), and the gaseous diffusion plant (K-25). The world's first graphite reactor (code-named X-10) was built on the ORR to produce plutonium. The enriched uranium produced through diffusion and separation at Oak Ridge fueled the world's first atomic bomb, which was dropped on Hiroshima on August 6, 1945.

When the government began buying land in East Tennessee in the fall of 1942, the area encompassing what is now the ORR was code-named the Kingston Demolition Range. The site was renamed the Clinton Engineer Works in 1943. An atomic pile was begun in February 1943 and was arbitrarily named X-10. X-10, now ORNL, was operated by the Metallurgical Laboratory of the University of Chicago until July 1, 1945, when the Monsanto Chemical Company of St. Louis (Monsanto) assumed control. X-10 served as a model for the atomic pile at the Hanford Site. The giant electromagnetic plant, operated by Tennessee Eastman Corporation, was also begun in February of 1943 and was designated Y-12. Construction of the gaseous diffusion plant, to be operated by Carbide and Carbon Chemicals Corporation (Union Carbide), was begun in the fall of 1943. The gaseous diffusion plant's code name of K-25 was derived from the name of the designer, the Kellex Corporation. The number 25 was a common nickname for uranium-235 and was added arbitrarily. Local tradition holds that the code names X-10, K-25, and Y-12 were named for fictitious map coordinates and were meant to confuse enemy spies.

The Oak Ridge site was ideal because of its rural isolation, minimizing public awareness and preventing potential air attack from enemy aircraft. The ridge-and-valley system provided natural barriers between the facilities and the Townsite. The valley was accessible by both highway and railroad, amply providing for transportation needs. The site's location in the South was favorable for two reasons: (1) land needed for project development could be purchased at very low Depression prices and (2) the region contained an abundant supply of recruitable nonfarm labor in the region.

The ORR would ultimately expand to 58,574.97 acres covering an area 17 miles long and 7 miles wide. The entire site (approximately 92 square miles) was enclosed by a barbed-wire fence and was heavily guarded with seven gates and three checking stations. The gates secured the outer perimeter of the ORR, while the checking stations provided monitored access between the facilities and the Townsite. The Townsite was located on the southern slopes of Black Oak Ridge approximately 10 miles northeast of K-25. X-10 and Y-12 were built in narrow valleys separated from the Townsite by two ridges. The topography that had isolated the native farmers from the events of the early twentieth century now isolated one of the century's greatest scientific and military endeavors from the rest of the world.

ORR security was a joint endeavor between military and civilian forces. Each plant was managed by a private corporation (e.g., Union Carbide and Tennessee Eastman) that provided its own security forces. Roane-Anderson Company guards protected the project administration area, and the perimeter gates and checking stations were manned by military police. By 1945, 4900 civilian guards, 740 military policemen, and over 400 civilian policemen guarded the secret city (while comparable southern communities had a ratio of 1.6 police officers per 1000 inhabitants, the ORR had a ratio of 14 officers per 1000 inhabitants). Roadblocks were set up often to ensure that individuals were where they were supposed to be. Every resident 12 years and older was required to wear a badge denoting the status of the individual. Most plant employees worked under a "need-to-know" clearance.

At the start of the Manhattan Project in 1942, $54 million was earmarked for the project. The ultimate cost of the Manhattan Project in Oak Ridge alone was about $1,106,393,000 of the total two-billion-dollar project budget. The two billion dollars supported the construction of sites in three states as well as research at universities across the country. Since not even Congress knew about the top-secret project, President Roosevelt allocated funds through hidden pockets in the federal budget.

The need for safe plutonium and uranium separation challenged chemical engineers to design, fabricate, and test equipment for remotely transferring and evaporating liquids, dissolving and separating solids, and handling toxic gases. Instrumentation was needed for remote measurements of volumes, densities, and temperatures in a hazardous environment. Techniques to separate microscopic amounts of radioactive elements from volumes of liquid thousands of times larger had to be invented. The unknown effects of intense radiation on the solvents had to be identified and handled. Disposal of contaminated equipment and unprecedented volumes of radioactive wastes had to be

addressed. These were but a few of the difficulties facing scientists in Oak Ridge, particularly during the autumn of 1943 at the X-10 Site.

The separation of uranium through the gaseous diffusion process took place at the ETTP. The process of gaseous diffusion was developed expressly for the purpose of manufacturing an atomic weapon. Designed by the Kellex Corporation, a unit of M. W. Kellogg Corporation of New York City, construction of the K-25 Site began in September 1943. The chief construction contractor was the J. A. Jones Construction Company of Charlotte, North Carolina. In April 1944, Union Carbide assumed overall management of the gaseous diffusion barrier development and production program. In January 1945, the first gaseous diffusion cascade equipment became operational using uranium hexafluoride. On February 21, 1945 the first enriched uranium was extracted from the K-25 cascade, and on March 19, 1945, the first enriched uranium was shipped from K-25 to Y-12. The cascade reached full operation status on August 15, 1945 and consumed approximately 10 percent of the electrical power in the United States. A second gaseous diffusion process, Building K-27, was built and began full operation in December 1945. These buildings were connected by piping and the cascade was thus lengthened. The K-25 Building is the U-shaped building covering approximately 44 acres. Each side of the building measures 2450 feet long and averages 400 feet wide. At one time, the K-25 Building was the largest building under one roof in the world. K-25 and K-27 were build of reinforced concrete with steel frame and cemesto siding. A third processing plant, Building K-29, was completed in 1951 at a cost of $65,000,000. Construction of the K-31 Building was also completed in November 1954. The main plant area eventually contained more than 70 support buildings.

The Y-12 Plant was a uranium processing plant that utilized the electromagnetic separation process to enrich uranium. The electromagnetic process involves the ionization of uranium particles and the acceleration of these particles in a mass spectrometer. The stream of particles is bent by an electromagnet in an almost absolute vacuum. Uranium-235 separates from uranium-238 in an arc that has a smaller radius and thus can be "captured" and stored separately. Stone and Webster designed and built the Y-12 Plant at a cost of $427,000,000, and production began in January 1944. The Y-12 Plant was operated by Tennessee Eastman Corporation, a subsidiary of Eastman Kodak. The original plant contained 170 buildings and covered 500 acres. The electromagnetic plant was the first and only one of its kind in the world.

The pumps needed to create the nearly perfect vacuum for the electromagnetic separation process were of a higher speed and lower pressure than any previously developed. The vacuum produced by the pumps was 30,000,000 times that commonly used in power plants. The magnets used, nearly 100 times larger than any magnet previously built, were 230 feet long and were so strong that the pull on the nails in shoes made it difficult for workers to walk. Fourteen thousand tons (worth $400,000,000) of silver was borrowed from the U.S. Treasury to replace unavailable copper needed for the many magnets. There was no time even to construct a pilot plant that could test the methods of electromagnetic separation, making the Y-12 Plant one of the biggest gambles in history. The equipment was manufactured by General Electric, Westinghouse,

and Allis-Chalmers, and the enormous amount of electricity required for the plant's operation was produced by TVA. The materials required to build the plant included 275,000 cubic yards of concrete and 37,562,000 board feet of lumber.

Construction of the X-10 Site's graphite pile (Graphite Reactor) and six hot cells (Chemical Separations Plant now referred to as the Radiochemical Processing Pilot Plant) was begun in March of 1943 by E. I. Du Pont de Nemours and Company (Du Pont). The cells had thick concrete walls with removable slab tops for equipment replacement. The cell nearest the graphite pile housed a tank for dissolving uranium brought from the pile through an underground canal; four other cells housed equipment for successive chemical treatment of the uranium-precipitation, oxidation, and reduction; a sixth cell stored contaminated equipment removed from the other cells. An adjoining frame structure housed the remote operating gallery and offices. Other structures built at X-10 housed chemistry, physics, and health physics laboratories; machine and instrument shops; warehouses; and administrative buildings. Including the smallest structures, about 150 buildings were completed during the summer of 1943 by 3000 construction workers, at an initial cost of $12 million.

Atomic fission producing plutonium occurs when naturally occurring uranium is placed in tubes running in different geometric designs through a solid mass of graphite, called a pile. The pile slows down neutrons and permits them to split the uranium atoms rather than being absorbed, thus creating a chain reaction. The graphite pile "went critical" on November 4, 1943. As Wigner and Alvin Weinberg at Chicago had predicted during the design phase, the pile went critical when about half of its 1248 channels were loaded. Near the end of November 1943, it discharged the first uranium slugs for chemical separation. By year's end, chemists had successfully extracted 1.54 mg of plutonium from the slugs and dispatched them to Chicago, by secret courier, in a container resembling a penlight. Blocking empty channels in the graphite (to concentrate the cooling air) allowed an increase in the pile's thermal power to 1800 kilowatts in early 1944. Subsequent air-flow modification, plus the installation of larger fans for cooling, permitted its operation at more than 4000 kilowatts, nearly four times the original design capacity, resulting in a corresponding increase in plutonium production. Noted for its reliability, the Graphite Reactor at X-10 worked with few operational difficulties throughout 20 years of service.

3.2.5.1.3 Bomb Production

By April 1945, production at all three plants at the ORR, and at Hanford, was going very well. At Los Alamos, the scientists had always been confident that a uranium gun would work, and progress was being made on placing the uranium-235 from the ORR within such a weapon. Work on an implosion device that could use the plutonium from Hanford was not going well in the spring of 1945 but was beginning to look better by June of that year.

In the meantime, scientists at Los Alamos could not be certain that the implosion device designed for the plutonium from Hanford (the so-called "Fat Man") would work and therefore decided to test the device. Oppenheimer, inspired by the poems of John

Donne, named the test "Trinity." The test was held on July 16, 1945, within a barren area of the Alamogordo Bombing Range known as "Journey of Death," 210 miles south of Los Alamos (Gosling 1990). Project leaders stationed themselves at different areas in case of an accident, but the test was an unqualified success with an explosion far more devastating than scientists had anticipated. The scientists were relatively confident about the uranium bomb ("Little Boy") made from ORR-enriched uranium-235 and did not stage tests for it.

As work on the bombs neared completion, leaders within the project knew that they likely had two bombs for use as early as August 1945, but controversy ensued as to whether or not to use them. Many of the project scientists, including some at the University of Chicago who initiated a petition drive (Johnson and Jackson 1981), urged that it not be used, arguing that it preempted the United States from being perceived as a moral leader of the world and that using it would precipitate a worldwide arms race. They pointed out that Japan had been essentially beaten and should be given a clear opportunity to surrender. This group of people, including civilians associated with the project, urged that one of the bombs be dropped for demonstration purposes. They further argued that since the U.S. Navy was credited with winning World War II in the Pacific against Japan, the U.S. Army was jealously pushing for use of the bombs. It also seemed clear that, regardless of other motivations, political and military leaders wanted to use the bomb to establish U.S. military superiority as a means of intimidating Russia as Europe was being partitioned. Those opposed to using the bomb on Japan further argued that racial prejudice against Asians was a motivation.

The other side countered with its own argument, insisting that since many of the leading scientists had been persecuted by Hitler, they would gladly have used the atomic bomb against Hitler had the technology been developed in time. Proponents also argued that either of the bombs might not detonate in a demonstration test and that, with only two bombs, each was essential for direct military use. They also pointed to Japan's historical unwillingness to surrender even when defeated. Their most potent argument, however, was that dropping the bomb might save thousands (if not hundreds of thousands) of lives that would be lost in a land invasion. The feeling also existed among many people that using the bomb would give the United States an edge in negotiations with Russia after World War II.

The Trinity Test was conducted while the Allied leaders met at Potsdam to discuss plans for post-World War II Europe. After learning of the results of the Trinity Test and considering their options, President Truman and British Prime Minister Attlee issued a statement from Potsdam urging the Japanese to surrender or face utter devastation of their homeland. Although the civilian population and the government wanted to accept this offer, the Japanese military refused, in large part because the terms left the Emperors status unclear (Gosling 1990). In a July 28, 1945, statement, the Japanese prime minister publicly rejected the Potsdam statement.

After Japan's refusal to surrender, the United States decided to proceed with dropping the atomic bomb. Although the U.S. Army and both bombs were ready by August 1, bad

weather delayed the flight until August 6, 1945. On that day the Enola Gay took off from Tinian Base in the Marianas carrying the "Little Boy" bomb-the untested uranium-gun bomb made from uranium-235 enriched at the K-25 and Y-12 plants-and dropped it on Hiroshima. The bomb immediately killed nearly 100,000 people and fatally injured an equal number, leaving the city a 5-square-mile pile of rubble (Gosling 1990).

Within hours, President Truman released another statement warning the Japanese that if they refused to surrender unconditionally, the United States would continue bombing. The Japanese military staunchly refused to surrender, and two days later (on August 8) the Red Army invaded Manchuria. The following day (August 9, 1945) the Americans dropped a second bomb. The U.S. Army had intended to drop the bomb on Kokura Arsenal, but unacceptable weather conditions eliminated that target. After three passes over Kokura, the pilot, running low on fuel, switched to his secondary target, Nagasaki, home of the Mitsubishi plant that had manufactured the torpedoes used against the United States at Pearl Harbor. After dropping the "Fat Man" bomb, the implosion device made with plutonium from Hanford, the pilot headed to Okinawa, where he was forced to make an emergency landing due to low fuel (Gosling 1990). The death rate was comparable to that of Hiroshima, but the physical devastation to the city was less due to the steep hills surrounding Nagasaki. Even after this, the military objected to unconditional surrender; however, after the personal intervention of the Emperor, Japan surrendered on August 14, 1945. The formal act of surrender took place on September 2, 1945.

People all over the country, but especially in East Tennessee, were surprised at the announcement that the work in Oak Ridge was connected with the bomb dropped on Hiroshima. Many Oak Ridge workers learned the nature of their work from a radio broadcast shortly after the bombing. So ended the Manhattan Project's efforts to produce atomic weapons for use in World War II.

3.2.5.2 Oak Ridge, Tennessee – The Postwar Era to Present

Many Oak Ridgers were unsure of the city's future at the end of the war. Shortly after V-J Day, Congress was expected to make a decision on postwar plans to develop and control nuclear energy. The city that had been planned to last only for the duration of the war was informed that operations would continue on the ORR in a different peacetime capacity. This announcement, made three weeks after the Japanese surrendered, launched the ORR into becoming a permanent nuclear and scientific research facility.

The change in the status of Oak Ridge from temporary to permanent is significant for two reasons: the Army recognized for the first time that the ORR had a future beyond the duration of the war, and the Army also recognized the uneasiness this change caused the employees of the Manhattan Project. The easing of this tension caused by uncertainty became a major concern for the Corps in the years following the war.

Feeding the postwar fears of many Oak Ridgers was the apparent lack of decisive action on the part of the U.S. Congress in dealing with nuclear development. General Groves and other military advisers testified at hearings in the House of Representatives

that only government control of atomic energy could prevent its misuse. Scientists at the Manhattan Project laboratories, including those at Oak Ridge, felt that government control was "tolerable during war but was unacceptable during peacetime when free scientific interchange should be resumed" (Gosling 1990). Following the Japanese surrender, an entire year of tedious and indecisive deliberations passed before the Atomic Energy Act became law in August 1946. The most important aspect of the Act was the transfer of America's atomic research from military to civilian control with the creation of the Atomic Energy Commission (AEC). The Manhattan Engineer District was discontinued, and the AEC assumed the responsibilities of postwar atomic research on January 1, 1947.

During this period, Oak Ridgers were plagued by continuous and often ominous rumors concerning the future of the city. The transition of the ORR from military to civilian authority did not assuage many fears. The fears and rumors that swept through Oak Ridge in 1946 were evidenced by the decline in population. Operations peaked in 1945 with 82,000 people employed on the ORR and 75,000 people living in Oak Ridge. By November 1945, just three months after the bombing of Hiroshima, employment at Oak Ridge had fallen to 51,000, and the population had plunged to 52,000. The work force dropped to 34,000 by June 1946, and the community population stood at 43,000. By 1950, the population of Oak Ridge had shrunk to 30,205, although the community maintained its standing as the fifth largest city in Tennessee.

3.2.5.2.1 Oak Ridge National Laboratory

Winning the war left the staff of Clinton Laboratories with both a pride in their accomplishment and a sense of anxiety. Their prime task of guiding the Hanford facility in producing and separating plutonium for use in an atomic bomb had been accomplished on schedule. With this task successfully completed, however, the future looked uncertain. Could the research facility be as useful and productive in peace as it had been in war? Would its scientists be content to remain in the hills of East Tennessee, or would they opt to return to more cosmopolitan settings in Chicago, New York, and California? Would the federal government be willing to invest as much money in the peaceful uses of nuclear energy as it had in weapons production?

High-flux conditions prevailed at Clinton Laboratories after the war, when surprising decisions affecting the facility's future were made in St. Louis, Chicago, and Washington D.C. In Oak Ridge, the contract with Monsanto, the industrial operator for Clinton Laboratories, was not renewed. The University of Chicago, the proposed academic operator, failed to assemble a management team, resulting in the selection of a new industrial contractor, Union Carbide Corporation. Clinton Laboratories became Clinton National Laboratory in 1947 and Oak Ridge National Laboratory in 1948. Change was the watchword in the tumultuous postwar period, as one unexpected event followed another.

Despite management uncertainties and fluctuations, solid accomplishments in science and technology were achieved. Under the leadership of Eugene Wigner, Clinton Laboratories

designed a high-flux Materials Testing Reactor, the precursor of all modem light-water reactors, and experimented with the Daniels Pile, a forerunner of high-temperature gas-cooled reactors. The first of thousands of radioisotope shipments left Clinton Laboratories in 1946, initiating a program of immense value to medical, biological, and industrial science. New organizational units were formed to study biology, metallurgy, and health physics, and several solid scientific accomplishments were recorded in these fields before the departures of Wigner and Monsanto.

Management fluctuations proved a source of anxiety and despair among staff members during the 1947 Christmas season. By the start of the New Year in 1948, however, crucial management decisions ensured the survival of the facility, which was given a much broader mandate for fundamental science than it had during the war.

During the war, security concerns required officials to refer to Clinton Laboratories by its code name, X-10. The personnel of Monsanto (operating contractor at that time) continued this practice in the postwar years. The remote Appalachian location of Clinton Laboratories, along with unpaved streets and spartan living conditions, presented an easy target for ridicule. Metallurgical Laboratory personnel called X-10 "Down Under," while Du Pont personnel labeled it the "Gopher Training School." In official telegrams, Monsanto's staff referred to Oak Ridge as "Dogpatch," taking their cut from Li'l Abner, a popular comic strip lampooning "hillbilly" Appalachian life. Such ill-concealed scorn did not bode well for postwar Monsanto administration or research at the facility.

The choice of Monsanto as contract operator of Clinton Laboratories seemed logical because of the Laboratories' focus on chemistry and chemical technology. Monsanto was also interested in becoming a key player in nuclear reactor development. Charles Thomas, Monsanto's vice president, was the driving force behind the company's entry into nuclear science. A famous chemist, Thomas had established a laboratory at Dayton, Ohio, that Monsanto purchased in 1936, making it the company's central research laboratory.

In 1943, General Groves gave Thomas and Monsanto responsibility for fabricating nuclear triggers at the Dayton laboratory. When Thomas also agreed to supervise the operation of Clinton Laboratories in 1945, he merged both facilities into a single project and appointed himself project director, although he kept his main office at Monsanto's corporate headquarters in St. Louis.

In 1947, under Monsanto's management, Clinton Laboratories employed 2141 workers, making building expansion imperative. A moratorium on new construction during 1946 and 1947, while the facility's future was debated in Washington, caused personnel and equipment to be moved into empty buildings at the Y-12 Plant, which was shifting its focus from the electromagnetic separation of uranium-235 to precision machining of weapons components.

Expecting Clinton Laboratories to build the nation's first peacetime research reactor and the first electric-power-generating reactor, Thomas courted Eugene Wigner, bringing

him from Princeton to Oak Ridge several times during late 1945 to conduct seminars and to consult on reactor designs. In early 1946, he lured Wigner into a year's leave from Princeton University to become Clinton Laboratories' research and development director by promising to relieve him of administrative duties, which Thomas assigned to James Lum. Wigner also acquired an assistant for the administration of research and development, Edgar Murphy, a scientist who had served as Army Major in the Manhattan Engineer District office during the war.

When his Princeton colleagues asked Wiper why he was going to "Dogpatch," he told them that, as one of the three major nuclear research laboratories in the United States, Clinton Laboratories would become important "in the life of the whole nation." As its research director, he intended to focus on science education by (1) developing research reactors suitable for use at universities, (2) establishing nuclear science training under his former graduate student Frederick Seitz, and (3) coordinating scientific research with universities *throughout* the South.

When Wiper arrived as research director, staff at Clinton Laboratories had begun designing new types of reactors. Researchers investigated the possibilities of developing a high-neutron-flux reactor for testing materials and a gas-cooled Daniels Pile for demonstrating the use of nuclear energy for electricity production. The Laboratories' chemists also initiated research aimed at a high-flux homogeneous reactor. Wiper devoted most of his attention to the high-flux reactor, subsequently renamed the Materials Testing Reactor. Its chief function was to bombard test materials with neutrons to determine which materials would be best for future reactors. A reactor designer's reactor, it provided the most intense neutron source at the time.

Initial designs called for use of enriched uranium fuel, heavy water in the interior lattice to moderate the neutrons, and ordinary (light) water to cool the exterior. Wigner and Alvin Weinberg, appointed by Wigner to be Lothar Nordheim's successor as chief of physics, concluded that use of heavy water could severely reduce the flux of very fast neutrons. Squeezing heavy water out of the reactor design, they selected ordinary water as both moderator and coolant. Instead of uranium rods canned in aluminum as in the Graphite Reactor, the fuel element or core would be uranium sandwiched between aluminum cladding and plates. To ensure a high thermal neutron flux for research, the plates were surrounded by a neutron reflector made of beryllium. In time, this design served as the prototype for many university research reactors and, in a sense, for all light-water reactors that later propelled naval craft and generated commercial power.

Wigner's best-known contribution was the curved design of the aluminum fuel plates in the reactor core. These plates were placed parallel to one another with narrow spaces between for the cooling water; the reactor's power was largely set by how much water flowed past the fuel plates. Concern arose that intense heat might warp the plates, bringing them in contact and restricting coolant flow. After pondering this potential problem, Wigner directed that the plates be warped, or curved, to improve their structural resistance to stress. Because warped plates could only bow in one direction, they would not constrict water flow.

Plans were made to construct a plant adjacent to the Materials Testing Reactor to reprocess spent nuclear fuel using the precipitation process developed during the war. In reprocessing, nuclear fuel is extracted from the spent fuel and separated from the accumulated fission products for reuse in reactors. Chemists John Swartout and Frank Steahly recommended that the "25 solvent-extraction Process" replace the more expensive precipitation process. Their recommendation was accepted. Solvent extraction (separation of one material from others dissolved in a single liquid by transferring it into another liquid that cannot mix with the first) eventually became the standard method worldwide for reprocessing spent nuclear fuel.

Distribution of the radioisotopes produced at the Graphite Reactor for biological and industrial research rapidly became the most publicized activity at Clinton Laboratories in the postwar years. Orders began arriving soon after Clinton Laboratories published a radioisotope catalogue in the June 1946 issue of *Science*, which listed isotopes the staff could prepare and ship. On August 2, 1946, Wigner stood in front of the Graphite Reactor to hand the first peacetime product of atomic energy, a small quantity of carbon-14, to Dr. E. V. Cowdry of the Barnard Free Skin and Cancer Hospital of St. Louis (Hewlett and Anderson 1962). Soon, nearly 50 different radioisotopes were regularly available for distribution. To handle isotope production and distribution, Logan Emlet of Operations established an Isotopes Section in 1947 headed by Arthur Rupp; as the program expanded, it later became the Isotopes Division, which was headed by Rupp and John Gillette, among others.

Just as the atom's nucleus captivated physical scientists, the living cell was the center of attention for life scientists. The Graphite Reactor supplied a variety of radioisotopes that helped bring about a revolution in the life and medical sciences by leading to a new understanding of metabolic processes and genetic activities. Developments in biological sciences and the need to better understand the effects of radiation on human health and the environment led Wigner to expand the biology and health physics organizations.

When John Wirth, head of the Health Division, returned to the National.Cancer Institute in September 1946, Wigner and Lum split the Health Division into two new research sections, plus a medical department, which was headed by physician Jean Felton and later by Thomas Lincoln and then Seaton Garrett. In October, Wigner recruited Alexander Hollaender to form and head a Biology Division. Hollaender had received degrees in physical chemistry from the University of Wisconsin. At the National Institutes of Health, he had studied the effects of radiation of cells and the use of ultraviolet light to control airborne diseases. Hollaender s initial research plan at Clinton Laboratories called for studying the effect of radiation effects on living cells, including such cell constituents as proteins and nucleic acids.

Beginning with a few radiobiologists who studied microorganisms and fruit flies in crowded rooms behind the dispensary, Hollaender initiated a broad program that would make his division the largest biological laboratory in the world. Hollaender would successfully unite fundamental research in the biological sciences with physics,

chemistry, and mathematics and would recruit widely to staff the initial research units in biochemistry, cytogenetics, physiology, and radiology. Lacking space at the X-10 site, the new division moved into vacated buildings at the Y-12 Plant.

The biological research that attracted the most public interest was the genetic experiments conducted under the supervision of William and Liane Russell, who used mice to identify the long-term genetic implications of radiation exposure for humans. Hollaender took special pride in some of the division's early scientific accomplishments, such as William Arnold's discoveries of the electronic nature of energy transfer in photosynthesis, Waldo Cohn and Elliott (Ken) Volkin's discovery of the nucleotide linkage in ribonucleic acid (RNA), and Larry Astrachan's discovery of messenger RNA. The Biology Division's greatest long-term influence on science, however, may have come from its cooperation with the UTK-Oak Ridge Graduate School of Biomedical Sciences and with universities and research centers throughout the nation and the world.

The second division separated from the old Health Division in 1946 was Health Physics, directed by K. Z. Morgan. The Health Physics Division eventually included 70 staff members who monitored radiation levels in research and production areas and furnished improved radiation detection devices. Early research included studies of radioisotopes discharged into river systems, estimates of thermal neutron tolerances, and development of new methods to detect radiation.

In 1944, Oak Ridge health physicists trained personnel responsible for radiation protection at Hanford. They continued this schooling at Oak Ridge until 1950 when the AEC established fellowships for graduate study at Vanderbilt and Rochester universities. The Army, Navy, and Air Force also sent personnel to receive health physics training at Oak Ridge. In addition to its land-based monitoring efforts, the Health Physics Division used boats to measure radioactivity entering the Clinch River from White Oak Creek and airplanes to monitor radioactivity in the air above Oak Ridge. As a result, the division was said to have its own army, air force, and navy.

One of the most important roles of Oak Ridge in the development of nuclear energy was the establishment of the Oak Ridge School of Reactor Technology (ORSORT).

Following the war, few people in the entire country understood the technology of nuclear reactors enough to develop commercial uses for atomic energy. In 1946, this technology was only a few years old and, of course, still in its infancy. One of the first students of ORSORT (and its most famous) was Captain (later Vice-Admiral) Hyman Rickover. Rickover was charged with developing a nuclear-powered submarine. With his work, the Navy supported the school, which became the basis of all nuclear training schools in the country, both civilian and military. Oak Ridge has been involved in many nuclear development programs since Rickover s successful nuclear submarine Nautilus-notably the Breeder Reactor, gascooled reactors, and the nuclear ship *Savannah.*

Also in 1946, the U.S. Air Force established the Nuclear Energy for Propulsion of Aircraft Project and began research in this field. In 1949, the U.S. Air Force, Union Carbide, the AEC, and others met in Oak Ridge to discuss pooling their efforts to pursue this research goal, which resulted in the establishment of the Aircraft Nuclear Propulsion Project (ANP) at ORNL and the division of the ORNL Reactor Technology Division into two sections: the Nuclear Experimental Engineering Division and the Aircraft Nuclear Propulsion Division [later renamed the Aircraft Reactor Engineering Division (Carver and Slater 1994)].

Although "the plane never got off the ground," the ANP resulted in the construction of three unique reactors at ORNL: the Aircraft'Reactor Experiment (later renamed the Molten Salt Reactor Experiment), the Tower Shielding Facility, and the Bulk Shielding Reactor. In addition to these unique reactors, the ANP helped ORNL justify the acquisition of nuclear particle accelerators (e.g., Van de Graaf and Cockcroft-Walton accelerators), fund the construction of the first programmable von Neumann-type computer at ORNL, called the Oak Ridge Automatic Computer Logical Engine (ORACLE), and fund research in radiation damage resulting in the establishment of the Physics of Solids Institute in 1950. The ANP also played a significant role in the major construction and facilities expansion of ORNL during the 1950s.

Reactor research and the production of radioisotopes for medicine were the major foci of ORNL throughout the 1950s and into the 1960s. In addition to the Graphite Reactor and reactors associated with the ANP, other reactors were constructed at ORNL (e.g., Homogeneous Reactor Experiment, Oak Ridge Research Reactor, Health Physics Research Reactor, and the High-Flux Isotope Reactor); and other reactors such as the Army Package Power Reactor (later renamed the SM-1), constructed by the Corps at Fort Belvoir, Virginia, were designed by ORNL research teams.

By the late 1950s the ANP, which was responsible for a significant quantity of research funding at ORNL, had been cancelled. Alvin Weinberg, then director of ORNL, and his staff examined ORNL's mission to try and identify potential missions beyond nuclear energy. Concurrently, Congress was urging the AEC to diversify its national laboratories to provide a more rounded approach to satisfying some of the nation's critical needs. This led to a change in the direction of ORNL into new research fields with an ever-increasing broadening of research horizons. ORNL began to perform contract work with agencies other than the AEC, such as the National Aeronautics and Space Administration (NASA), the Department of Housing and Urban Development, and the Department of State. Out of this environment ORNL grew into what it is today-a multipurpose national laboratory with a variety of missions, including basic and applied technology, high-temperature materials science, research into alternative energy sources (e.g., coal and fusion energy), renewable resources, computing technologies, biological sciences, environmental sciences, and waste technologies (see Section 3.1.2.1 for more detailed information on current ORNL missions).

The following is a listing of scientific achievements either directly or indirectly associated with ORNL:

1942 Oak Ridge selected as Manhattan Project site. First fission chain reaction at Stagg Field, Chicago.
1943 Graphite Reactor starts up as first continuously operated reactor.
1945 Atomic bombs dropped on Hiroshima and Nagasaki, ending World War II. Neutron scattering studies begin at ORNL.
1946 Naval reactor program conceived at ORNL. First radioisotope shipment for medical research.
1948 Biology Division established; mice used to estimate radiation effects on genes.
1950 86-inch cyclotron completed with world's most intense proton beams. Bulk Shielding Reactor begins operation. Low-Intensity Test Reactor begins operation. Oak Ridge School of Reactor Technology (ORSORT) established.

1953 Oak Ridge Automatic Computer and Logical Engine (ORACLE), then the world's most powerful computer, installed at ORNL.
1954 ORNLs Aircraft Reactor Experiment tested. ORNL ecology program started.
1955 ORNL "swimming pool" reactor showcased at UN atoms-for-peace conference in Geneva.
1956 First experimental bone-marrow transplants in mice performed. ORNL biologists find predicted messenger RNA.
1957 First ORNL fusion-energy experiment begins.
1958 Relationship between intensity of radiation doses and their genetic effects explored. Oak Ridge Research Reactor begins operation. ORNL visited by U.S. Senator Lyndon Johnson.
1959 ORNL and the city of Oak Ridge visited by U.S. Senator John Fitzgerald Kennedy and Mrs. Kennedy.
1961 Development begins on isotope heat sources to power space satellites.
1962 Oak Ridge Isochronous Cyclotron completed. ORNL discovers ion channeling in crystalline solids.
1964 ORNL is first national laboratory to hire social scientists. "Water for Peace," nuclear desalination concept, featured at UN conference.
1965 High Flux Isotope Reactor (HFIR) and Molten Salt Reactor begin operation. Heavy Section Steel Technology program for reactor safety started. ORNL-University of Tennessee graduate program in biomedical science established. ORR toured by U.S. Representative Gerald Ford and Vice President Hubert Humphrey.
1967 Viruses separated in high-speed centrifuge. International Biological Program launches with ORNL help.
1968 Centrifugal fast analyzer developed for medical diagnosis. Zonal centrifuge makes ultra pure vaccines. Second Molten Salt Reactor operated. Oak Ridge Electron Linear Accelerator completed.
1971 ORNL studies moon rocks. ORNL studies environmental impacts of nuclear power plants. Research begins at ORMAK, experimental fusion tokamak.
1972 World's first successful freezing, thawing, and implantation of mouse embryos. Energy conservation studies started.
1975 Ground breaking for Environmental Sciences Building.

1976 Research on global carbon cycle begins.
1977 Construction begins on Large Coil Test Facility for superconducting fusion magnets.
1978 President Carter visits ORNL.
1979 ORNL's neutral-beam injectors achieve record fusion plasma temperatures.
1980 ORNL opens user facilities: accelerator laboratory, neutron research facilities, and environmental research park.
1982 ORNL begins helping developing nations assess energy technologies and policies.
1984 Ecological and Physical Sciences Study Center opens. Martin Marietta Energy Systems, Inc. assumes ORNL operating contract. Planning begins for Advanced Neutron Source, next-generation research reactor.
1984 Tennessee Wildlife Management Area designated.
1987 High Temperature Materials Laboratory opens as user facility. Center for Global Environmental Studies created. Human genome studies begin.
1988 Technology transfer becomes an ORNL mission.
1988 Biosphere Reserve designated.
1989 Science education emphasized. High-Temperature Superconductivity Pilot Center signs several agreements with industry.
1990 First DOE cooperative research and development agreement signed using ORNL expertise. ORNL computer programs schedule transport of troops and equipment for Persian Gulf War. Operation of HFIR resumes.
1991 Zachary Taylor's remains analyzed for arsenic using neutrons at HFIR.
1992 Center for Computational Sciences established. President Bush visits ORNL.

3.2.5.2.2 K-25 Site (present-day ETTP)

The original mission of the K-25 Site was to produce highly enriched uranium-235 using the gaseous diffusion process. During the Manhattan Project, the gaseous diffusion process proved to be the most efficient and productive method of uranium-235 enrichment. In 1947, the AEC was established to take charge of the nuclear program and to administer a new program of developing nuclear energy for beneficial peacetime applications. Because such great success wac exp(-.rienced at the K-25 Site with the gaseous diffusion process during the war years, the mission of the K-25 Site continued unabated throughout most of the postwar period until the stockpile of fissionable material was sufficient to meet anticipated demands. New gaseous diffusion facilities were constructed at the K-25 Site (e.g., K-29, K-31, and K-33) that utilized advancements in technology developed at the site. In addition, other gaseous diffusion plants were constructed at Paducah, Kentucky, and Portsmouth, Ohio, during the Cold War Era that were based on, and utilized, technologies developed at the K-25 Site. For example, in the postwar years, research into gaseous diffusion barrier technology continued at the K-25 Site, and all barriers placed into diffusion cells constructed in the United States were designed and manufactured at the K-25 Site.

Soon after President Lyndon B. Johnson took office, he ordered a 25% cutback in the production of highly enriched uranium and the shutdown of four plutonium piles at the

Hanford Site. As a result, production of highly enriched uranium-235 in the K-25 and K-27 cascades was discontinued in 1964.

The gas centrifuge process was one of the four methods considered for uranium isotope separation during the Manhattan Project but was not implemented in favor of the gaseous diffusion process. Therefore, R&D on this method of separation was discontinued in 1944. It was not until the years 1955 through 1960 that advancements in gas centrifuge technology were made through research at the University of Virginia. Based on this research, the gas centrifuge process was estimated to use only about 4% of the power required by the gaseous diffusion process. In 1961, the AEC authorized the three-year Gas Centrifuge Development Program, which involved construction of experimental gas centrifuge enrichment facilities at the K-25 Site. These facilities were used for manufacturing development and reliability testing and as a pilot plant that included two cascades of gas centrifuges. As a result of the Gas Centrifuge Development Program, four proposals for a private gas centrifuge enrichment plant, to be constructed adjacent to the Portsmouth Gaseous Diffusion Plant in Ohio, were submitted to the Energy Research and Development Administration (DOE's predecessor). The proposals were subject to Congressional action under the Nuclear Fuel Assistance Act, which was subsequently tabled in 1976, resulting in the withdrawal of the proposals. Although a number of facilities were constructed, the planned gas centrifuge plant in Ohio was never completed, and the Gas Centrifuge Development Program was ultimately cancelled in 1985.

In 1964, President Johnson brought to an end the 18-year government monopoly on special nuclear materials by signing into the law the Private Ownership of Special Nuclear Materials Act. This act, beginning on January 1, 1969, authorized the AEC to offer uraniumenrichment services to both domestic and foreign customers under long-term contracts. In response to these opportunities, the K-25 Site initiated the Toll Enrichment Program, which involved producing slightly enriched uranium in the K-29, K-31, and K-33 process buildings and charging a toll for its use in nuclear power plants. With a projected upswing in the nuclear power industry and an increased demand for slightly enriched uranium, two programs, the Cascade Improvement Program (CIP) and the Cascade Upgrading Program (CUP), were initiated in June 1975. During the CIP, cascade equipment was removed, modified, and reinstalled to improve the efficiency of the gaseous diffusion process and to provide increased production capacity. The CUP upgraded the electrical equipment in the switchyards and within the process buildings so that additional electrical power could be supplied to the gaseous diffusion equipment. The CIP/CUP upgrading projects were completed in September 1981. A 1983 Fact Sheet for the Oak Ridge Gaseous Diffusion Plant stated that the plant's total budget for fiscal year 1983 was about $570 million, which included $281 million for electrical power. This amount was easily recovered by the sale of enrichment services to the electrical power industry through the Toll Enrichment Program (approximately $1.8 billion in revenues in fiscal year 1983 alone).

By 1985, the electrical power industry's projections for enrichment services had drastically changed, partly due to the Three Mile Island Nuclear Power Plant incident. Facing

August 1985. Later that year, the gas centrifuge process was shut down, and in 1986 work on the Advanced Vapor Laser Isotope Separation program was reduced. In 1987, gaseous diffusion at the K-25 Site ended permanently, and the K-25 Site was effectively without a mission from 1985 to 1989 and currently it is called ETTP.

The ETTP has been the home of the DOE Center for Environmental Technology and Center for Waste Management since 1989 but also serves as the base of operations for the Bechtel Jacob s/Emergency Management (EM) Program. The primary mission of the EM Program is to provide innovative leadership and cost-effective management of environmental restoration, waste management, technology development and demonstration, education and training, and technology transfer programs for DOE, other federal agencies, and the public. In addition, development of the Advanced Vapor Laser Isotope Separation program continues at the ETTP, although no new production facilities have been constructed as part of this project. The current missions of the ETTP have been summarized in Section 3.1.2.2.

The following is a listing of scientific achievements and/or events either directly or indirectly associated with the ETTP (formerly K-25 Site):

1942 Oak Ridge selected as Manhattan Project site.
1944 First uranium hexafluoride (UF6) received at K-25 Site.
1945 First cell on UF6, K-303-3.10 developed.
1945 First unit of UF6, K-310-2 (8 cells) developed.
1945 First product withdrawal.
1945 First product shipment to Y-12.
1945 First three K-27 units on UF6 (K-402-3, -4, and -9).
1945 Atomic bombs dropped on Hiroshima and Nagasaki, ending World War II.
1948 Barrier Manufacturing Plant begun.
1950 Feed Manufacturing Plant begun.
1950 First K-29 cells onstream (K-502-1.1 and -1.2 cells).
1951 All K-29 units onstream.
1951 First K-31 cells onstream (K-602-4.1, -4.4, and -4.6 cells.
1951 Last complete K-31 unit onstream.
1954 First 3 cells of K-33 onstream.
1954 K-1420 Decontamination and Recovery Facility scheduled for initial operation during September.
1954 Last complete K-33 unit onstream (K-902-5).
1956 Power loads for site reached 2285 megawatts (MW).
1964 All K-25 and K-27 shut down.
1964 Transition period between military and civilian power program use of cascade 1972 production. Characterized by variable power usage and placing much of cascade in standby for extended periods. Cascade production stored for future use in the Toll Enrichment Program. Power usage levels as low as 460 MW.
1969 Toll Enrichment Program fully initiated.
1975 Process Equipment Modification, Cascade Improvement Program (CIP) and Cascade Upgrading Program (CUP) initiated.

1979 Area power load decreased to 645 MW.
1979 Power load increased to 1150 MW.
1980 New Central Control facility (K-1650) placed in service.
1981 CIP/CUP Program completed.
1982 Shutdown of K-1037 Barrier Plant after successful production of high-quality material for all three gaseous diffusion plants.
1984 On April 1, 1984 Martin Marietta Energy Systems, Inc. assumes contractor responsibility for the Oak Ridge Gaseous Diffusion Plant (ORGDP) from Union Carbide-Nuclear Division.
1985 March, 1985 the ORGDP celebrates 40' university as dependable, continuous producers of enriched uranium.
1985 On June 5, 1985 DOE announced the gaseous diffusion cascade at ORGDP would be shutdown and placed in standby and all research and development work on the advanced gas centrifuge program would be terminated.
1985 On August 7, 1985 the last operating cell in the gaseous diffusion cascade was de-energized.

Accomplishments associated with the ERWM Program and Reindustrialization Program during the 1990s includes the following:

- Completion of a coffer-design, sediment-retention dam to control pollution into the Clinch River.
- Remediation of the Kerr Hollow Quarry using a remotely controlled underwater vehicle.
- Incineration of over 4 million pounds of mixed waste in the TSCA Incinerator.
- Demonstration of state-of-the-art Rotasonic drilling technology developed by the private sector.
- Final Environmental Assessment for "Lease of Land and Facilities within the East Tennessee Technology Park" was approved in November 1997.
- Final Environmental Assessment for "Lease of Parcel ED-1 of the Oak Ridge Reservation by the East Tennessee Economic Council" was approved in April 1996; thus paving the way for industrial development on a parcel of land between ETTP and the west end of the city of Oak Ridge residential area.

3.2.5.2.3 Y-12 Plant

The original mission of the Y-12 Plant was the separation of uranium-235 from naturally occurring uranium using the electromagnetic separation process. This effort involved the use of approximately 1200 electromagnetic separation units known as "Calutrons," most of which were taken out of service in 1946 when gaseous diffusion became the accepted process for enriching uranium. However, as the Y-12 Plant was being downsized in late 1945, the Stable Isotope Separations Program was begun. Although the electromagnetic separation process was found during World War II to not be capable of producing large quantities of enriched uranium, it was found to be the most versatile process and the most capable of producing highly enriched orpure isotopes. Scientists, including Drs. Clarence Larson and Christopher Keim of the Y-12

Plant and Eugene Wigner, then director of Clinton Laboratories (ORNL), urged the continuation of isotope separation at the Y-12 Plant for research into the value of isotopes in science, medicine, and industry, which was supported by the directors of the Manhattan Engineer District. The Isotope Separations Program was initially a Y-12 Plant mission; however, as decisions affecting program management were made, management recognized the primary role of the Stable Isotope Separations Program was to produce research material. Therefore, management elected to move the administrative responsibilities for the program to ORNL in keeping with the mission of facilities and divisions at ORNL.

Drs. Swartout and Boyd reported the first separation of a stable isotope in 1945 when they separated the stable isotopes of copper. Swartout and Boyd then irradiated one of the isotopes, copper-65, to produce nickel-65 (a radioactive isotope of nickel with a half-life of 2.5 hours). By using a stable isotope to produce a radioactive or unstable isotope, Swartout and Boyd were able to confirm the mass- or artificially produced radioisotopes; which has proved to be a major contribution to modern physics and chemistry; the masses of over 80 isotopes have been confirmed since 1952 (Compere and Griffith 1991; Thomason and Associates 1996). Before these experiments, no isotope other than deuterium had been separated in appreciable quantities; therefore, physical properties of isotopes, such as measured mass, occurrence, and whether a stable isotope could produce a radioisotope upon irradiation, had not been confirmed.

Concurrent with the Stable Isotope Separations Program, a Special Separations Program housed in Building 9204-3 (Beta-3) was developed to separate and study isotopes of plutonium. In 1951, Building 9204-3 was modified to accommodate special facilities for the development and processing of alpha-active plutonium. Modifications included designing a special containment system Tank 610, the installation of facilities for washing calutron components to recover unresolved plutonium, and construction of a chemistry laboratory containing glove boxes and a contained evaporator. Over time, the processing of alpha-active plutonium grew from 1 unit into 17, and at the end of its fifth year the program was combined with the Stable Isotope Separations Program to form the Isotopes Division (Compere and Griffith 1991; Thomason and Associates 1996).

Although ORNL isotope-separation activities at the Y-12 Plant included plutonium separations, the primary focus of the program was always the enrichment of stable isotopes into a marketable form. The initial facilities of the isotopes separations program were housed in Building 9731; by 1957 the program had expanded to include a significant number of facilities in Building 9204-3. Operations in Building 9731 were shut down in 1974 and the facility was closed. During the 30 years of operations in Building 9731, every naturally occurring stable isotope had been separated within the facility. Operations within Building 9204-3 were reduced at the same time as the Building 9731 shutdown, but the facility continues to produce stable isotopes for medical purposes and is now the only facility outside of Russia with equipment capable of separating metallic stable isotopes for medical purposes (Thomason and Associates 1996).

Another major research effort undertaken at the Y-12 Plant included the use of cyclotrons to study the properties of compound nuclei and heavy-particle reactors, which involved the merging of efforts among ORNL and Y-12 Plant researchers. Beginning in the late 1940s and early 1950s, the researchers used leftover electromagnets from the Manhattan Project to build three cyclotrons: a 22-inch, 44-inch, and an 86-inch cyclotron. The 22-inch cyclotron, built in Building 9204-3 in the late 1940s, was the first of three to be constructed and was used to study the use of electromagnets in cyclotrons and how high-current, ion source techniques could be applied to cyclotron functioning. The size of the cyclotron was later doubled to 44 inches to study new ion sources, ion-beam focusing techniques, and ways' to increase beam intensities (Thomason and Associates 1996).

In November of 1950, the 86-inch cyclotron had been constructed in Building 9201-2 and was operational. The construction and operation of this cyclotron was funded through the Aircraft Nuclear Propulsion Project and was used to perform radiation damage studies. The 86-inch cyclotron was capable of producing a proton beam which was four times more intense than any other cyclotron in the world at that time. This cyclotron was also used to study proton-induced reactions and to produce polonium-208. The early research conducted using the three cyclotrons at the Y-12 Plant fostered future research that led to construction at ORNL of the Oak Ridge Isochronous Cyclotron in 1962 and the Holifield Heavy-Ion Research Facility in 1980 (Thomason and Associates 1996).

In 1951, President Juan Peron of Argentina announced that scientists in Argentina had produced energy through thermonuclear fusion, without using uranium, under controlled conditions. This claim, although false, fueled fusion energy research on an international scale. Prior to Peron's claim, scientists theorized that although nuclear fusion could be produced by the detonation of a hydrogen bomb, the temperature of fusion would be about one million degrees, leading some to conclude that the detonation of such a bomb could set off a chain reaction that would burn up the earth's atmosphere. Under the AEC's Project Sherwood, three fusion devices were constructed: a stellerator constructed at Princeton University and consisting of a hollow, twisted doughnut-shaped metal container covered with a wire coil that produced a magnetic field capable of confining hydrogen ions; a "mirror" device constructed at Lawrence Livermore National Laboratory that was designed to produce a magnetic field stronger at one end than in the middle to reflect hydrogen ion back to the middle of the field; and the "Perhapsatron" constructed by a team of scientists led by James Tuck at the Los Alamos National Laboratory that was designed to contain or "pinch" hot plasma toward the middle of a container.

Also under Project Sherwood, ORNL built a cyclotron at the Y-12 Plant in Building 9204-3 that became operational in 1952. The purpose of this cyclotron was not to serve as a fusion device but rather to help solve problems such as how to inject ion particles into a fusion device and how to heat plasma to temperatures high enough to ignite a fusion reaction. As part of this project, a team of scientists lead by Alex Zucker, Harry Reynolds, and Dan Scott soon discovered that the detonation of a hydrogen bomb would not consume the earth's atmosphere through a chain reaction. This particular cyclotron

was the first source of energetic heavy ions and opened the door to the study of the interactions of complex nuclei.

Significant accomplishments were also made in biological research at ORNL facilities at the Y-12 Plant. During the Manhattan Project, a Health Division was established to study and monitor radiation exposure. The division split into two research divisions (plus a medical department) in 1946 to form the Biology and Health Physics Divisions. The Biology Division was housed in Buildings 9207, 9210, and 9208 at the Y-12 Plant and eventually grew to become the largest biology laboratory in the world (Johnson and Schaffer 1992). Pioneering research in the Biology Division such as that conducted on mice by Liane and William Russell led to the discovery of a wealth of information that now serves as a cornerstone to understanding molecular biology, virology, and genetics. For example, Liane Russell's study into the gestation period of mice led to (1) the discovery that radiation induced changes in cells are more likely to occur during gestation, (2) the discovery that nucleoproteins within cell nuclei are sensitive to ionizing radiation, (3) the use of paper chromatography and ion-exchange methods by Waldo Cohn to separate and identify the constituents of nucleic acids, and (4) the discovery by Elliot Volkin that RNA has the same general structure as deoxyribonucleic acid (DNA).

The following is a listing of scientific achievements and/or events either directly or indirectly associated with the Y-12 Plant (ORNL accomplishments, such as calutron, fusion energy, isotope separations, and biological research, that took place at the Y-12 Plant are listed in Section 3.1.2.3 above):

1942 Oak Ridge selected as Manhattan Project site.
1945 Atomic bombs dropped on Hiroshima and Nagasaki, ending World War II.
1947 Enriched uranium-235 produced by the gaseous diffusion process was reduced to metal and fabricated in accordance with AEC requirement.
1948 Machining of enriched uranium on a small scale started.
1950 Hafnium-free zirconium production started for use in Naval Reactor program.
1950 Casting and machining of uranium-aluminum alloy and first large-scale precision machining of beryllium begun.
1953 Additional uranium casting facilities, another uranium machining shop, and a hydraulic pressing facility were installed/constructed.
1954 Expansion of enhanced-uranium salvage facility completed.
1955 Installation of additional uranium casting facilities completed.
1956 Accelerated program for providing technical information and assistance to industries interested in uranium salvage and recovery operations begun.
1957 Installation of a Primary Rolling Mill and additional pressing facilities for fabricating uranium completed.
1958 Installation of a heavy machine shop for uranium fabrication completed.
1958 Second rolling mill for uranium installed.
1959 Development and special fabrication service in pressing and machining of tungsten provided for missile program.
1959 AEC announced public sale of highly-enriched lithium-7.

1960 Specialized development and reproduction fuel element fabrication for nuclear powered rocket program.

1962 AEC authorized Y-12 Plant to provide specialized fabrication service to National Aeronautics and Space Administration (NASA) for a missile nose cone.

1963 A settling basin, named New Hope Pond for the pre-war community church near there, has been constructed at the east end of the Y-12 Plant.

1963-1965 During this period the Y-12 Plant fabricated radiation shields for the Space Nuclear Auxiliary Power (SNAP) Program, made high-temperature resistant ceramic tubes for controlled fusion experiments, cast pure gold collimators for medical diagnostic equipment, rolled uranium to 10-mil thickness, produced precision machined reactor components, prepared seismographic gauges to measure the intensity of underground blasts, and designed and fabricated a unit to irradiate blood samples aboard a Gemini flight.

1966-1967 These periods were characterized by numerous developments involving numerically controlled fabrication and inspection machines, new computer applications and increased use of laser interferometry. Development of automated air monitoring systems; automatic welders; automatic tool setters; computer-controlled gage head calibrators; voltage sensors, and heat sensing units for biological and machining applications. Design, fabrication, and testing of vacuum containers for collecting lunar geological. samples began. The Y-12 Plant was assigned an important role in the production of nuclear components for more advanced weapon systems. The Y-12 Plant also became the site of the Training and Technology Project to assist in the training of vocational teachers and underemployed men and women.

1968 Machining capabilities at Y-12 reach anew level of precision.

1969 Y-12 designs, constructs, and supervises the installation of the environmental control system for NASA's underground facility for the examination of samples brought back from the moon's surface. For NASA, Y-12 builds and helps install the Lunar Vacuum Receiving Module System for Houston.

1971 The technology of producing strong, light weight, reproducible carbon foams with predictable properties has been perfected by chemists in the Y-12 Development labs over the past decade and used for many years.

1972 At the request of DOE's Defense Programs, Y-12 undertakes anew kind of weapons work called Surveillance. Y-12 plays a major role in gearing up for production of a large weapon, the Spartan Program.

1973 The basic idea of diamond knife cutting, developed by Dupont (see 1962 above), was married to the best of Y-12's machining expertise- the use of air-bearing spindles, temperature controlled machines and environment, automatic tool-setting and computer-controlled tool-path control. In the fall of 1973 planning is begun for holding annual meetings of technical specialists of the Oak Ridge and Knoxville area to exchange unclassified information and to promote professionalism. The first meeting, Welding and Testing Technology Exhibition and Conference was planned for February 1974 in Knoxville.

1974 Research starts at Y-12 (Development Division) on the AVLIS process.

1975 New, safer, more secure, storage vaults were built to house the Nation's stockpile of excess weapons-grade, highly enriched uranium.

1976 Significant programs were being carried out in the Y-12 Development Labs to manage plant wastes in accordance with new regulatory requirements passed by the Congress.

1979 Another very useful innovation in improved waste management for the Plant is the development of processes for recovery and reuse of machine coolants which the plant uses in large quantities.

1981 Two major Y-12 capital improvement projects, Production Capabilities Restoration (PCR) and the Utility Systems Restoration (USR) have been funded by Congress and are now well underway.

1982 A major upgrading of the Y-12 physical security system, the P1DAS project, was undertaken in response to new threat analyses (terrorists etc.) developed by DOE, Washington.

1983 Research on AVLIS feed, withdrawal, and materials work is moved from Y-12 to K-25.

1984 Martin Marietta is the successful bidder and replaces Union Carbide after 37 years as the operator of the Y-12, ORNL, and K-25 and Paducah facilities for the DOE and its predecessor organizations.

1985 A major new and state-of-the-art, computerized Production Control System for the Plant is initiated using classified networks.

1986 The Y-12 Plant is recognized by the Society of Manufacturing Engineers with a Special Award for having the Best Computer-Integrated Manufacturing Program in the United States.

1987 The Production Capabilities Restoration (PCR) and the Utility Systems Restoration (USR) Projects are completed.

1988 The decision was finally made to adopt the IAEA standards in 1987. Work For Others includes a major effort for the US Navy.

1990 The Cold War begins to end with the fall of the Berlin Wall and the collapse of Communism in the Soviet Union.

1991 President Bush announces unilateral weapons reduction initiatives.

1992 U.S. enters moratorium on underground nuclear testing, halts the development and production of new nuclear weapons, and begins closing portions of the NWC no longer needed to support the stockpile of the future. Y-12 disassembles an entire nuclear weapons system, the fast since major weapon reductions were announced by President Bush in 1991. Used a new disassembly process, safe and faster, resulted in a special commendation to Y-12 by DOE Secretary Watkins.

1994 Y-12's nuclear facilities placed on "stand-down" by DOE for safety and compliance review and upgrading. Lockheed and Martin Marietta agree to merge to become Lockheed Martin Energy Systems.

1995 Project Sapphire- 600kg of Oralloy purchased from Khazakstan by US Government. A Y-12 team trained in handling weapons grade uranium went to Russia and brought it here to Oak Ridge.

1997 Remarkable success of the Technology Transfer program.

3.2.5.2.4 Oak Ridge Associated Universities

To take advantage of the large concentration of scientists and scientific research facilities then assembled in Oak Ridge, a consortium of southern colleges met in December 1945 to discuss establishing a joint universities center at Oak Ridge. This consortium was established in 1946 to conduct scientific research concentrating in the field of nuclear energy. Originally known as the Oak Ridge Institute of Nuclear Studies (GRINS), this organization became a prime-operating contractor of the U.S. AEC in March 1947.

The AEC provided office space for the Institute in the AEC administration buildings, known as Buildings 2714-G and 2714-F, located on Laboratory Road. The first acting executive director of the Institute was Dr. William G. Pollard, a University of Tennessee physics professor. As part of the Institute's operations, a Medical Division to conduct clinical research was established in 1948. The one-story wing of the Oak Ridge Hospital that had been provided by the AEC was extensively remodeled, and a new, two-story wing was constructed in 1949. An additional one-story wing was added to the hospital in 1950.

By the summer of 1950, visiting students and scientific staff came to the Medical Division for training on collaborative projects. These projects primarily centered around nuclear medicine and related research which continued throughout the decade. In 1960 the Medical Division acquired the adjacent three-story D wing of the Oak Ridge Hospital, which greatly increased its space. During the 1960s, an immunology program was begun that included the use of a colony of South American marmosets. The marmosets were bred successfully in captivity, and a facility to house them was constructed in 1968 (Pollard 1980).

In 1949 GRINS acquired a building that was constructed in 1943 and served as a hospital for black workers in the Woodland-Scarboro area of Oak Ridge. After the war, the building was no longer needed as a hospital and was converted into offices and laboratories (now the ATDL). The laboratory area of GRINS expanded in 1959 to occupy Building 2715, a one-story building on Laboratory Road constructed in 1944 as a storage facility and later converted into offices and a laboratory.

Expansion of the Institute took place in 1959 when 37 acres northwest of the intersection of Illinois and Tulane avenues was acquired for construction of a modern campus. The Central Administration Building was completed in 1959. In 1963, a new library was constructed at the campus south of the Central Administration Building. A two-story wing (exclusively office space) was added to the library in 1979, and the entire building was renamed the Energy Building. The name of the institution was changed in 1966 to Oak Ridge Associated Universities because the original name no longer expressed the institute's direction and goals. The new name legitimized the organization's true role in the academic and research community (Pollard 1980).

The Marmoset Research Center was constructed adjacent to the library in 1968. This building originally housed some 450 marmosets in 12 animal rooms. The building is owned by ORAU and ORAU and UTK scientists conducted research there until 1996. The building now is empty and is scheduled for demolition. The most recent building on the campus is the William G. Pollard Auditorium, completed in 1982. This building is located to the west of the Central Administration Building and contains an auditorium, the Center for Epidemiologic Research, and other office space.

In 1981, ORAU acquired responsibility for the remaining 1456 acres of the original 5000-acre Comparative Animal Research Laboratory (CARL), which was established in 1948 as the UT-AEC Agricultural Research Laboratory (ARL). The ARL was established in 1948 by the AEC and UT to conduct research and experimentation on radioisotopes and radiation in agriculture. The center for this laboratory was Scarboro School, a one-story brick school constructed in 1939. The Scarboro School was one of only a handful of pre-World War II properties left standing during the construction of Oak Ridge; over a dozen other buildings were constructed at the laboratory over the following several decades.

CARL's research mission included a broad spectrum of multidisciplinary studies on responses to external radiation of plants and animals, uses of radioisotopes in agricultural research, transport of radionuclides in food chains, and risks to humans from effluents of various energy-producing systems. Only 164 acres (Scarboro Operations Site) of the former research laboratory still are part of ORAU.

Scarboro School continues to be used as offices and laboratories, while the remaining buildings are used for storage. Agricultural research at the facility ended in 1983 (Thomason 1993).

The following is a listing of scientific achievements and/or events either directly or indirectly associated with ORAU:

1947 GRINS received charter of incorporation from Secretary of State of Tennessee on October 15, 1946.
1948 Long-term contract with AEC established.
1949 Construction of GRINS Cancer Research Hospital began.
1949 Educational Services Division set up (initially to open museum to function as a public education program).
1950 The GRINS Cancer Research Hospital completed; patients admitted in May.
1950 Animal colony and experimental laboratory completed in cooperation with UTK-AEC Agricultural Research Program.
1951 Medical Division built efficient cobalt-60 teletherapy machine.
1954 Medical Division initiated radioiodine uptake calibration program.
1955 First special basic radioisotope-techniques course for foreign nationals began.
1956 Special Training Division developed neutron and gamma-ray dosimeter for the U.S. Air Force.

1958 Medical Division given care of eight persons exposed to accidental doses of radiation at the Y-12 Plant.
1958 Special Training Division designed two mobile radioisotope laboratories presented by ABC to the International Atomic Energy Agency for training purposes.
1960 Medical Division began use of a new linear scanner and research scanner.
1960 Medical Division began immunology and microbiology programs.
1960 Medical Division began operation of Medium Exposure Total Body Irradiator.
1963 Experimental immunology studies on marmosets began under sponsorship of U.S. Air Force.
1965 Medical Division began cytogenetics program.
1966 ORINS officially became ORAU.
1966 Life Science Radiation Laboratory exhibit developed and premiered at Smithsonian Institution.
1966 Construction of the Low-Exposure Total Body Irradiation facility began.
1970 University Isotope Center, Oak Ridge, organized by ORAU and group of 11 universities in cooperation with ORNL.
1971 Food and Drug Administration agreed to support Center of Information on Internal Dosimetry of Radiopharmaceuticals.
1974 Institute for Energy Analysis established.
1975 Radiation Emergency Assistance Center/Training Site established to provide emergency treatment and to train personnel in handling radiation accidents.
1977 Medical Division installed Emission Computerized Axial Tomograph.
1978 Training Research and Data Exchange network founded.
1980 University Isotope Center, Oak Ridge, developed laser optical-spectroscopy system.
1986 Center of Excellence for Human Reliability established.
1988 University Isotope Center, Oak Ridge, tested Nuclear Orientation Facility.
1992 Oak Ridge Institute for Science and Education established as the DOE facility managed by ORAU.
1994 Recoil Mass Spectrometer obtained by University Isotope Center, Oak Ridge.

3.2.5.2.5 Incorporation of the City of Oak Ridge

With the creation of the AEC in August 1946, Oak Ridge entered a new phase of development. Before transferring the community to the AEC, Army officials investigated appropriate options for the new city's status. Under current Tennessee State Law, application for incorporation had to be made by 100 property owners. Because Oak Ridge was located in a restricted military area and was fully owned by the federal government, the Townsite was not eligible for incorporation. There were no private land owners, nor was there any planned provision for future ownership of property. The Army concluded that the community should remain under federal control, operating as a federal district similar to the District of Columbia.

The move toward incorporation began in 1947 when the ABC assumed administration of the community and encouraged incorporation by commissioning a Master Plan to be

To encourage incorporation, houses were offered for sale. By the beginning of 1956, all of the houses in the city were privately owned, and by 1958 the city was ready to be incorporated. In 1959 more Oak Ridge residents (nearly 100%) owned their homes than in any other city in the country. The Oak Ridge Advisory Town Council, created in 1944 to advise the Army of community needs, devised a modified council/manager form of government which provided for precinct-type elections. This plan was accepted, and the town was incorporated in 1959. The plan has since become a state statute under which any community in Tennessee may choose to incorporate.

drawn by Skidmore, Owings, and Merrill. John C. Treadwell and George Goldstein, Chicago consultants hired by the AEC to evaluate and appraise the town in 1948, offered several suggestions for incorporation. After living under the thumb of the federal government for so long, Oak Ridgers were eager for independence, yet tentative about the new responsibilities (taxes) that accompanied incorporation. Under 1953 Tennessee law, only two forms of city government existed: council/alderman and manager/council. Since neither form was deemed acceptable, the first vote to incorporate failed in 1953.

The biggest push for incorporation came in 1955 with Public Law 221, the Oak Ridge Disposal Bill. Under this legislation, the AEC was permitted to sell houses and land in Oak Ridge and to give the town its municipal facilities, with the condition that the city incorporate and all transactions be completed by August 4, 1960. If the community did not incorporate, it would become charterless and dependent on Anderson and Roane counties for its public administration. Oak Ridge stood to lose its schools, including a new $3.5 million high school, and its public buildings, streets, sewers, utilities, and waterworks to these counties.

Though incorporation did not occur until 1959, the Townsite was opened to the public and separated from the ORR in 1949. The reduction in Townsite security associated with this change required a decrease in the community's fenced area from 23,684.99 ha (58,525.61 acres) to 14,266.29 ha (35,252 acres) and the reconstruction of three sentry posts from wood to concrete: Bear Creek Road Checking Station (located on Scarboro Road), Bethel Valley Checking Station, and the Oak Ridge Turnpike Checking Station. The original seven gates that controlled access to the ORR were removed at this time.

The new status of Oak Ridge as a permanent city brought about many changes in Anderson County and on the ORR itself. Many East Tennesseans did not realize the tremendous economic effect Oak Ridge brought to bear on the surrounding towns of Clinton, Oliver Springs, Harriman, Kingston, and the city of Knoxville. This effect was outlined in a 1956 housing appraisal conducted by the Federal Housing Administration

(FHA). The entire region had been hit hard by the Depression but enjoyed tremendous rebirth during the war and postwar years. Perhaps the best illustration of this was the 851 % increase in retail sales in Anderson County between 1939 ($3.1 million) and 1948 ($29.7 million). State sales tax collections in Anderson County showed a 35% increase in the dollar volume of sales between 1950 and 1955. Oak Ridge accounted for 57.3% of the total volume of sales in 1955. Workers from Oliver Springs, Clinton, Harriman, and Kingston generated an average payroll take of $4,000,000. The FHA appraisal went on to note that "All of East Tennessee owes much of its recent economic betterment to Oak Ridge Operations. It has generally benefited from direct expenditures of the facility itself and the personal spending of Oak Ridgers. It has materially benefited in indirect ways from the expansion of the TVA Empire, necessary to supply Oak Ridge Area Power needs. The immediate surrounding area has been transformed from a static, sparsely settled farming section, with one-industry towns or small crossroad villages, to a vitalized progressive territory."

3.3 KNOWN CULTURAL RESOURCES

3.3.1 Prehistoric Properties

3.3.1.1 Districts, Sites and Structures

Forty-four archeological sites have been identified and recorded on the ORR. Of these sites, 13 have been determined to be eligible for inclusion in the National Register of Historic Places (NRHP) (DuVall and Souza 1996). Table 3.4 presents the site numbers, cultural affiliation, U.S.G.S. 7.5-minute quadrangle on which the sites are located, latitude, longitude, and site eligibility for inclusion in the NRHP. The location of these sites is shown in Fig. F.1 of Appendix F. Appendix F contains more detailed information on the location of prehistoric properties and contains a map showing the location of pre-World War II structures on the ORR. To protect the integrity of these sensitive resources, the contents of Appendix F have been removed from copies of this document that are targeted for distribution to the general public.

Table 3.4. Prehistoric archeological sites on the ORR

Site Number	Cultural Affiliation	U. S. G. S. 7.5' Quad.	NRHP Status
40AN8	Undetermined	Lovell	N
40AN20	Woodland, Mississippian, and Euramerican	Lovell	E
40AN21	L. Woodland	Lovell	N
40AN22	L. Woodland	Lovell	N
40AN25	Woodland	Lovell	E
40AN26	Undetermined	Lovell	N
40AN27	L. Woodland	Lovell	E
40AN29	M. and L. Woodland	Lovell	N
40AN30	Undetermined	Lovell	N
40AN31	Undetermined	Lovell	N
40AN68	Undetermined	Lovell	N
40RE27	Woodland	Bethel Valley	E

40RE86	Archaic, Woodland, and Mississippian	Elverton	E
40RE87	Undetermined	Elverton	E
40RE88	Undetermined	Elverton	N
40RE89	L. Mississippian	Elverton	E
40RE90	L. Woodland	Elverton	N
40RE96	Undetermined	Bethel Valley	N
40RE97	Undetermined	Bethel Valley	N
40RE98	Undetermined	Bethel Valley	N
40RE99A	Woodland	Bethel Valley	E
40RE99B	L. Woodland	Bethel Valley	E
40RE100	Undetermined	Bethel Valley	N
40RE101	Woodland	Bethel Valley	E
40RE102	Woodland	Bethel Valley	N
40RE103	E. Archaic	Bethel Valley	N
40RE104	Undetermined	Bethel Valley	N
40RE109	E. M. and L. Archaic; E. and L. Woodland, and Mississippian	Elverton	E
40RE110	Woodland	Elverton	E
40RE111	Archaic and Woodland	Elverton	E
40RE112	Undetermined	Elverton	E
40RE114	Woodland	Elverton	E
40RE117	Undetermined	Bethel Valley	N
40RE126	Paleo-Indian?, Archaic, m. and L. Woodland, and Mississippian	Bethel Valley	N
40RE127	Undetermined	Bethel Valley	N
40RE131	L. Woodland	Bethel Valley	N
40RE132	Archaic and Woodland	Bethel Valley	N
40RE133	Undetermined	Bethel Valley	N
40RE134	Woodland	Bethel Valley	N
40RE135	Undetermined	Elverton	N
40RE138	Paleo-Indian – Mississippian	Elverton	E
40RE194	Undetermined	Bethel Valley	N

E=eligible for inclusion in NRHP, N=not eligible for inclusion in the NRHP.

Based on previous archeological investigations conducted on the ORR, no evidence linking two or more prehistoric archeological sites has been found to justify defining a prehistoric district or districts. No extant prehistoric archeological structures, other than burial mounds, have been identified and recorded on the ORR. However, evidence of prehistoric structures has been found at ORR sites in the form of (1) postholes that presumably represent structures such as palisade segments or bastions, (2) single-post circular structures, and (3) wall-trench dwellings.

3.3.1.2 Objects

No known isolated or special prehistoric objects included in or eligible for inclusion in the NRHP have been recovered from or exist on the ORR. However, ongoing surveys could identify such objects meeting these criteria.

3.3.1.3 Other Important Properties

No known or special prehistoric properties have been recovered from or are known to exist on the ORR. However, ongoing surveys could identify such properties meeting these criteria.

3.3.2 Historic Properties

This section addresses DOE ORO properties that date to the Historic period but predate the World War II Manhattan Project. DOE ORO properties associated with the Manhattan Project and following events are addressed in Section 3.3.4, Properties of Recent Scientific Significance.

3.3.2.1 Districts, Sites, Buildings, and Structures

A number of architectural and historical assessments/surveys have been conducted in the Oak Ridge, Tennessee, area that include (at least partly) a determination of the historical significance and/or NRHP eligibility of DOE ORO-owned pre-World War II properties. Examples of these surveys include the following:

- *Cultural Resource Survey of the Exxon Nuclear Facility, Oak Ridge, Tennessee: An Interim Report* (Fielder 1975);
- *Historic Sites Reconnaissance of the Oak Ridge Reservation, Oak Ridge, Tennessee* (Fielder, Ahler, and Barrington 1977);
- *Archaeological Investigations of the Jenkins House Site (40RE188) and the Jones House Site (40RE189), Copper Ridge, Oak Ridge Reservation, Roane County, Tennessee* (Faulkner 1988);
- *Historic and Architectural Resources of Oak Ridge, Tennessee,* a Multiple Property National Register Nomination prepared by Thomason and Murphy (1991);
- *An Archaeological Reconnaissance of a 14 Mile Section of the East Fork Poplar Creek for the Environmental Restoration Project, Anderson and Roane Counties, Tennessee* (DuVall 1992k);
- *Historic and Architectural Analysis Oak Ridge Associated Universities Properties, Oak Ridge, Tennessee* (Thomason 1993);
- *Archaeological Reconnaissance, K-2S Site, Oak Ridge Reservation, Oak Ridge, Tennessee,* [Jacobs Environmental Restoration Team (Draft)]; and
- *An Evaluation of Previously Recorded and Inventoried Archeological Sites on the Oak Ridge Reservation, Anderson" and Roane Counties, Tennessee* (DuVall and Souza 1996).

Most of the surveys dealt with a limited number of pre-World War II resources. However, in May 1994, DuVall & Associates, Inc., was engaged to evaluate NRHP eligibility of previously recorded and inventoried DOE ORO-owned pre-World War II Historic period structures on the ORR. The resulting report (see DuVall and Souza 1996) detailed the function, condition, locational coordinates, and NRHP status of 254 individual structures that were either visited as part of the study or visited by the Jacobs Environmental Restoration Team in 1994.

Of the 254 structures evaluated by DuVall and Souza (1996), 41 were determined to be individually eligible for inclusion in the NRHP, 6 of which were found to be previously included in the NRHP (Table 3.5). The locations of these structures are shown in Fig. F.2 of Appendix F. The six NRHP-included properties are the New Bethel Baptist Church and Cemetery (including a church and two gravehouses), the George Jones Memorial Baptist Church, and the Freels Cabin (including a dwelling and one outbuilding). These properties were included in the NRHP as a result of a 1991 Multiple Property National Register Nomination prepared by Thomason and Murphy. A complete listing and map showing the location of all known pre-World War II Historic period structures owned by DOE ORO in the Oak Ridge area are provided in Appendix F. One pre-World War II structure owned by DOE ORO that was not evaluated during this study is the Scarboro School, which is located at the ARL or South Campus facility constructed in 1939. Because this facility is still used today and has played an integral role in the research activities conducted at the ARL, it is addressed under Section 3.3.4, Properties of Recent Scientific Significance.

Table 3.5. Pre-World War II Structures on the ORR included in and individually eligible for inclusion in the NRHP [After DuVall and Souza (1996)]

Inv. No.	Function	Condition (1994)	NRHP Status
16A	Church (New Bethel Baptist Church)	Standing	I
16B	Gravehouse	Standing	I, I
16C	Gravehouse	Standing	I
25A	Dwelling	Foundation only	E
25B	Smokehouse	Foundation only	E
25C	Barn	Partially standing	E
33B	Dwelling	Foundation only	E
33C	Root cellar	Foundation only	E
33D	Crib	Foundation only	E
33E	Barn I	Foundation only	E
37A	Storage	Could not relocate	E
37B	Dwelling	Foundation only	E
43A	Dwelling	Foundation only	E
44C	Dwelling	Foundation only	E
52C	Dwelling	Foundation only	E
52D	Dwelling	Foundation only	E
52E	Barn	Foundation only	E

52F	Silo	Standing	E
54C	Dwelling	Foundation only	E
55A	Dwelling	Partially standing	E
55B	Barn	Partially standing	E
55D	Firebox	Foundation only	E
55E	Shed	Foundation only	E
55F	Shed	Foundation only	E
151A	Bam	Foundation only	E
151B	Dwelling	Foundation only	E
151C	Shed	Standing	E
151D	Henhouse	Partially standing	E
610B	Dwelling	Foundation only	E
610C	Barn	Foundation only	E
610D	Dwelling	Foundation only	E
610E	I Barn	Foundation only	E
610F	Shed	Foundation only	E
610H	Dwelling	Foundation only	E
616A	Dwelling	Foundation only	E
640A	Dwelling (Freels Cabin)	Standing	I
640B	I Smokehouse	Standing	I
727A	Church (George Jones Memorial Baptist Church)	Standing	I
939A	Dwelling	Foundation only	E
939B	Mill	Foundation only	E
975C	Mill	Foundation only	E

I=included in NRHP; E=individually eligible for inclusion in NRHP.

DuVall and Souza (1996) also identified two potential historic archeological districts: the Wheat Community and the Gravel Hill District. "The Wheat Community was a thriving community that was centered on the Blair Road and Gallaher Ferry Road intersections. The community was named after its first postmaster, Frank Wheat, and consisted of a number of residences, businesses (e.g., service station, post office, and store), two churches, and the Wheat School, formerly Roane College" (DuVall and Souza 1996). The boundary of the Wheat Community Historic District is shown in Fig. F.3 of Appendix F.

An area of the ORR closely associated with the Wheat Community is located along East Fork Poplar Creek to the northeast of the Wheat Community center. The area extends from the confluence of Poplar Creek and East Fork Poplar Creek to east of the Rather-Hembree Cemetery, south to the Oak Ridge Turnpike (State Route 95), and north along an indefinite ridge boundary. This area contains a number of structures ranging in age from ca. 1840 to the late 1930s,- including two mill sites (40RE195 and 40RE200); four known cemeteries (Rather-Hembree, Silvey, McKamey-Carmichael, and Gallaher); and a Pratt pony truss bridge built by the Champion Bridge Company, Wilmington, Ohio, ca. 1925 (Fig. F.4).

The Gravel Hill Historic District is located south of the ORNL main facilities complex along and south of Copper Ridge. The general boundaries encompass the area from approximately 700 m east of White Wing Road (State Route 95), east along the ridge crest of Copper Ridge, south to a point on the Clinch River near river mile 27, and west along an irregular line and south of the Tower Shielding Facility (Fig. F.5).

The area that encompasses the Gravel Hill Historic District contained a number of rural farmsteads, a school, a church, and a cemetery. Structures within the district vary from foundation-only remains to fully standing. This area was spared the major disturbance associated with the extensive clearing and construction activities that took place during the Manhattan Project and later events on the ORR. The Tower Shielding Facility is located adjacent to the district, but much of the disturbance associated with its construction is confined to areas within the security-fenced region that surrounds the facility (see Fig. F.5). Table 3.6 provides a list of structures that are contained within and contribute to the Wheat Community and Gravel Hill historic districts.

Table 3.6. Pre-World War 11 structures contained within and that contribute to the Wheat Community and Gravel Hill historic districts.

Inv. No.	Function	Condition (1994)	NRHP Status
Gravel Phil Historic District Contributing Structures			
36A	Dwelling	Partially standing	C
36B	Undetermined	Foundation only	C
37A	Storage	Could not relocate	E, C
37B	Dwelling	Foundation only	E, C
37C	Barn	Partially standing	C
38A	Barn	Foundation only	C
38B	Smokehouse	Standing	C
38C	Dwelling	Partially standing	C
38D	Crib	Foundation only	C
38E	Barn	Foundation only	C
39A	Dwelling	Foundation only	C
39B	Crib	Could not relocate	C
39C	Barn	Foundation only	C
43A	Dwelling	Foundation only	E, C
54A	Dwelling	Foundation only	C
54B	Crib	Foundation only	C
55A	Dwelling	Partially standing	E, C
55B	Barn	Partially standing	E, C
55C	Dwelling	Foundation only	C
55D	Firebox	Foundation only	E, C
55E	Shed	Foundation only	E, C
55F	Shed	Foundation only	E, C
56A	School	Foundation only	C

57A	Church	Foundation only	C
58A	Dwelling	Foundation only	C
58B	Barn	Foundation only	C
58C	Gravehouse	Partially standing	C
58D	Dwelling	Foundation only	C
68A	Dwelling	Foundation only	C
Wheat Community Historic District Contributing Structures.			
711A	Dwelling	Foundation only	C
711B	Dwelling	Foundation only	C
712A	Dwelling	Foundation only	C
712B	Shed	Could not relocate	C
712C	Store	Could not relocate	C
712D	Dwelling	Foundation only	C
715A	Church	Foundation only	C
722A	Dwelling	Foundation only	C
723A	Dwelling	Foundation only	C
723C	Undetermined	Foundation only	C
725A	Dwelling	Standing	C
727A	Church	Could not relocate	I, C
727B	Garage	Foundation only	C
727C	Root cellar	Foundation only	C
728A	Dwelling	Foundation only	C
729A	Undetermined	Foundation only	C
730A	School	Foundation only	C
730B	Dormitory	Could not relocate	C
730C	Dormitory	Could not relocate	C
730D	Church	Foundation only	C
730E	Dwelling	Could not relocate	C
730F	Dwelling	Could not relocate	C
730G	Dwelling	Could not relocate	C
730H	Dwelling	Foundation only	C
730I	Dwelling	Foundation only	C
730J	Dormitory	Foundation only	C
732A	Barn	Could not relocate	C

I = included in NRHP; E = individually eligible for inclusion in NRHP; C = contributing to historic district.

3.3.2.2 Objects

The American Museum of Science and Energy (AMSE), located at 300 S. Tulane Avenue, Oak Ridge, Tennessee, is the repository and interpretive center for objects/artifacts dating from the region's Native American, Euramerican settlement, and World War II periods. Many of the museum exhibits consist of photographs and narratives, although World War II-Era mementos and equipment used in the uranium refining process are also interpreted. In describing the World War II period and Oak

Ridge's military role, the museum outlines development of the uranium process and the role uranium played in bomb production.

The museum provides a thorough overview of the region prior to the establishment of Oak Ridge in 1942. Again, photographs predominate exhibit space, but artifacts (objects illustrating day-to-day life) dating from Native American and Euramerican settlement periods are present. Artifacts/ photographs pertaining to Oak Ridge history are also reposited with the DOE ORO Photography Department located in the AMSE.

3.3.2.3 Other Important Properties

In 1991, the city of Oak Ridge (Townsite) engaged the preservation consulting firm of Thomason and Associates to prepare a National Register nomination for all properties within the Townsite that are eligible for inclusion in the NRHP. Thomason and Murphy (1991) prepared a Multiple Property National Register Nomination that included a Cover Nomination for the entire area encompassing the original 23,684.99-ha (58,525.61-acre) ORR. Although the Cover Nomination dealt primarily with Manhattan Project and later properties within the Townsite, two pre-World War II structures not owned by DOE ORO were included in the NRHP as a result: the J. B. Jones house and the Luther Brannon house.

The J. B. Jones house is a one-and-one-half-story, three-bay, frame bungalow home that was built ca. 1920. The house has a rectangular plan, brick foundation, gable roof with asphalt shingles, and weatherboard siding; it is located on Old Edgemoor Road across the Clinch River from the Bull Run Steam Plant. The Luther Brannon house is a four-bay, onestory, stone bungalow with a gable roof. This house was built in 1941 and is located at the far east end of city of Oak Ridge on the Oak Ridge Turnpike (Thomason and Murphy 1991). The Luther Brannon house was built and lived in by Owen Hackworth until the government acquired it as part of the Manhattan Project. During the Manhattan Project the house was temporarily used by General Groves. Luther Brannon moved into the house in 1946.

3.3.3 Resources of Ethnic Importance

3.3.3.1 Sacred Sites

Sites 40AN21 (Crawford Farm Mounds),, 40AN22 (Freels Farm Mound), 40RE27 (Lee Farm Site), 40AN27 (Scarboro Creek Site), 40RE86, 40RE89 (Roberts Branch Site), 40RE90 (Roberts Branch Mound Site) and 40RE124 (Hensley Site Mound) are sites that could be considered sacred due to the presence of burial mounds and/or due to the fact that they were known to have contained human burials (see Fig. F.1 for location of sites). Some of these sites are now inundated and not accessible.

The absences of major archeological excavations within the ORR do not allow accurate evaluations of site function (i.e., campsite, village, and cemetery). It could be expected that some of the sites, exclusive of those previously mentioned, within the Clinch River

Valley and its major tributaries, such as Poplar Creek and East Fork Poplar Creek, will contain individual human interments or formal cemeteries.

With the acquisition of the numerous tracts of lands from individuals between October 1942 and March 1943, a large number of private cemeteries and those associated with churches were incorporated within the original ORR boundaries. A total of 69 cemeteries were identified by the AEC and assigned AEC numbers. A list of known cemeteries within the Oak Ridge area and a compilation of readable inscriptions were prepared by Marjorie Parsly (1985) as part of a Bicentennial project that was originally initiated by the Clinch Bend Chapter of the Daughters of the American Revolution and continued by the Oak Ridge Bicentennial Commission. Along with the inscriptions are the estimated number of graves within the cemeteries based on fieldstone markers and subsidence depressions. Of the 69 cemeteries on the AEC list, Parsly indicated that 8 could not be found despite attempts to relocate them. Three additional cemeteries that were either not located or were identified after the initial land acquisition period [e.g., the McKameyCarmichael Cemetery (AEC No. 69)] were also inventoried by Parsly. The cemeteries range in size from a single grave to more than 150 graves [e.g., New Bethel Baptist Church Cemetery (AEC 16), George Jones Memorial Baptist Church Cemetery (AEC No. 4), and the New Hope Baptist Church Cemetery (AEC No. 32)].

A total of 32 of the 69 AEC-identified cemeteries are located within the present boundaries of the ORR. All DOE ORO-owned cemeteries are listed in Table 3.7 and shown in Fig. 3.5. The cemeteries on the ORR are now maintained for DOE ORO by ETMC.

At least one National Cemetery including reinterments from the ORR has been identified just south of the Roane-Morgan County line (in Roane County) between Oliver Springs and Harriman. This cemetery, which encompasses approximately 1 acre adjacent to the Borum Cemetery, contains a memorial monument and an estimated 10-12 grave. It could be expected that more National Cemeteries are located in the areas surrounding Oak Ridge.

Table 3.7. Cemeteries on the ORR

AEC	Name	Tract No.	Acquired From
1	Gallaher	H-738	Rhea & Catherine Gallaher
1	Welcker	H-738	Rhea & Catherine Gallaher
2	Slave	H-738	Rhea & Catherine Gallaher
3	Ellis-Keath	H-719	Martha L. Gallaher
4	George Jones Memorial Baptist Church	H-727	Mt. Zion Baptist Church
5	New Zion Baptist Church	H-749	New Zion Church & Community
6	Vann	A-73	Solomon Vann et al.
7	Crawford Cumberland Presbyterian Church	H-718	TRS Cumberland Presbyterian Church

8	Thacker	A-72	W. H. Thatcher et al.
9	Burns (McFarling)	I-840	Frank Gann et ux.
10	Hembree	I-815	William M. Hembree Heirs
11	Smith (Gallaher)	I-863	R. L. Gallaher
12	Gallaher	J-939	Lucy E. Mountcastle
14	Gravel Hill	A-58	M. J. Atchley
15	Kent McClain	A-54	M. Kent McClain et ux.
16	New Bethel Baptist Church	A-16	Trustees of the Bethel Baptist Church
17	Cox-Copeland	I-846	J. D. Davis et ux.
19	Scott	J-968	Trustees of Methodist Church
22	Douglas Chapel	I-850	R. G. Kite et ux.
24	Friendship Baptist Church	G-603	Trustees of the Friendship Baptist Church
25	Crawford-Shannon	G-623	Whit. T. Shepherd et ux.
26	Mt. Vernon Methodist Church	B-183	TRS Mt. Vernon M. E. Church
32	New Hope Baptist Church	B-121	TRS New Hope Baptist Church
41	Scarbrough	E-438	Scarbrough Cemetery Trustees
58	Currier	I-830	J. D. Davis et ux.
59	Lindsay-Bleu	H-742	C. W. Gallaher et ux.
60	(Hembree-Magill)	H-761	Matilda Hembree Magill Heirs
62	Silvey	J-959	Harvey & Lula Guffey
63	Rather-Hembree	J-961	Jack Rather et ux.
67	Kirby	B-161	C. E. Brennen
68	Shelton	K-1012	W. H. Shelton et ux.
69	McKamey-Carmichael	J-953	Clarence Lawson et ux.

3.3.3.2 Traditional-Use Resources

No known traditional-use resources areas are located on the ORR.

3.3.3.3 Native American Cultural Items

Only one Native American burial is known to have been excavated and removed from the ORR under the jurisdiction of DOE ORO or its predecessor agencies. The material was excavated from a burial at site 40RE36 and consisted of the skeletal remains of a single adult male associated with one shell-tempered, cord-marked vessel. The recovered items were interpreted to be affiliated with a Late Mississippian Dallas Phase period of habitation and are now curated at the UTK McClung Museum under the title 40RE86, Trench 1, Feature ?.

3.3.3.4 Other Resource of Ethnic Importance

No resources of ethnic importance are known to have been recovered from the ORR.

3.3.4 Properties of Recent Scientific Importance

Because the recent history of the Oak Ridge area is so inextricably tied to the Manhattan Project, the Cold War Era, major achievements in scientific R&D, and the fact that most properties in the Oak Ridge area are less than 50 years old, all DOE-owned, municipally owned, and/or privately owned properties in the area that are associated with these events are considered to be of recent scientific significance and are addressed below.

3.3.4.1 Districts, Sites, Buildings, Structures, and Other Facilities

Seven separate architectural and historical assessments/surveys that address the historical significance and NRHP eligibility of Manhattan Project period and later properties have been conducted within the Oak Ridge, Tennessee, area. The surveys include the following:

- *Historic and Architectural Resources of Oak Ridge, Tennessee,* a Multiple Property National Register Nomination prepared by Thomason and Murphy (1991);
- *Historic and Architectural Analysis Oak Ridge Associated Universities Properties, Oak Ridge, Tennessee* (Thomason 1993), including the addendum to this report (Thomason 1993);
- *Architectural/Historical Assessment of the Oak Ridge National Laboratory, Oak Ridge Reservation, Anderson and Roane Counties, Tennessee* (Carver and Slater 1994);
- *Architectural/Historical Reconnaissance, K-25 Site, Oak Ridge Reservation, Oak Ridge, Tennessee* (Jacobs Environmental Restoration Team, 1998); and *Architectural/Historical Assessment of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee* [Tinker and Thomason (Draft)].

Each of these surveys identifies properties included or eligible for inclusion in the NRHP and is discussed in more detail in Sections 3.3.4.1.2 through 3.3.4.1.4 below.

3.3.4.1.1 City of Oak Ridge

As previously noted, the city of Oak Ridge (Townsite) engaged the preservation consulting firm of Thomason and Associates in 1991 to prepare a National Register nomination for all properties within the Townsite that are eligible for inclusion in the NRHP. Thomason and Murphy (1991) prepared a Multiple Property National Register Nomination that included a Cover Nomination for the entire area encompassing the original 23,684.99-ha (58,525.61-acre) ORR. As a result of the Multiple Property National Register Nomination, two historic districts, the Oak Ridge Historic District and the Woodland-Scarboro Historic District, were included in the NRHP. DOE ORO properties found to be contributing to these districts included Charlotte and Cheyenne Halls in the Oak Ridge Historic District and the ATDL in the Woodland-Scarboro

Historic District. The Turnpike Building, a DOE ORO property located on South Jefferson Circle, was found by Thomason and Murphy (1991) to be eligible for inclusion in the NRHP but was not included in the Oak Ridge Historic District due to the presence of numerous non-NRHP-eligible properties in the immediate vicinity around the building. The locations of the Oak Ridge and Woodland-Scarboro historic districts, the ATDL, and the Turnpike Building are shown in Fig. 3.6.

Other DOE ORO properties included in the NRHP as a result of the 1991 Multiple Property National Register Nomination, but not located within the Oak Ridge Historic District or Woodland-Scarboro Historic District, include the Oak Ridge Turnpike Checking Station, Bear Creek Road Checking Station (located on Scarboro Road), and the Bethel Valley Road Checking Station. Because the main building associated with the Bethel Valley Road Checking Station is located on Parcel B, which was transferred to the city of Oak Ridge in 1985, the main portion of the checking station no longer belongs to DOE ORO. However, the small concrete block shack on the south side of Bethel Valley Road that is associated with this checking station is still owned by DOE ORO. The location of the checking stations is also shown in Fig. 3.6.

3.3.4.1.2 ORNL

In March 1993, DuVall & Associates, Inc., was engaged to identify properties at ORNL that are included or eligible for inclusion in the NRHP. Fieldwork and research were undertaken by Martha Carver and Margaret Slater, architectural historians/historic preservation specialists working with DuVall & Associates, Inc. Carver and Slater, in conjunction with DOE ORO and ORNL staff and in consultation with the SHPO, concluded that the following properties at ORNL are eligible for inclusion in the NRHP: the ORNL Historic District, which includes facilities in the 2000 through 5000 areas of ORNL and contains 66 contributing structures and 62 noncontributing structures; Buildings 7001 and 7002 in the ORNL East Support Area; Building 7503, the Aircraft Reactor Experiment Building now referred to as the Molten Salt Reactor Experiment Facility; the Tower Shielding Facility, which includes Buildings 7700, 7701 through 7704, and 7751; and White Oak Lake and Dam. The Graphite Reactor (Building 3001) and the New Bethel Baptist Church and Cemetery (addressed in Section 3.3.2 above) were identified as properties previously included in the NRBP; the Graphite Reactor was also identified as a National Historic Landmark (NHL). More detailed information on ORNL properties included or eligible for inclusion in the NRHP is provided in Table 3.8, and the location of the properties is shown in Figs. 3.7 and 3.8.

Table 3.8. ORNL properties included or eligible for inclusion in the NRHP.

Bldg. No	Building Name	Year Built	NRHP Status
--	ORNL Historic District	--	E
Properties within ORNL Historic District Included or Eligible for Inclusion in NRHP			
2000	Solid State Laboratory Annex	1948	C
2001	Information Center Complex	1948	C
2003	Process Water Control System	1947	C
2019	Solar Energy Laboratory	1951	C
2624	Solid Waste Storage Area 1	1943	C
3000	13.8-kV Substation	1952	C
3001	Graphite Reactor	1943	C
3002	Filter House for 3001	1948	C
3005	Low Intensity Testing Reactor	1948	C
3008	Source & Special Material Vault	1943	C
3009	Pump House for 3010	1950	C
3010	Bulk Shielding Reactor Facility	1950	C
3012	Rolling Mill	1947	C
3013	Geological Disposal Laboratory	1948	C
3017	Chemical Technology Division' Annex	1952	C
3018	Exhaust Stack for 3003	1943	C
3019	(A) Radiochemical Processing Pilot Plant	1943	C
3019	(B) High Level Radiation Analytical Laboratory	1954	C
3020	Exhaust Stack for 3019	1943	C
3021	Turbine House for 3019	1943	C
3023	North Tank Farm	1943	C
3025	(E) Physical Examination-Hot Cells A	1951	C
3025	(M) Solid State Division Laboratory	1951	C
3026	(C) Radioisotope Development; Laboratory B	1943	C
3026	(D) Dismantling & Examination Hot Cells	1945	C
3027	Safeguard Nuclear Materials Vault	1955	C
3028	Radioisotope Production Laboratory A	1951	C
3029	Radioisotope Production Laboratory B	1951	C
3030	Radioisotope Production Laboratory C	1951	C
3031	Radioisotope Production Laboratory D	1951	C
3032	Radioisotope Production Laboratory E	1951	C
3033	Radioisotope Production Laboratory F	1951	C
3034	Radioisotope Area Services	1951	C
3036	Isotope Area Storage & Service	1951	C
3037	Operations Division Offices	1951	C
3038	Radioisotope Laboratory	1951	C
3039	Central Radioactive Gas Disposal Facility	1951	C
3042	Oak Ridge Research Reactor	1955	C

3044	Special Materials Machine Shop	1955	C
3074	Interim Manipulator Repair Facility	1951	C
308	Reactor Experiment Control Room	1953	C
3091	Filters for 3019	1950	C
3092	Off gas Facility	1956	C
3500	Instrumentation & Controls Division	1951	C
3501	Sewage Pumping Station	1949	C
3502	East Research Service Center	1950	C
3503	High Radiation Level Engineering	1948	C
3504	Geosciences Laboratory	1951	C
3506	Chemical Evaporator Building	1949	C
3507	South Tank Farm	1943	C
3508	Chemical Technology Alpha Laboratory	1944	C
3513	Settling Basin	1957	C
3515	Fission Product Pilot Plant	1948	C
3518	Process Waste Treatment Plant	1957	C
3523	Storage	1954	C
3524	Process Waste Systems Basin	1944	C
3550	Research Laboratory Annex	1943	C
3587	Instrument Laboratory Annex	1950	C
3592	Coal Conversion Facility	1952	C
4500N	Central Research & Administration	1952	C
4501	High Level Radiochemical Laboratory	1951	C
4505	Experimental Engineering	1952	C
4507	High-Radiation-Level Chemical Development Laboratory	1957	C
5000	Main Portal	1952	C
5500	High Voltage Accelerator Laboratory	1952	C
Properties Outside ORNL Historic District Included or Eligible for Inclusion in NRHP			
7001	General Stores	1948	E
7002	Garage & Iron Working Shop	1948	E
7503	Molten Salt Reactor Experiment Building	1951	E
7700	Tower Shielding Facility	1953	E
7701	Pool-Tower Shielding Facility	1953	E
7702	Control House Tower Shielding Facility	1954	E
7703	Hoist House Tower Shielding Facility	1954	E
7704	Control House No. 2 Tower Shielding Facility	1954	E
7751	Sentry Post No. 22 at Tower Shielding Facility Exclusion Fence	1947*	E
7813	White Oak Dam	1943	E
7846	White Oak Lake	1943	E

C=contributing to historic district; E=eligible for inclusion in NRHP; I=included in NRHP. *Structure thought to have been moved to its present location in 1952.

3.3.4.1.2 ETTP

The Jacobs Environmental Restoration Team was engaged by DOE ORO in 1994 to identify properties at the ETTP that are included or eligible for inclusion in the NRHP. The Jacobs Environmental Restoration Team, in conjunction with DOE ORO and ETTP staff and in consultation with the SHPO, concluded that the following properties at the ETTP are eligible for inclusion in the NRHP: (1) the ETTP Main Plant Historic District, which includes facilities within the main plant area and contains 120 contributing structures and 37 noncontributing structures, and (2) 11 structures that are not contiguous with the historic district. More detailed information on those properties at the K-25 Site that have been found to be eligible for inclusion in the NRHP is provided in Table 3.9, and the location of these properties is shown in Figs. 3.9 and 3.10.

Table 3.9. DOE ORO properties at the ETTP eligible for inclusion in the NRHP

Building No.	Site No.	Building Name	Year Built	NRHP Status
--	--	ETTP Main Plant Historic District	--	E
Properties within K-25 Main Plant Historic District Eligible for Inclusion in NRHP				
K-75	4OREl12	Gaseous Diffusion Process Building	1945	C
K-27	40RE113	Gaseous Diffusion Process Building	1945	C
K-29	40RE114	Gaseous Diffusion Process Building	1951	C
K-31	40RE115	Gaseous Diffusion Process Building	1951	C
K-33	40RE116	Gaseous Diffusion Process Building	1954	C
K-101	40RE117	K-25 Feed Purification Building	1944	C
K-131	40RE118	K-27 Feed Purification Building	1945	C
K-300-C-2	40RE119	Coolant Pumphouse	1945	C
K-300-C-3	40RE120	Coolant Drying Plant	1945	C
K-413	40RE121	K-27 Product Withdrawal	1945	C
K-601	40RE122	K-25 Tails Withdrawal System Building	1945	C
K-631	40RE123	Process Tails Facility	1945	C
K-633	40RE124	Test Loop Facility	1952	C
K-731	40RE146	Switch House	1944	C
K-732-101	40RE147	Synchronized Condenser Building	1946	C
K-732-102	40RE148	Synchronized Condenser Building	1946	C
K-732-103	40RE149	Synchronized Condenser Building	1946	C
K-733-A	40RE150	Oil House	1948	C

K-733-D	40RE151	K-731 West Valve House	1953	C
K-733-E	40RE152	East Valve House	1953	C
K-761	40RE158	K-31 Switch House	1951	C
K-762-204	40RE159	Sync Condensation Building	1950	C
K-763-A	40RE160	Oil Filter House	1951	C
K-763-B, -C	40RE161	Oil Storage Tank	1951	C
K-763-D	40RE162	East Sprinkler Valve House	1949	C
K-763-E	40RE164	West Sprinkler Valve House	1949	C
K-791	40RE166	K-33 Switch House	1952	C
K-791-N & SB	40RE167	K-33 Switch House	1952	C
K-794	40RE168	Oil Pumphouse	1952	C
K-795-A, -B, -C, -D	40RE169	K-33 Sprinkler Valve House	1954	C
K-801	40RE171	Intake Water Pumphouse	1944	C
K-801-A, -B	40RE172	Water Treatment Facility	1944	C
K-801-H	40RE173	K-25 Cooling Tower A	-	C
K-802	40RE174	K-25 Recirculating Cooling Water Pumphouse	1944	C
K-832	401ZE177	Recirculating Water Pumphouse	194G	C
K-833	40RE178	Recirculating Cooling Water Return Lift Station	1946	C
K-861	40RE179	K-31 Cooling Tower	1951	C
K-862	40RE180	K-31 Recirculating Cooling Water Pumphouse	1951	C
K-892	40RE182	Recirculating Water Pump House	1954	C
K-892-G/H	40RE183	K-33 Cooling Towers	1954	C
K-1001	40RE186	Administration Building	1944	C
K-1002	40RE187	Cafeteria	1945	C
K-1004-A,-B, -C, -E	40RE 189	Laboratory	1945	C
K-1004-D	40RE190	Isostatic Pressing	1945	C
K-1004-F	40RE191	Laboratory	1954	C
K-1004-H	40RE192	Gas Cylinder Storage Shed	1945	C
K- 1004-J	40RE193	Radio Chemical Lab	1948	C
K-1008-A	40RE199	Change House	1945	C
K-1008-B	40RE200	Change House	1945	C
K-1008-C	40RE201	Change House	1945	C
K-1008-D	40RE202	Change House	1945	C
K-1015	40RE203	Laundry	1944	C
K-1018	40RE204	Emergency Generator Building	1953	C
K-1019-5A	40RE205	Bus Shelter Portal 5	1954	C
K-1020	40RE206	Gate House 2 and Guard Building	1944	C
K-1021	40RE207	Fire Station	1944	C
K-1024	40RE208	Filter Test Facility	1945	C

K-1024-A, -B	40RE209	Instrument Shop	1945	C
K-1024-C	40RE210	Guard House	1944	C
K-1025-A	40RE211	Drum Storage Warehouse	1945	C
K-1025-B	40RE212	Drum Storage Warehouse	1945	C
K-1025-C	40RE213	Drum Storage Warehouse	1945	C
K-1025-D	40RE214	Drum Storage Warehouse	1945	C
K-1025-E	40RE215	Drum Storage Warehouse	1945	C
K-1028-40	40RE216	Gate House	1949	C
K-1028-45	40RE217	Gate House Portal 4	1944	C
K-1028-47	40RE218	Portal 5	1944	C
K-1028-50	40RE220	Portal 6	1944	C
K-1028-54	40RE221	Pay Point Portal 5	1944	C
K-1028-55	40RE222	Gate House Portal 7	1949	C
K-1028-56	40RE223	Portal 8	1950	C
K-1028-57	40RE224	Portal 2	1944	C
K-1028-59	40RE225	Gate House Portal 2 East	1944	C
K-1028-64	40RE226	Portal	1944	C
K-1030	140RE229	Electrical Maintenance	1945	C
K-1031	40RE230	Paint Storage Warehouse	1945	C
K-1034	40RE231	Plant Records Vault and Offices	1946	C
K-1035	40RE232	Maintenance Building	1945	C
K-1036	40RE233	Maintenance Spare Part Storage	1945	C
K-1036-A	40RE234	Drum Storage, Roof Shed	1952	C
K-1037	40RE235	Industrial Research Building	1945	C
K-1037-C	40RE236	Smelter House	1954	C
K-1039	40RE237	Telephone Exchange Building	1945	C
K-1040	40RE238	Fire Station 2	1945	C
K-1058	40RE242	Materials Warehouse	1945	C
K-1098	40RE246	Cement Storage House	1948	C
K-1098-D	40RE247	Equipment Shed	1949	C
K-1101	40RE249	Air Conditioning Building	1945	C
K-1102	40RE250	Fan & Transfer Building	1945	C
K-1102-A	40RE251	Fan & Transfer Building	1945	C
K-1102-B	40RE252	Fan & Transfer Building	1945	C
K-1131	40RE253	Air Conditioning Plant	1945	C
K-1132	40RE254	HF Tank Storage Building	1951	C
K-1133	40RE255	HF Tank Storage Building	1953	C
K-1134	40RE256	Drum Storage Shed	1953	C
K-1201	40RE258	Compressor Building	1944	C
K-1202	40RE259	Transfer Station & Oil Tank Enclosure	1944	C
K-1203-10	40RE260	High Water Lift Station	1945	C
K-1203-4	40RE261	Chlorination Containment Building	1945	C

K-1203-8	40RL262	Sewage Lift Station	1945	C
K-1207	40RE267	Air Humidity Condenser	1946	C
K-1231	40RE268	K-27 Machine Shop	1945	C
K-1301	40RE269	Fluorine Production Facility	1944	C
K-1302	40RE270	Fluorine Storage Building	1944	C
K-1303	40RE271	Fluorine Facility	1945	C
K-1400	40RE272	Engineering Office Building	1954	C
K-1401	40RE273	Conditioning Building	1944	C
K-1402	40RE274	Electrical Control Building	1944	C
K-1404	40RE275	Acid Storage Building	1944	C
K-1407	40RE277	Acid Neutralization Plant	1944	C
K-1408-A	40RE278	Nitrogen Plant	1944	C
K-1410	40RE279	K-27 Cascade Maintenance Building	1945	C
K-1413	40RE280	Engineering Laboratory	1952	C
K-1414	40RE281	Garage	1949	C
K-1415	40RE282	Material Storage Building	1952	C
K-1416	40RE283	Chemical Storage Building	1952	C
K-1420	40RE284	Decontamination Building	1954	C
K-1421	40RE285	Incinerator Building	1954	C
K-1422	40RE286	Storage Building	1953	C
K-1501	40RE287	Heating Plant	1945	C
Properties Outside K-25 Main Plant Historic District Eligible for Inclusion in NRHP				
K-716	40RE138	Poplar Creek Sampling Pier	1946	E
K-766	40RE165	Storage Shed	1944	E
K-891	40RE181	Raw Water Pumphouse	1954	E
K-901	40RE185	RCW Intake Facility	1944	E
K-1045	40RE239	Maintenance Shop/Hazardous Materials	1944	E
K-1204-10	40RE263	(3-11) Sewage Lift Station	1945	E
K-1206-D	40RE264	Fire Water Tank & Valve	1953	E
K-1513	40RE288	Pumphouse	1944	E
K-1515	40RE289	Sanitary Water Treatment Plant	1944	E
K-1529	40RE291	Sanitary Water Storage Tank	1944	E
K-1530	40RE292	Sanitary Water Storage Tank	1944	E

C=contributing to historic district; E=eligible for inclusion in NRHP.

3.3.4.1.4 Y-12 Plant

In February 1995, Thomason and Associates was engaged to identify properties at the Y-12 Plant that are included or eligible for inclusion in the NRHP. Thomason and Associates, in conjunction with DOE ORO and Y-12 staff and in consultation with the SHPO, concluded that the Y-12 Plant encompasses a historic district containing 92 contributing structures and 53 noncontributing structures. In addition, four structures (Buildings 1405, 1501-1, 9213, and 9712) were found to be eligible for inclusion in the

NRHP but are outside the boundary of the historic district. Buildings 9731 and 9204-3 were recommended for NHL status based on their roles in uranium enrichment and the production of stable isotopes. A total of 248 buildings were individually surveyed, and the remaining 283 buildings were identified through "type" (i.e., those buildings whose similarities in use and building material allow them to be grouped and identified through typology). More detailed information on those properties at the Y-12 Plant that have been found to be eligible for inclusion in the NRHP is provided in Table 3.10, and the location of these properties is shown in Fig. 3.11.

Table 3.10. DOE ORO properties at the Y-12 Plant eligible for inclusion in the NRHP

Bldg. No.	Building Name	Year Built	NRHP Status
--	Y-12 Plant Historic District	--	E
Properties within Y-12 Plant Historic District Eligible for Inclusion in NRHP			
9201-1	Alpha-1	1943	C
9201-2	Alpha-2	1943	C
9201-3	Alpha-3	1943	C
9201-4	Alpha-4	1944	C
9201-5	Alpha-5	1944	C
9202	Development Facility	1943	C
9203	Development Facility	1944	C
9204-1	Beta-1	1944	C
9204-2	Beta-2	1943	C
9204-3	Beta-3	1944	C
9204-4	Beta-4	1945	C
9205	Development Laboratories	1943	C
9206	Uranium Processing Facility	1944	C
9207	Biology	1945	C
9208	Biology	1944	C
9210	Biology	1945	C
9211	Biology	1945,65	C
9212	Production	1945	C
9215	Production	1956	C
9401-1	Engine Test Cells	1943	C
9401-2	Plating Shop	1943	C
9401-3	Steam Plant	1954	C
9404-4	Pump House	1943	C
9404-6	Pump House	1943	C
9404-7	Storage Pumphouse	1943	C
9404-9	Rubber Shop	1944	C
9404-10	Pump House	1944	C
9404-12	Pump House	1944	C
9404-13	Pump House	1944	C

9404-16	Utilities	1954	C
9404-17	Pump House	1954	C
9404-18	MW Plant	1954	C
9416-4	Utilities - Water Treatment	1943	C
9418-1	Tank Building	1955	C
9418-6	Utilities - Tank Building	1955	C
9419-1	Beryllium Facility	1944	C
9419-2	Utilities	1944	C
9510-2	Disposal Pit	1944	C
9610	Electrical Offices	1945	C
9616-3	Chemical Unloading Station	1946	C
9620-2	Z Oil Filter & Pump House	1944	C
9704-1	Offices & Computer Room	1943	C
9704-2	Offices - Plant Manager	1943	C
9706-2	Medical & Offices	1944	C
9710-2	Post #21, Fire Department	1944	C
9711-1	Library & Offices	1943	C
9720-1	Stores & Maintenance	1944	C
9720-2	Maintenance, Stores	1944	C
9720-6	General Plant Maintenance	1944	C
9720-7	BM Stores	1955	C
9720-8	Stores, Receiving & Shipping	1954	C
9720-9	R C R A Warehouse	1954	C
972042	Warehouse - Machine Tool	1954	C
9720-13	Plant Maintenance Warehouse	1954	C
9720-17	Uranium Chemistry	1956	C
9722-2	Emergency Power Facility	1944	C
9723-4	Changehouse	1943	C
9723-24	Changehouse	1945	C
9723-25	Changehouse	1945	C
9727-3	Nitrogen Converter	1955	C
9728	Laundry	1943	C
9729	Stores C02, Shipping & Receiving	1943	C
9731	Offices & Labs	1943	C
9732-2	Storage Building	1944	C
9732-3	Experimental Engineering	1944	C
9733-1	Engineering - Offices	1944	C
9733-2	Engineering - Offices	1943	C
9733-3	Engineering - Offices	1943	C
9734	Engineering - Offices & Laboratory	1943	C
9735	Research Services	1943	C
9736	Engineering - Offices	1943	C
9737	Electrical Shop	1943	C
9738	General Shops	1943	C

9739	Engineering - Offices & Reproduction	1943	C
9743-2	Animal Quarters	1944	C
9752	Utilities	1944	C
9764	Offices	1944	C
9767-2	Utilities	1944	C
9768	Utilities	1944	C
9770-1	Emergency Generator	1944	C
9770-2	Radiation Source Building	1945	C
9802-2	Utilities	1954	C
9803	Utilities	1955	C
9804	Utilities	1954	C
9805-1	Uranium Chemistry	1956	C
9977	Utilities (Nitrogen Station)	1943	C
9977-1	Utilities (Nitrogen Station)	1955	C
9987	Records Storage Vault	1945	C
9996	Maintenance & Dispatching	1950	C
9998	Maintenance & Machine Shop	1954	C
Properties Outside Y-12 Plant Historic District Eligible for Inclusion in NRHP			
1405	Filter Plant	1943	E
1501-1	Elza Switchyard Equipment Room	1944	E
9213	Development & Training	1947	E
9712	Garage	1944	E

C=contribution to historic district; E=eligible for inclusion in NRHP

3.3.4.1.5 Oak Ridge Associated Universities

In January 1993, ORAU (also known as ORISE) engaged the preservation consulting firm of Thomason and Associates to conduct an architectural and historical assessment/survey of properties that ORAU manages and/or owns. Of the 30 properties evaluated, 26 are owned by DOE ORO. The results of the survey are contained in *Historic and Architectural Analysis Oak Ridge Associated Universities Properties, Oak Ridge, Tennessee* (Thomason 1993). Through the survey process, Thomason (1993) identified two properties managed by ORAU-the Freels Cabin and the ATDL-that were previously included in the NRHP. Management responsibilities for the Freels Cabin have been transferred to UT-Battelle.

3.3.4.2 Objects

Although most DOE ORO properties on ORR are of recent scientific significance and may contain objects such as major pieces of scientific equipment or apparatus, an inventory of such objects has not yet been developed. Survey and inventory efforts planned for the future are anticipated to involve the evaluation of specific facilities and/or structural components such as objects of recent scientific significance.

3.3.4.3 Other Properties

Properties of recent significance in the Oak Ridge area that are not owned by DOE ORO are primarily located within the Oak Ridge and Woodland- Scarboro historic districts. These properties are not technically scientific facilities but are associated with the Manhattan Project and later events and, therefore, are noted here. The resources include a variety of World War II and post-World War II housing (e.g., homes, dormitories, and apartments), churches, commercial buildings, and schools. Several good examples of these types of properties are the Chapel on the Hill, the Alexander Inn, and Elm Grove Center in the Oak Ridge Historic District. Overall, the Oak Ridge Historic District contains 3714 contributing structures and 1363 noncontributing structures, and the Woodland-Scarboro Historic District contains 622 contributing structures and 294 noncontributing structures.

3.4 CRM ACCOMPLISHMENTS

3.4.1 Cultural Resource Records and Reports

3.4.1.1 Cultural Resource Site Records

Until now, most site records and documentation for DOE ORO-owned historical and archeological sites have been prepared by outside consultants with expertise in specific fields of study. Site data has been collected in accordance with current Tennessee Historical Commission (THC) and Tennessee Division of Archaeology (TDOA) guidelines, which are updated periodically and appropriately recorded on standard Tennessee Historical and Architectural Resource Forms and Tennessee Archaeological Site Forms. The Smithsonian Institution numbering system-a simple alphanumeric system that provides information as to state, county, and sequential site number recorded in the county-is used for site designation. For example, a number such as 40AN100 would indicate that the site is located in Tennessee (i.e., the number 40 indicates the numerical order of the states as arranged alphabetically where Tennessee is the fortieth), Anderson County (AN = county abbreviation), and site 100 (sequential number based on previously recorded sites in the county).

I he standard historical and archeological resource forms contain locational data along with other information such as data relevant to architectural features, historical or cultural affiliation, degree of disturbance, artifact inventory, and site/facility descriptions. Some forms are prepared by computer through word processing or database programs, and hard copies are submitted to the THC/TDOA for evaluation and the assignment of permanent site numbers.

Field notes that have been prepared by consultants as a prelude to completion of standardized forms are not generally submitted to the THC/TDOA at the Phase I reconnaissance level. Phase II testing and Phase III mitigation field notes, photographs and negatives, maps, and forms, along with cultural material and a copy of the report to the curating agency, are submitted to the THC/TDOA.

Although a number of historical and archeological sites on the ORR have been assigned permanent site numbers, DOE ORO has not maintained a complete site records system and therefore has not maintained a site record cataloging system for the storage, access, and security of site records. However, a GIS using Map lnfo. software has been developed for the ORR that, aside from location data, contains information such as date of construction, structure/site number and name, cultural affiliation, and NRHP eligibility. The GIS data is maintained on a networked server that allows the data to be shared among cultural resource coordinators on the ORR, the DOE ORO CRM Coordinator, and others with a justified need to access the data (e.g., site and facility planners). Although this data is maintained on a networked server, the data is inaccessible to the general public through system securities. One of DOE ORO's short-term goals is to obtain copies of all site records curated by the THC/TDOA for ORR sites and establish a complete site records system.

3.4.1.2 Cultural Resource Project Records

Cultural resource projects carried out to _date by DOE ORO have consisted of (1) architectural/ historical assessments of World War II and post :World War II scientific facilities, (2) Phase I archeological surveys of proposed development areas to identify cultural resources that could be potentially impacted by proposed DOE ORO actions, (3) evaluations of known pre-World War II structures and prehistoric archeological sites on the ORR, (4) Section 106 Archeological and Historical Reviews (Project Summaries) for proposed actions, and (5) some Phase II testing of sites. Project records may include copies of field notes taken by professional historians/archeologists, the reports generated as a result of the specific projects, and documentation prepared pursuant to regulatory compliance activities associated with projects (e.g., Section 106 documentation and letters of consultation).

Another type of cultural resource project that has been performed by DOE ORO in recent years has involved the preparation of Section 110 documentation as required by stipulations set forth in Memorandums of Agreement (MOAs) for projects that would have adverse effects on properties included and/or eligible for inclusion in the NRHP. These projects have involved the preparation of historical descriptions of the properties that would be impacted, a compilation of maps/drawings (present and historical, if available) showing the locations/layout of the potentially impacted properties, and a compilation of photographic documentation (present and historical photographs, if available). Copies of all Section 110 documentation are filed under the MOAs for which they were prepared, along with any other project documentation such as Archeological and Historical Reviews (AHRs) and letters of consultation.

Project records are maintained by the individual sites (e.g., ORNL, the ETTP, and the Y-12 Plant) and/or prime contractors (e.g., ORAU) that are responsible for coordinating and preparing project documentation and by the DOE ORO CRM Coordinator. Copies of project records are also maintained by the Environmental Compliance (EC) Document Center at the Y-12 Plant, which serves as a central repository for cultural resource project records. Databases containing information pertinent to cultural

resource projects are also maintained, both at the site/prime-contractor level and by the EC Document Center, and are used to track the status of documentation associated with cultural resource projects.

3.4.1.3 Other Cultural Resource Records

No other types of cultural resource records are maintained by DOE ORO.

3.4.1.4 Cultural Resource Reports

3.4.1.4.1 Standardized Report Outlines

DOE ORO has not prepared internal reports on cultural resource management activities but has participated in the preparation of the *Secretary of the Interior's Report to Congress on Archaeological Activities* through the completion of an annual questionnaire that is submitted to the U.S. Department of the Interior. DOE ORO does use standardized outlines for the preparation of Section 106 documentation used in the SHPO and Advisory Council on Historic Preservation (Advisory Council) consultation process. Standardized report outlines for archeological reconnaissance surveys and architectural/historical assessments have not been prescribed by DOE ORO to date. However, DOE ORO does recognize the need for such standardization to simplify document tracking and review and consultation with the SHPO and Advisory Council. Therefore, standardized report outlines have been developed as part of this CRMP (see Section 4.1.4.1 and Appendix E below).

3.4.1.4.2 Report Library

All currently available cultural resource site records, project records, and reports within the DOE ORO system in Oak Ridge are maintained by the individual sites and/or by prime contractors that are responsible for coordinating and preparing cultural resource projects and documentation. In addition, copies of records and reports are maintained at the EC Document Center, which serves as a central report/document library for DOE ORO cultural resource management and compliance activities.

3.4.2 Inventory

4.4.2.1 Archival Searches

Archival searches are an integral part of cultural resource investigation and compliance activities conducted by DOE ORO. Map and report files at the THC and TDOA may be reviewed for additional information Archival searches are an integral part of cultural resource investigation and compliance activities conducted by DOE ORO. Map and report files at the THC and TDOA may be reviewed for additional information.

3.4.2.2 Ethnographic Fieldwork

Other than efforts made to determine the cultural affiliation of archeological sites found on the ORR, little ethnographic fieldwork has been conducted in the Oak Ridge area. In fact, most inhabitants of East Tennessee were of Native American and Euramerican heritage, and it was not until recently (i.e., Manhattan Project and later) that the cultural diversity of the Oak Ridge area became what it is today.

Perhaps the most extensive ethnographic fieldwork completed to date is that of Marjorie Parsly (1985). Parsly compiled an inventory of known cemeteries in the Oak Ridge area that were acquired by the U.S. Government during the original Manhattan Project land-acquisition period of 1942-1943. Parsly's inventory included 69 cemeteries with AEC inventory numbers, 8 of which could not be relocated, and 3 other cemeteries that were, either not located or were identified after the initial land acquisition period. Parsly's inventory also included a compilation of approximately 1700 readable inscriptions found on gravestones within the cemeteries. A complete listing of cemeteries presently owned by DOE ORO was presented in Table 3.7, and the location of the cemeteries was shown in Fig. 3.5.

3.4.2.3 Structure and Facility Surveys

Seven major structure and facility surveys have been conducted in the Oak Ridge area in recent years to inventory and identify properties that are included or eligible for inclusion in the NRHP. These surveys include the following:

- *Historic and Architectural Resources of Oak Ridge, Tennessee,* a Multiple Property National Register Nomination prepared by Thomason and Murphy (1991);
- *Historic and Architectural Analysis, Oak Ridge Associated Universities Properties, Oak Ridge, Tennessee* (Thomason 1993), including the addendum to this report (Thomason 1993);
- *Architectural/Historical Assessment of the Oak Ridge National Laboratory Oak Ridge Reservation, Anderson and Roane Counties, Tennessee* (Carver and Slater 1994);
- *Architectural/Historical Reconnaissance, K-25 Site, Oak Ridge Reservation, Oak Ridge Tennessee* (Jacobs Environmental Restoration Team, 1998); and
- *Architectural/Historical Assessment of the Y-12 Plant, Oak Ridge Reservation, Anderson County, Tennessee* [Tinker and Thomason (Draft)].

One other survey that involved the evaluation of a significant number of structures was conducted by Fielder, Ahler, and Barrington (1977) titled *Historic Sites Reconnaissance of the Oak Ridge Reservation, Tennessee.* Although this survey involved identification and evaluation of DOE ORO-owned properties/structures, it did not specifically involve the evaluation of the properties/ structures for NRHP eligibility.

The first major survey in the Oak Ridge area that involved the evaluation of properties for NRHP eligibility was that conducted by Thomason and Murphy (1991) for the city of Oak Ridge, which resulted in the preparation of a Multiple Property National

Register Nomination containing a Cover Nomination for the area encompassed by the original 23,684.99-ha (58,525.61-acre) ORR. The Cover Nomination established three Historic Context Periods for the area: (1) The Valley Before World War II, ca. 1800-1942; (2) The World War II Era, 1942-1945; and (3) The Postwar Era, 1945-1959. Through an extensive evaluation of resources such as war-time and postwar housing, schools, churches, and commercial buildings, Thomason and Murphy were able to define two areas within the city of Oak Ridge that retain enough integrity to establish historic districts: the Oak Ridge Historic District and the Woodland-Scarboro Historic District.

Following the NRHP work conducted for the city of Oak Ridge, ORAU engaged the preservation consulting firm of Thomason and Associates in 1993 to evaluate properties owned and/or managed by ORAU for NRHP eligibility. Using the Historic Context Periods established in the Cover Nomination prepared by Thomason and Murphy (1991) as a basis, Thomason (1993) identified two DOE ORO-owned properties managed by ORAU, the ATDL and the Freels Cabin, to be included in the NRHP.

ORNL engaged the cultural resources services firm of DuVall & Associates, Inc., in 1993 to evaluate and identify properties at ORNL that are included or eligible for inclusion in the NRHP. Using the Cover Nomination prepared by Thomason and Murphy (1991) as a basis, DuVall & Associates, Inc., developed a historic context for ORNL within which a period. of significance of 1943 to 1957 was defined (Carver and Slater 1994). Fieldwork and research undertaken by DuVall & Associates, Inc., at ORNL involved (1) reviewing ORNL documents such as current and past building directories, an ORNL historic document written in 1963 (Thomason 1963), ORNL division histories prepared as part of ORNL's fiftieth anniversary, and a general history of ORNL prepared in 1992 by Leland Johnson and Daniel Schaffer; (2) reviewing ORNL Engineering records and facilities; (3) describing the architectural features of ORNL facilities and noting their condition and any alterations that have been made to the facilities; and (4) viewing the interiors of selected facilities.

Carver and Slater (1994), in conjunction with DOE ORO and ORNL staff and in consultation with the SHPO, concluded that the following properties at ORNL are eligible for inclusion in the NRHP: the ORNL Historic District, which includes facilities in the 2000 through 5000 areas of ORNL and contains 66 contributing structures and 62 noncontributing structures; Buildings 7000 and 7001 in the ORNL East Support Area; Building 7503, the Aircraft Reactor Experiment Building now referred to as the Molten Salt Reactor Experiment Facility; the Tower Shielding Facility, which includes Buildings 7700, 7701 through 7704, and 7751; and White Oak Lake and Dam. Carver and Slater also identified the Graphite Reactor (Building 3001) and the New Bethel Baptist Church and Cemetery as properties previously included in the NRHP and indicated that the Graphite Reactor was also designated an NHL in 1966 by the National Park Service.

DOE ORO engaged the Jacobs Environmental Restoration Team in 1994 to evaluate and identify properties at the ETTH that are included or eligible for inclusion in the

NRHP. The Jacobs Environmental Restoration Team developed a historic context for the ETTP within which a period of significance of 1944 to 1964 was defined (Jacobs Environmental Restoration Team 1998). During this period, the gaseous diffusion process was employed at the ETTP to produce highly enriched uranium for use in atomic weapons. The Jacobs Environmental Restoration Team, in conjunction with DOE ORO and ETTP staff and in consultation with the SHPO, concluded that the following properties at the ETTP are eligible for inclusion in the NRHP: (1) the ETTP Main Plant Historic District, which includes facilities within the main plant area and contains 120 contributing structures and 37 noncontributing structures and (2) 11 structures that are not contiguous with the historic district.

The Y-12 Plant engaged the preservation consulting firm of Thomason and Associates in 1995 to evaluate and identify properties at the Y-12 Plant that are included or eligible for inclusion in the NRHP. Using the Cover Nomination prepared by Thomason and Murphy (1991) as a basis, Thomason and Associates developed a historic context for the Y-12 Plant within which a period of significance of 1943 to 1958 was defined (Thomason and Associates 1996). The period of significance includes (1) the early years of operations at the plant when uranium enrichment was the plant's primary function, (2) the initial $300 million spent on a building program that lasted from 1943 to about 1954, when the AEC opened roads on the ORR to the public, and (3) the postwar reduction in uranium enrichment processes and staff in 1947 that led to a change in focus from production to research at Y-12 Plant facilities. During the late 1950s to early 1960s, management of the Y-12 Plant re-examined its mission and broadened its development and production base to maintain viability in an ever-increasingly competitive budget process. Thomason and Associates chose the 1958 cutoff in the period of significance during this interval in Y-12 Plant history because it represents a look to the future of the plant rather than a closure on the past.

Thomason and Associates, in conjunction with DOE ORO and Y-12 staff and in consultation with the SHPO, concluded that the Y-12 Plant encompasses a _historic district containing 92 contributing structures and 53 noncontributing structures. In addition, four structures (Buildings 1405, 1501-1, 9213, and 9712) were found to be eligible for inclusion in the NRHP but are outside the boundary of the historic district. Buildings 9731 and 9204-3 were recommended for NHL status based on their roles in uranium enrichment and the production of stable isotopes.

ORNL engaged the cultural resources services firm of DuVall & Associates, Inc., in 1995 to evaluate all previously recorded and inventoried pre-World War Il structures and archeological sites on the ORR for NRHP eligibility. Previous work conducted by Fielder (1974) and Fielder, Ahler, and Barrington (1977) served as the primary basis for the relocation and evaluation of properties. A total of 254 Historic period pre-World War II structures and 44 prehistoric sites were evaluated. During the evaluation, an attempt was made to evaluate the remains of the properties without performing intrusive sampling activities. If cultural material was observed during the field review, the general nature of the material was recorded in the field notes. The physical remains and the degree of previous disturbance to the properties, if any, were the primary factors used in the

evaluation (DuVall and Souza 1996). Of the 254 pre-World War II structures evaluated, 35 were determined to be individually eligible for inclusion in the NRHP, 6 of which were found to be previously included in the NRHP as a result of the Multiple Property National Register Nomination prepared by Thomason and Murphy (1991). DuVall and Souza (1996) also identified two areas of the ORR, based upon the nature and concentration of the structures present that appear to retain enough integrity to establish historic districts: the Wheat Community Historic District and the Gravel Hill Historic District.

3.4.2.4 Structure and Facility Survey Status

DOE ORO has made substantial efforts to inventory and evaluate structures and facilities under its jurisdiction for NRHP eligibility. Subsequently, all three of the DOE ORO plant sites on the ORR, and the ORISE properties have been evaluated against established NRHP criteria. The ORNL, ORISE properties have been evaluated against established NRHP criteria. The ORNL, ORISE, and K-25 surveys have been accepted by the Tennessee SHPO. The Y-12 survey has been completed and is pending submittal to the SHPO.

3.4.2.5 Archeological Surveys

A number of reconnaissance-level surveys and Phase II test excavations have been conducted on the ORR, with many sufficiently documented in a management plan prepared by DOE (1983). The map location of reported prehistoric archeological sites on the ORR is shown in Fig. F.1.

The first reported reconnaissance of the area was conducted along portions of the Clinch River by Cyrus Thomas (1894) and reported in the Bureau of American Ethnology. Thomas reported a visit to the Lee Farm Site (40RE27) and a visit to Jones Island (40RE28).

Two Woodland mound sites located on the reservation, the Crawford Farm Mounds (40AN21) and the Freels Farm Mounds (40AN22), were excavated by Webb (1938) during the construction of the Norris Dam.

Construction of the Watts Bar Reservoir resulted in a survey of portions of the Clinch River, mainly in the narrow bench areas and terraces along the main channel. Numerous sites along the course were identified, facilitated by almost ideal survey conditions (Nash 1941).

Construction of the Melton Hill Dam resulted in several investigations by UTK (McNutt and Graham 1961; McNutt and Fisher 1960): sites 40AN2 (UT Farm Site), 40AN8 (Freels Bend Site), and 40AN20 (Bull Bluff Site). The most extensively occupied of these appeared to be 40AN20, which contained Woodland, Mississippian, and Euramerican artifacts.

During 1972, archeological investigations were initiated on the proposed site of the CRBRP. Schroedl (1972) relocated sites 40RE104-40RE108, originally recorded during Nash's 1941 survey. Additionally, four historic Euramerican farmsteads and a cemetery were recorded.

A follow-up study of the CRBRP site located on the ORR was conducted by Schroedl (1974) following the acquisition of 1940 survey maps from TVA. The major emphasis of the survey was the relocation of the structural areas and comparison of current conditions to those at the time of the acquisition of the ORR by the Corps in 1942. The findings indicated that some of the original locations were intact with all structures present while others contained no evidence of former structure locations.

Surveys by Fielder (1974) and Fielder, Ahler, and Barrington (1977) of specific areas of the ORR focused on the prehistoric and historic sites, respectively. The 1974 survey relocated and identified 45 sites dating from the Paleo-Indian through the Historic Euramerican Period with no conclusive evidence for any historic Native American occupations within the ORR. The 1977 survey focused on the numerous structures and former structure areas partially noted in previous surveys. A total of 415 structures ranging from houses to barns and sheds were identified. Of these, one structure (the Freels Cabin) was considered eligible for inclusion in the NRHP (Fielder 1974).

A survey of approximately 1400 acres for the proposed Tennessee Synfuels Associates site was conducted by GAI, Inc., during the summer of 1981. The survey and testing program relocated and evaluated five previously recorded sites. The overall results included the identification of three cemeteries and associated residential areas and one house complex. Prehistoric site 40RE86 produced undisturbed cultural features and was recommended for inclusion in the NRHP (GAI 1981).

Jolley (1982) conducted a second CRBRP site survey of those areas not evaluated in Schroedl's 1972 survey. The utilization of a thorough shoreline survey, a deep-testing program along the floodplain and terraces, and a shovel-test strategy resulted in the identification of 17 additional sites.

An archeological assessment of two historic house sites for the purpose of NRHP-eligibility evaluation was conducted on the Jenkins House site (40RE188) and the Jones House site (40RE189) (Faulkner 1988). The assessment utilized subsurface testing to determine if artifact concentrations were present on the sites. The Jones House site and support structures were determined to be eligible for inclusion in the NRHP due to the relatively intact nature of the site and its early occupation date (ca. 1820). On the other hand, the Jenkins house had been severely affected by modern intrusions and was not considered eligible for inclusion.

A survey of the Solid Waste Storage Area (SWSA) 7 encompassed approximately 220 acres of extremely steep and deflated uplands and the low floodplain of Melton Branch (DuVall 1992a). Shovel tests revealed a low density of cultural material over a 15 x 15-meter area on a low terrace near Melton Branch. Shovel tests also revealed a very

deflated and eroded landform. Based on the shovel tests, site 40RE194 was determined to be an ephemeral encampment of unknown cultural affiliation. No further archeological investigations were recommended for this site.

An approximately 40-acre reconnaissance of the Remotely Handled Transuranic Waste Storage Area site encompassed the Jenkins House site (40RE188) (DuVall 1992b). However, the house site area was scheduled to be excluded from the project area.

Several surveys associated with borrow areas and proposed construction projects on the ORR were conducted in 1991 and 1992. They include the approximately 425-acre Health Physics Research Reactor-Dosimetry Applications Research facility and Tower Shielding Borrow area (DuVall 1991), the approximately 78-acre Advanced Neutron Source Project (DuVall 1991a), the approximately 6500-linear-foot Liquid Low-Level Waste Collection and Transfer System (DuVall 1991 b), the 1-acre Melton Valley Recontour site (DuVall 1991 c), a reconnaissance of the M. K. Ferguson Lay-Down AreafWest End Treatment Facility (DuVall 1992d), the Pond Waste Management Project on the K-25 Complex (DuVall 1992m), a survey of the Waste Area Grouping (WAG) 11 (White Wing Scrap Yard site (DuVall 19921), a reconnaissance of the RH-TRU Waste Storage Basin and Melton Valley Storage Tank Capacity Increase Project (DuVall 1992b), an approximately 150-acre reconnaissance of the WAG 2 (White Oak Lake and White Oak Creek floodplain) (DuVall 1992e), a reconnaissance of the approximately 6-acre Low-Level Waste Solidification Retrievable Cask Interim Storage Facility II (DuVall 1992f), a reconnaissance of the Radio Repeater Facility (DuVal11992g), the East End Monitoring Station (DuVall 1992h), the Y-12 Plant Chestnut Ridge Access Road (DuVall 1992i), and the Y-12 Plant Drilling Staging Area (DuVall 1992j). No archeological sites were identified on any of the project areas due to large areas of prior disturbance or steep, deflated slopes (in most cases).

A number of negative-findings reconnaissance-level surveys were conducted in 1993, including the approximately 1-acre Radiochemical Engineering Development Center (DuVall 1993); the 4000-linear-foot Hydrofracture Facility Pipeline Upgrade (DuVall 1993a); the 1-acre Office Building, 1500 Area site (DuVall 1993b); the 1-acre Waste Management Health and Hygiene Support Facility (DuVall 1993c); approximately 1.2 miles of TVA Power Line Relocation (DuVall 1993d); and the 3-acre Environmental Safety and Health Compliance and Training Building (DuVall 1993e).

A reconnaissance-level survey was conducted on approximately 100 acres (three tracts) on the southeast slope of Pine Ridge for the proposed ORR Storage Facility (Bentz 1992). Intrusive testing by the placement of 257 shovel tests identified two pieces of chert debitage. No additional archeological investigations were recommended for the tracts.

A reconnaissance of the approximately 100-acre Center for Biological Sciences encompassed a Historic period house site on the northwest corner of the project area (DuVall 1993f).

The site had been originally identified during the Fielder et al. (1977) survey of historic sites within the ORR. This site (Inv. No. 5A) was not considered significant at the time due to the physical remains and the probable twentieth century origin. The latest reconnaissance identified bulldozed brick chimney remains, a partial stone-lined cellar, stone-lined spring, concrete root or storm cellar, and several piers related to the barn. Artifacts observed included numerous "Mason-" type canning jars, glass, and screw-cap bottles. Based on the physical remains, amount of disturbance, and twentieth century artifacts, no additional archeological investigations were recommended for the site.

An archeological reconnaissance of approximately 24 miles of floodplain and low terraces along the East Fork Poplar Creek was conducted in 1992 as part of an environmental restoration project (DuVall 1992k). The survey was limited to the floodplain and the low terrace areas along East Fork Poplar Creek. The reconnaissance which was non intrusive in scope due to the potential for contamination identified two prehistoric (40AN67 and 40AN68) and six Historic period sites (40RE195- 40RE199). Of the eight sites, 40RE195 (mill site, structure 975C) and 40RF197 (nineteenth century house site, 939A) were considered eligible for inclusion in the NRHP pursuant to 36 CFR 60.4.

Archeological surveys have recently been conducted at ORNL (X-10) (DuVall 1994). An archeological evaluation of the developed areas and areas immediately adjacent to developed areas included (1) ORNL main facilities complex in Bethel Valley; (2) Tower Shielding Facility; (3) Dosimetry Applications Research Facility and Health Physics Research Reactor Facility; (4) HFIR Experiment Facility; (5) Old and New Hydrofracture Facilities; (6) Hazardous Waste Management Area; (7) Experimental Gas-Cooled Reactor Facility (now Robotics and Process Systems Complex); (8) Aircraft Reactor Experiment Facility (now Molten Salt Reactor Experiment Facility); (9) Homogenous Reactor Experiment Facility (now Nuclear Safety Pilot Plant); (10) Global Change Research Facility; (11) various ORNL WAGS; and (12) Spallation Neutron Source.

The archeological reconnaissance’s were limited in scope to evaluate the potential for surviving archeological sites within these areas. It was determined early in the reconnaissance that the construction areas both in the ORNL main facilities complex and in the satellite areas had been severely damaged with major landform alterations. These surveys consisted of non intrusive sampling and were based on visual observations of the existing conditions. The findings were negative with no evidence of or potential for surviving archeological resources within the investigated areas.

An archeological reconnaissance of portions of the K-25 Site has been recently completed. The purpose of the archeological survey was to "inventory and identify the properties in the project areas that may be of historic significance" (Jacobs Environmental Restoration Team, 1998). Nine previously recorded archeological sites (40RE109,110,111,126,127,135,136,138, and 202) were visited. Evaluations ranged from visual examination to soil borings on site 40RE109. Recommendations included

testing of sites 40RE109, 40RE111, and 40RE138 based upon the potential for deeply buried deposits.

The Wheat Community, a nineteenth to twentieth century community, was investigated in a manner similar to that of former house sites, schools, churches, stores, and cemeteries that were revisited to determine the current condition of the sites. Recommendations include (1) buffering of the George Jones Memorial Baptist Church and Cemetery from any development, (2) testing and capping/filling of cisterns near the house, and (3) location and evaluation of site 40RE136.

3.4.2.6 Archeological Survey Status

The recent focus of environmental restoration on the ORR and an awareness of environmental compliance regulations have resulted in more intensive and systematic cultural resource-oriented investigations. The focus of the surveys has been, in general, oriented toward evaluating the potential for surviving archeological sites within the three major plant areas (i.e., ORNL, the ETTP, and the Y-12 Plant) and in areas of the ORR that are being considered for development under proposed actions. The map location of those areas of the ORR that have undergone recent systematic intensive surveys for prehistoric and historic archeological sites is shown in Fig. 3.12. To date, a large portion of the previously disturbed areas has been evaluated for the potential for archeological sites. The remainder of the ORR has seen little archeological investigation outside the project-specific areas or those areas reviewed by Fielder (1974) and Fielder, Ahler, and Barrington (1977) pursuant to Executive Order 11593. From the standpoint of cost effectiveness, systematic intensive surveys will continue to be conducted on a project-specific basis when a proposed action is planned in an area that has not been subjected to an intensive survey.

3.4.2.7 Other Inventory Activities

3.4.3 Excavation

3.4.3.1 Test Excavations

Test excavations conducted by or on behalf of DOE ORO have been limited in scope and related to project-specific developments. Site 40RE132 was located on the right bank of White Oak Lake in a heavily disturbed area and identified by Fielder (1974). Fielder noted that the site had been heavily damaged by the development of WAG 6 but that some cultural strata may have survived. The initial work consisted of a surface collection and the excavation of one test unit. Follow-up testing was initiated by the mechanical stripping of the plow zone to subsoil. The resultant exposure failed to identify any archeological features.

Phase H testing of two Historic period house sites within proximity to the RH-TRU facility was conducted by Faulkner (1988). The Jenkins House site (40RE188) and the Jones House site (40RE189) were investigated by excavation with manual test units.

The specific purpose of the testing program was to determine the significance of the sites pursuant to 36 CFR 60.4 and to comply with Section 106 of the NHPA.

The Jenkins House site is represented by a partially standing single-pen log house and remnants of a log smokehouse. Surface collections were made from a recent bulldozer scrape which had been made during the installation of a nearby groundwater monitoring well. This scrape lay immediately north of the house but had not damaged the extant portion of the structure.

A total of 59 shovel tests were placed on a grid around and west of the house. Shovel tests revealed a shallow deposit (< 20 cm) and a low density of cultural material. Based on the recovered artifacts and archival records, it appeared that the Jenkins House was occupied between 1880 and 1930 (or later). It was also determined that due to prior disturbance and damage. The site did not meet the criteria for inclusion in the NRHP.

The Jones House site consists of a collapsed two-pen log house, cellar and limestone chimney base, a partially collapsed log smokehouse, and a partially collapsed log barn. The same methodology was employed on this site as was used at the Jenkins House site. Twenty-six shovel tests were placed on a grid extending from the immediate south side of the house north to the smokehouse, a distance of approximately 22 m. All but four of the units were positive. Cultural material recovered extended to ca. 1830 on the lower limits to the 1920s.

The Jones House site was determined to be eligible for inclusion in the NRHP based on its current condition, the relationship between the house and outbuildings (rural farmstead), and a datable period of occupation.

3.4.3.2 Large-Scale Excavations

The only documented large-scale excavations conducted on the ORR can be traced to Webb's (1938) excavation of the Crawford Farm Site (40AN21) and the Freels Farm Mound Site (40AN22), which pre date DOE and its predecessors. The mounds at both sites were completely excavated. The Crawford Farm Site consisted of two burial mounds (Mound 1 and Mound 2). Mound 1 contained a total of 23 burials, and Mound 2 contained 19 burials. Webb (1938) noted that all burials in both mounds were in a poor state of preservation. Although no period assignment was made for the mounds, a Late Woodland period date is suggested based on recovered artifacts.

3.4.3.3 Excavation Status

With the exception of Phase I surveys, there are no plans to conduct any Phase 11 or Phase III projects on the ORR. However, the discovery of archeological sites during Phase I surveys or during construction activities could result in the need for additional archeological investigations.

3.4.4 Structure and Facility Management

3.4.4.1 Structure and Facility Documentation

Structure and facility documentation projects carried out to date by DOE ORO have been in support of MOA's prepared for projects that involved the removal or D&D of facilities known to be eligible for inclusion in the NRHP. A list of the MOA's ratified to date that have involved such actions is provided in Table 3.11.

Table 3.11. A Subset of Ratified MOAs that have involved removal or demolition of structures and facilities.

Memorandum of Agreement	Date Ratified
Demolition of Cooling Towers, ETTP	August 6, 1993
Demolition of K-25 Guard Stations K-1028-40 and K-1028-69	August 13, 1993
K-25 Site Power Plant Complex Demolition Project	March 1, 1994
Building 81-10 Demolition, Y-12 Plant	July 13, 1994
Gunite and Associated Tanks Remediation and D&D of Buildings 3506 and 3515	January 1, 1995
Waste Area Grouping 1 Surface Impoundments Operable Unit Remediation	April 20, 1995
Building 9703-11 Demolition, Y-12 Plant	October 16, 1996
Metal Recycle Project, Building 9204-1, Y-12 Plant	October 16, 1996
Demolish Buildings 9714-3, 9714-4, 9983-AY at Pistol Range	October 16, 1996
Building 3004 Dismantlement, ORNL	May 12, 1997
Three Building D&D and Recycle Project at the K-25 Site - Included Building K-25, K-31, K-33 and auxiliary facilities in associated Switchyards	August 28, 1998
Equipment Removal and Decontamination at Building K-1420 and Demolition of Auxiliary Facilities K-1421 and K-1422	July 1, 1998
Building 9418-1 Demolition	March 26,1998
Demolish Buildings 9418-4 and 9418-5	April 28, 1998
Building 9419-1 Demolition	September 9, 1999
Charlotte and Cheyenne Hall	June 28, 1998
Demolition of Buildings K-724, K-725, K-1031, K-1131, and K-1410	July 8, 1996

Documentation prepared in support of MOAs is also prepared in accordance with Section 110 of the NHPA and typically includes (1) a physical description of the facilities; (2) a discussion of the history and use of the facilities; (3) recent and historical photographs taken of the facilities throughout their lifetime, if available; (4) copies of facility drawings, schematics, and maps showing the evolution of the facilities, if available; and (5) maps showing the location of the facilities and surrounding streetscapes and/or

landscapes. The location of facilities that have undergone facility documentation pursuant to Sections 106 and 110 of the NHPA.

To date, no DOE ORO facilities in the Oak Ridge area have been assessed through the Historic American Buildings Survey (HABS) or Historic American Engineering Record (HAER), as requested by the Tennessee SHPO, facilities have been assessed to their specifications and standards which are consistent with and equivalent to the NABS and HAER requirement.

3.4.4.2 Structure and Facility Maintenance

Many DOE ORO properties in the Oak Ridge area that are included or eligible for inclusion in the NRHP receive routine surveillance and maintenance because they play a continuing role in DOE ORO missions. Therefore, most maintenance activities performed at DOE ORO facilities are carried out to maintain the functional use of the facilities rather than for the sole purposes of maintaining historical integrity. However, several maintenance projects have been performed in recent years to maintain significant properties for purposes other than functional reasons only. Examples of such maintenance actions include (1) the renovation and restoration of the New Bethel Baptist Church and George Jones Memorial Baptist Church, (2) the replacement of columns on the main facade of the ATDL, (3) the replacement of wooden flooring on the porch of the Freels Cabin, and (4) the replacement and updating of exhibits in the Graphite Reactor Museum.

3.4.4.3 Structure and Facility Mitigation

DOE ORO has carried out a number of undertakings in the recent past that have involved structure or facility mitigation activities. Mitigation activities have involved measures ranging from the in kind replacement of facility or equipment components to the construction of new facilities that are consistent in design and architecture with adjacent properties that are eligible for inclusion in the NRHP. Most undertakings that have involved structure or facility mitigation activities have been addressed in Section 106 AHRs (Project Summaries) prepared in support of consultations with the SHPO and Advisory Council (as warranted). However, some mitigation activities have been included as part of the commitments made in three-party MOAs. For example, the MOA prepared for the Measurements and Controls Support Facility at ORNL included the development and implementation of a vegetative screening plan that would help minimize visual impacts to adjacent NRHP eligible properties. A complete listing of the DOE ORO actions that have involved consultation with the SHPO and Advisory Council (as warranted) and actions that have involved three-party MOAs is provided in Section 3.5.1.1, Tables 3.12 and 3.13 below.

3.4.4.4 Structure and Facility Management Status

DOE ORO is taking a proactive role in the proper management, maintenance, and preservation of its NRHP eligible and included properties. The first major steps DOE

ORO has taken in this endeavor have involved the identification and evaluation of its properties, which led to more informed decision making and improved compliance with cultural resource laws and regulations. Consideration of cultural resources has become a very important part of activities such as facility planning, the evaluation alternatives in the environmental restoration/remediation process, and the ongoing maintenance of facilities.

3.4.5 Laboratory Treatment and Curation

3.4.5.1 Processing

Cultural and scientific materials that are processed, analyzed, and curated at DOE ORO facilities are in the form of historic documents such as technical memoranda and reports, compliance documentation, original or other copies of preconstruction and as-built drawings and schematics of facilities, schematics of facility/equipment components, and photographic documentation. Such materials have been processed as they are generated and then archived according to established procedures set forth by DOE and its predecessor agencies.

At present, DOE ORO does not maintain laboratory facilities to process cultural or scientific materials such as Prehistoric and Historic period artifacts. These types of cultural materials have been almost entirely recovered during archeological investigations conducted by archeological consultants and processed by consultants as part of the scope of services. Thus, consultants have been required to provide adequate laboratory facilities to process artifacts using normal and accepted practices and to prepare them for curation at a facility in compliance with 36 CFR 79.9.

3.4.5.2 Analysis

DOE ORO does not maintain laboratory facilities for the analysis of most types of cultural materials. However, DOE ORO does maintain photographic laboratories, drafting laboratories, and numerous chemical and physical analytical laboratories equipped with highly advanced equipment that has been used to analyze materials such as the remains of President Zachary Taylor.

At present, DOE ORO does not maintain laboratory facilities to analyze cultural materials such as Prehistoric and Historic period artifacts. These types of cultural materials have been almost entirely recovered during archeological investigations conducted by archeological consultants and analyzed by the consultants as part of the scope of services. Thus, consultants have been required to provide adequate laboratory facilities to analyze artifacts using normal and accepted practices and to prepare them for curation at a facility in compliance with 36 CFR 79.9

3.4.5.3 Curation Facilities and Procedures

To date, archeological consultants who have investigated the ORR have prepared collections in accordance with standard procedures for preparing cultural materials for permanent storage. Many of these surveys (based on their locations within major areas of disturbance) provided few specimens, and collections remain small. It is common practice to store these smaller collections until sufficient quantity has been accumulated to fill a standard storage box. DOE ORO has consulted with the UTK McClung Museum, which has agreed to provide curatorial services for DOE ORO collections on a case-by-case basis.

3.4.6 Preservation

3.4.6.1 Protection from Natural Forces

Protection of DOE ORO properties from natural forces is mostly limited to the Freels Cabin, New Bethel Baptist Church and Cemetery, George Jones Memorial Baptist Church, and structures and facilities that house operations. The Oak Ridge Turnpike and Bear Creek Road checking stations have been completely restored with furnishings and photos of the 1950's era, and these two stations will be used for meetings, and educational, cultural, and civic activities sponsored by DOE. Other checking stations and unused facilities receive periodic surveillance and preventive maintenance as the need arises, since these facilities do not house current operations.

DOE ORO does not now intentionally protect prehistoric archeological sites and most pre-World War II structures (including foundation-only, partially standing, and standing structures) from natural forces on the ORR.

3.4.6.2 Protection from Human Forces

3.4.6.2.1 Authorized Actions

All DOE ORO actions are screened in some manner through the NEPA compliance process prior to being carried out. Screening of actions that possess a significant potential to affect the environment involves a comprehensive environmental, safety, and health review, including a review of the potential effects the actions would have on properties included or eligible for inclusion in the NRHP in accordance with Section 5.1. Small-scale actions such as routine maintenance activities are typically handled by project managers, project planners and estimators, and other individuals that have been trained by compliance personnel and have been instructed to bring potential concerns/issues to the compliance support organizations for further review. In addition, personnel responsible for area management and surveillance, as well as security patrol personnel, are made aware of those properties that are of historical significance (not limited to properties included or eligible for inclusion in the NRHP) and are instructed to stop any actions they may find that affect or could have an effect on those properties, as well as to contact the appropriate compliance staff members to resolve issues.

The review of actions through the NEPA process is well documented and carefully tracked using database systems. This existing review mechanism has proven to be an effective tool in the management of DOE ORO properties and in the protection of DOE ORO cultural resources. Continued improvement in this arena is one of DOE ORO's goals.

3.4.6.2.2 Illegal Acts

Most DOE ORO properties included or eligible for inclusion in the NRHP are protected from human forces, particularly those located at the three industrial complexes on the ORR and in the city of Oak Ridge that are protected by security fences and/or built-in facility security systems. Prehistoric sites and sites of pre-World War II structures along the Clinch River are the most susceptible to looting or vandalism. However, limited protection is provided by routine surveillance by security personnel; and since most of the Clinch River sites are accessible only by boat, the shoreline is posted with "No Trespassing" signs to alert people that only authorized access is permitted to government property.

3.4.6.3 Preservation Status

As previously noted, preservation of **DOE ORO** properties included or eligible for inclusion in the NRHP is carried out in the form of routine surveillance and maintenance of facilities used in ongoing operations and at some facilities that do not play an active role in DOE ORO missions. As present, DOE ORO does not intentionally preserve prehistoric archeological sites and most pre-World War II structures (including foundation only, partially standing, and standing structures) because they are either secondary-use resources or do not support ongoing missions.

3.4.7 Research

A considerable amount of research into prehistoric and historic DOE ORO properties has been conducted in the Oak Ridge area by, and on behalf of, DOE ORO and was summarized in Sections 3.4.2.3 and 3.4.2.5. Much of this work was performed to evaluate previously inventoried and recorded DOE ORO properties for NRHP eligibility, including prehistoric and historic properties and properties of recent scientific significance, and to identify previously unrecorded resources within potential development areas.

3.4.8 Outreach

3.4.8.1 Activities on the DOE Site

DOE ORO has been actively involved in numerous cultural resources and scientific outreach activities on a local and regional scale for a number of years, examples of which are noted below.

- In ca. 1983, the Oak Ridge Gaseous Diffusion Plant (ORGDP) or ETTP produced a brochure entitled "Did You Know," a pamphlet highlighting dates and activities regarding the ETTP.
- In ca. 1984 the ORGDP drafted "Factsheet," a popular history-styled document designed to make the public more aware of the ETIP's history.
- In 1984 the ORGDP organized "Family Tour Days" to familiarize the families of ORGDP employees with the ETTP's efforts in developing several advanced processes for enriching uranium for use as fuel in nuclear power plants. Activities included a video tape which provided background information on the ETTP, guided bus tours of the site, and an informational brochure entitled "ORGDP, Oak Ridge Gaseous Diffusion Plant."
- On August 3, 1990, the ORNL 50th Anniversary Working Group met with representatives. of the Tennessee State Historical Commission, the Oak Ridge Community Foundation Birthday Committee, the Oak Ridge Chamber of Commerce Historical Committee, Analysas, Inc., and staff members from DOE ORO's Public Relations Office to discuss preparations for celebrating ORNL's fiftieth anniversary. Discussions touched on signage commemorating the anniversary, but the meeting focused on planning the restoration of the New Bethel Baptist Church to its prewar condition. DOE ORO intended that the restored building be used for occasional gatherings (funerals, reunions, etc.) and as a visitor center with displays commemorating all prewar residents of Anderson and Roane counties who were displaced by the Manhattan Project.

  Building restoration and museum displays were begun in the fall of 1990, and the New Bethel Baptist Church was reopened to the public for the fast time in 50 years on May 26, 1991. This reopening allowed the church's congregation to meet in the building for the first time since December 1942. The congregation has since conducted a number of church activities including decorating a Christmas tree and holding family reunions and weddings. In addition, the church has been opened to visitors from 9:00 a.m. to 5:00 p.m. seven days a week and on holidays since August 12, 1994.

  - On the first Sunday in October, a "homecoming" celebration is held at the George Jones Memorial Baptist Church by members of its congregation. When the communities of Wheat, Robertsville, Scarboro, and Elza were dismantled and replaced by the Manhattan Project facilities and the town of Oak Ridge, the church was preserved in an agreement between the government and the people of Wheat with arrangements for an annual homecoming.
  - Restoration of the George Jones Memorial Baptist Church took place in ca. 1992 under the management of the ETTP. After the expenditure of over $64,000 in DOE ORO funds, the church was reopened in time for the October "homecoming" of the congregation.
  - *A Time to Remember, a Time to Share* programs recognizing the Native American Indian were held on October 30, 1992, at the ORNL Central

Auditorium and simultaneously broadcast to auditoriums at the ETTP, the Y-12 Plant, and DOE ORO. An evening program was also held in Pollard Auditorium, an ORAU facility in the city of Oak Ridge. The event featured Native American Indian dances, storytelling, arts and crafts, and guest speaker John "Bullet" Standing deer. The programs were jointly sponsored by Martin Marietta Energy Systems, Inc. (then-operating contractor of the ORR for DOE ORO), ORAU, and DOE ORO.

- *The Rhythm of Nature: Dancing to a Different Drum* programs focusing on Native American Indian dancing, storytelling, exhibits, and a lecture by Karen NoLand, Ph.D., were presented on November 5, 1993, in the ORNL Central Auditorium. The presentation was simultaneously broadcast to auditoriums at the ETTP, Y-12 Plant, and DOE ORO. An evening program sponsored by Martin Marietta Energy Systems, Inc., M. K. Ferguson, ORAU, and DOE ORO was presented at the AMSE in Oak Ridge.
- *Looking for Tomorrow, Today* programs focusing on the Red Clay Historic Area, Tracing Your Heritage, storytelling, intertribal dancing, and Native American art held at the AMSE on November 15, 1995. The featured guest speaker was Principal Chief Dugan of the Eastern Band of the Cherokee Indians. The event was sponsored by DOE ORO, LMES, MK-Ferguson, and ORAU.
- DOE ORO sponsors a variety of site-specific visitor and interpretive centers. Historical/ interpretive centers include the Graphite Reactor Museum and the K-25 Overlook. Each center features interpretive and historical materials.
- *A Biography of Dr. John M. Googin*, For Your Information (FYI), A Special Issue (Vol. 6, No. 1). Following the death of Dr. John M. Googin, this special edition of FYI was compiled and distributed by the Y-12 Plant Pride in Development Committee to provide Y12 Plant Development Division employees with information on the latest happenings within the division and the plant. Dr. Googin arrived in Oak Ridge in May 1944 as a Manhattan Project chemist and was employed until his death in 1994.
- *Oak Ridge National Laboratory Review, Vol.* 25, Nos. 3 and 4, 1992. The history of the first 50 years of ORNL was prepared to commemorate ORNL's golden anniversary in 1993. This 282-page volume contains historic photos, a history of the founding of Oak Ridge, and an in-depth look at the Manhattan Project and scientific achievements at ORNL.
- The DOE ORO Photography Department, now located in the AMSE, contains thousands of photos pertaining to the ORR and its history. These unclassified photos are available to the public upon request.
- *Reflections of the Past-Visions of the Future.* This event was held on November 18, 1994, at the AMSE in celebration of Native American Heritage Month. The program featured intertribal dancing, storytelling, exhibits, and a lecture on North American tribes by guest speaker Janet

David. The event, which was open to the public, was sponsored by DOE ORO, Martin Marietta Energy Systems, Inc., MK Ferguson, and ORAU.

- The ORO Native American Indian Program presented to the public "Fires of the Past ... Burning into the Future" as part of the Native American Heritage Month Celebration. This event was held at the American Museum of Science and Energy. Archeological issues were included in the keynote speech by James Bird, Linguist and Cultural Resource Officer for the Eastern Band of the Cherokee Indian. Mr. Bird praised DOE ORO on the development of the ORR Cultural Resource Management Plan.
- The ORO Native American Indian Program also held a brown bag at the DOE Federal Building. Dr. Russell Townsend, an archeologist, presented slides about the native people of Tennessee.

In addition to these activities, DOE ORO maintains the following public facilities: the Graphite Reactor Museum, the New Bethel Baptist Church Interpretive Center, the ETTP Overlook, and the AMSE. In preparation for the 1982 World's Fair in Knoxville, Tennessee, DOE ORO personnel planned Oak Ridge-based events for visitors frequenting the site en route to Knoxville.

A number of books and publications on the Manhattan Project have been written by historians or persons associated with the Manhattan Project and/or subsequent ORR activities. Examples of these include the following:

- *Construction for Atomic Bomb Production Facilities,* 1945. Engineering News-Record, December 13.
- DeCamp, D, 1988. *Oak Ridge From Secret City to Science City,* Oak Ridge, Tenn.
- Gailar, J. S., 1991. *Oak Ridge and Me from Youth to Maturity,* Children's Museum of Oak Ridge, Oak Ridge, Tenn.
- Greene, H., and M. Skipper, 1992. *History of the Laboratory Protection Division, Oak Ridge National Laboratory 1942-1992,* Oak Ridge National Laboratory, Oak Ridge, Tenn.
- Greenstreet, W. L., 1992. *History of the Engineering Technology Division, Oak Ridge National Laboratory 1944-1992,* Oak Ridge National Laboratory, Oak Ridge, Tenn.
- Greenstreet, W. L., *1992. History of the Engineering Technology Division, Oak Ridge National Laboratory 1944-1992,* Oak Ridge National Laboratory, Oak Ridge, Tenn.
- *Pollard, W., 1980. ORAU. From The Beginning,* Oak Ridge Associated Universities, Oak Ridge, Tenn.

3.4.8.2 **Activities Not on the DOE Site**

Many books and articles that do not deal solely with operations of DOE ORO and its predecessor agencies have been written by historians or local citizens about the Manhattan Project and the ORR. Examples of these include the following:

- Buck, A. L., *1983. A History* of *the Atomic Energy Commission, U.S.* Department of Energy, History Division, Washington, D.C.
- Gosling, F. G., *1990. The Manhattan Project: Science in the Second War, U.S.* Department of Energy, Washington, D.C.
- Groves, L. R., *1962. Now It Can Be Told,* Harper Publishing Co., New York.
- Hewlett, R. G., and O. E. Anderson, *1962. The New World, 193911946: Volume 1, A History of the United States Atomic Energy Commission,* Pennsylvania State University Press, University Park.
- Hewlett, R. G., and F. Duncan, *1969. Atomic Shield, 194711952: Volume 11, A History of the United States Atomic Energy Commission,* Pennsylvania State University Press, University Park.
- Hewlett, R. G., and J. Holl, *1989. Atoms for Peace and War, 1953-1961: Volume III, The Eisenhower Administration and the Atomic Energy Commission,* University of California Press, Berkeley.
- Johnson, C. W., and C. O. Jackson, 1981. Ciry *Behind a Fence: Oak Ridge, Tennessee, 1942-1946,* University of Tennessee Press, Knoxville.
- Lawren, W., *1988. The General and The Bomb: A Biography of General Leslie R. Groves, Director of the Manhattan Project,* Dodd and Mead, New York.
- Moneymaker, D., *1979. We'll Call It Wheat,* Adroit Printing, Oak Ridge, Tenn.
- Overholt, J., ed., *1987. These Are Our Voices: The Story of Oak Ridge, 1942-1970,* Children's Museum of Oak Ridge, Oak Ridge, Tenn.
- Parsly, M. P., *1985. Inscriptions from Old Cemeteries on the Oak Ridge (Manhattan Project) Area, Anderson and Roane Counties, Tennessee,* Oak Ridge, Tenn.
- Rhodes, R., *1986. The Making of the Atomic Bomb,* Touchstone Book, New York.
- Searcy, H., 1992. "A City Under Siege," *The Philadelphia Inquirer Magazine,* August 9, 1992.
- Smyser, D., 1992. *Oak Ridge* 1942-1992, *A Commemorative Portrait,* Oak Ridge Community Foundation, Oak Ridge, Tenn.
- Smyth, H. D., 1945. Atomic *Energy for Military Purposes: The Official Report on the Development of the Atomic Bomb Under the Auspices of the United States Government,* 1940-1945, Princeton University Press, Princeton, N.J.
- Sparrow, J. C., 1980. "The Oak Ridgers," M.S. thesis, History Department, Mississippi State University.

3.4.8.3 Outreach Status

In the years following World War II, DOE ORO has consistently advocated its role in scientific achievement. Advocacy has taken the form of books, lectures, visitor centers, community/employee educational programs, and federal designation of significant historic and cultural resources.

3.4.9 Other CRM Accomplishments

DOE ORO continues to reach out to the community by sponsoring a series of lectures focusing on the historic experiences of local native people. DOE ORO has assisted the AMSE with displays that describe early Oak Ridge and an exhibit depicting past and present missions of the Y-12 Plant.

3.5 LEGAL COMPLIANCE ACCOMPLISHMENTS

3.5.1 NHPA, Executive Order 11593, and 36 CFR Part 800

3.5.1.1 NHPA, Sections 106 and 110(f), and 36 CFR Part 800

In the early 1990s, DOE ORO initiated an effort to ensure that all DOE ORO actions were being screened and carried out in compliance with Sections 106 and 110(f) of the NHPA and 36 CFR 800 (Section 106 implementing regulations). Evaluations of actions were completed as part of the existing DOE ORO NEPA screening and compliance program and actions requiring consultation with the SHPO and/or Advisory Council, pursuant to 36 CFR 800.4-800.6, were identified. The consultation process was initiated and completed prior to the commencement of project activities. A list of individual projects that have been submitted to the SHPO and Advisory Council (as warranted) is provided in Table 3.12.

Table 3.12. DOE ORO actions that have involved consultation with the SHPO and Advisory Council (as warranted)

Project No.	Project Title	Section 106 Complete
1966X	5000 Portal Renovation	12/29/93
RR-154	Additional Compressor Removal, K-27 Building, ETTP	01/04/93
	Atmospheric Turbulence and Diffusion Laboratory (ATDL) Porch Column Repair and Replacement	04/25/94
	Atomic City Auto Parts Site, ORR Off-site	08/06/96
2128X	Building 81-10 Demolition, Y-12 Plant	07/13/94
2096X	Building 9982 Greenhouse Demolition	04/06/94
2441X	Carbon Dioxide Concentrations in a Closed-Canopy Forest, ORNL	08/06/96
1944X	Center for Biological Sciences	09/23/94
2038X	Central Training and Skills Enhancement Facility, Building	05/15/94

	3550	
2014X	Construction for Gravel Pad to Store Solidified LLLW	08/09/94
	Demolition of Nine Barns Located at the ORAU South Campus	09/09/93
	Diking System for K-1423 Waste Storage and Processing Unit	07/23/93
	DOE ORO Transfer of 1000 Acres to ETEC, ORR	08/08/95
	Dog Kennel Demolition at the South Campus Facility, Oak Ridge Institute of Science and Education (ORISE)	02/23/95
	Drum Wash Station	07/23/93
3513Y	Electrical Room Installation and Stairs, Building 9201-4 (Alpha 4)	07/26/95
3570Y	FLAP Replace Area 5 Switching Center	07/25/96
3569Y	FCAP New Switchgear Building	07/25/96
	Feasibility Study at the South Campus Facility, Oak Ridge Institute of Science and Education (ORISE)	02/23/95
2417X	Graphite Reactor Building 3001 Canal Stabilization, ORNL	08/06/96
	K- 1420A and K-1202 Transfer Station and Enclosures	07/23/93
	K-1423 Waste Reduction Program (Drum Compaction)	07/23/93
	K-1435B Change house Facilities Upgrade	07/23/93
	K-1515 Lagoon Project at ETTP	06/23/93
	K-25 Site K-27 Decontamination 8z Decommissioning Pilot Project	11/18/92
	Lease of 100-Acre Portion of the ORR to the City of Oak Ridge, K-25 Site	09/12/96
2337X	Lease of Approximately 1000 Acres of the Oak Ridge Reservation to the East Tennessee Economic Council	08/18/95
	Lease of Portal 9 Parking Lot and Building K-1028-64	05/29/97
CX-REK-006	Lease of Portion of Building K-1035, K-25 Site	05/07/97
CX-REK-008	Lease of Building K-1401, K-25 Site	05/29/97
RR-381	Lease of South End of Building K-1004-D, K-25 Site	05/07/97
RR-368	Lease of K-25 Facilities for Intermediate Transport and Distribution	11/12/96
2011X	Maintenance Shop Addition, Building 4509	02/08/94
1960X	Medical Records Storage Facility, 4500N	10/12/93
1950X	Melton Valley Storage Tank Capacity Increase Project	09/30/93
	Modification of Atmospheric Turbulence and Diffusion Laboratory Building, ORISE	09/12/96
1961X	Office Building 3156, 3000 Area	11/03/93
1894X	Office Buildings, 1000 Area	05/12/93
1898X	Office Buildings, 1500 Area	08/31/93

1959X	Office Expansion at Katy's Kitchen (Building 0907)	10/12/93
1969X	ORNL Regional Science Education Center, Building 1063	11/12/93
3612Y	Pistol Range Buildings Demolition, Y-12 Plant	12/05/96
	Modification of Atmospheric Turbulence and Diffusion Laboratory Building, ORISE	09/12/96
1961X	Office Building 3156, 3000 Area	11/03/93
1894X	Office Buildings, 1000 Area	05/12/93
1898X	Office Buildings, 1500 Area	08/31/93
1959X	Office Expansion at Katy's Kitchen (Building 0907)	10/12/93
1969X	ORNL Regional Science Education Center, Building 1063	11/12/93
3612Y	Pistol Range Buildings Demolition, Y-12 Plant	12/05/96
2006X	Process Waste Surge Tank	01/13/94
1995X	Reduce Steam Supply Station, Building 4501	05/20/94
1952X	Remote-Handled Transuranic Waste Storage Bunker	09/30/93
1962X	Renovating Buildings 9201-3, 9204-1, and 9725	02/25/94
3569Y	Replace Area 5 Switching Gear, Y-12 Plant	06/13/96
3175Y	Replacement and Operation of Anhydrous Hydrogen Fluoride Supply and Fluidized Bed Reactor Systems	07/31/95
RR-219	Replacement of Vault Doors on the K-25 and K-27 Buildings, K-25 *Site, Oak* Ridge, Tennessee	07/13/94
2057X	Safety Improvements to Building 3001	07/29/94
2194X	Sewage Sludge Disposal on the Oak Ridge Reservation	10/19/94
3447Y	Special Processing Office	01/04/95
2349X	Spent Nuclear Fuel Dry Cask Storage Facility	09/28/95
1951X	Tennessee Valley Authority Power Line Relocation	10/29/93
3571Y	Building 9703-11 Demolition	09/18/96
3627Y	Metal Recycle Project - 9204-1	09/18/96
RR-350	Three Leases of Portions of K-1401: Machining and Fabrication; Refurbishment of Power Plant Equipment; Container Fabrication, K-25 Site	11/12/96
1972X	Waste Management Operations Health and Hygiene Support Facility, Building 2100	03/21/94
2088X	Waste Operations Support Facility	09/22/94
3451Y	X-ray Records Vault	02/23/95
RR-437	Lease a portion of K-1401 to CROET	01/27/98
3710Y	Building 9418-1 Demolition	03/26/98
3751Y	Demolish North Equipment Room 9704-2	08/04/98
3764Y	Building 9419-1 Demolition	09/09/98
CX-REK 007	Lease of Portal 9 Parking Lot and Building K-1028-64	05/29/97
CX-K25-502	ETTP-Demolition/K-805	11/14/97

For those DOE ORO actions that were determined, in consultation with the SHPO and Advisory Council, to have the potential for an adverse effect on properties included or eligible for inclusion in the NRHP, DOE ORO entered into MOAs with the SHPO and Advisory Council in accordance with 36 CFR 800.8(c). A list of all ratified DOE ORO MOAs is provided in Table 3.13.

Table 3.13. List of three-party MOAs involving DOE ORO actions

Memorandum of Agreement	Date Ratified
Removal of Smoke Stack 2061 and Building 2017	September 8, 1992
Measurements and Controls Support Facility	September 8, 1992
Demolition of Cooling Towers, K-25 Site	August 6, 1993
Demolition of K-25 Guard Stations K-1028-40 and K-1028-69	August 13, 1993
K-25 Site Power Plant Complex Demolition Project	March 1, 1994
Building 81-10 Demolition, Y-12 Plant	July 13, 1994
Replacement of Exterior Doors on Buildings K-25 and K-27	July 13, 1994
Demolition of Facilities Auxiliary to Cooling Towers at the K-25 Site	December 8, 1994
K-731/K-732 Substation Replacement	December 8, 1994
Gunite and Associated Tanks Remediation and D&D of Buildings 3506 and 3515	January 1, 1995
Waste Area Grouping 1 Surface Impoundments Operable Unit Remediation	April 20, 1995
Demolition of Five Buildings at the K-25 Site	July 8, 1996
Metal Recycle Project, Building 9201-4, Y-12 Plant	September 18, 1996
Building 9703-11 Demolition, Y-12 Plant	October 15, 1996
Building 3004 Dismantlement, ORNL	May 12, 1997
Building 9418-1 Demolition	April 26, 1998
Demolish Buildings 9418-4 and 9418-5	April 28, 1998
Three Building D&D and Recycle Project at the K-25 Site – Included Building K-29, K-31, K-33 and auxiliary facilities in associated switchyards	August 28, 1998
Equipment Removal and Decontamination at Building K-1420 and Demolition of Auxiliary Facilities K-1421 and K-1422	July 1, 1998
Building 9419-1 Demolition	September 9, 1998
Charlotte and Cheyenne Hall	June 28, 1998

While in the process of completing individual project reviews and consultation with the SHPO and Advisory Council, and in the process of executing MOAs, DOE ORO prepared a draft PA in accordance with 36 CFR 800.13. The details of the draft PA were closely coordinated with the SHPO and Advisory Council, and the PA was ultimately ratified on May 6, 1994. A copy of the ratified PA is provided in Appendix G. The PA provided for a more streamlined and efficient Section 106 review processes than that provided for in 36

CFR 800. This was accomplished through mechanisms such as the application of Programmatic Exclusions, categories of actions that, if determined by DOE ORO to have no effect or no adverse effect on properties included or eligible for inclusion in the NRHP, could be excluded from Section 106 review upon approval of this CRMP. Flowcharts depicting the streamlined review process are shown in Appendix G. Following the ratification of the PA, the number of individual Section 106 reviews and consultations on DOE ORO actions was significantly reduced, which demonstrated the effectiveness of the PA as a good management tool for NHPA compliance activities.

3.5.1.2 NHPA, Sections 110(a)-(e) and (g)-(j), and Executive Order 11593, Section 2

In the mid-1970s, compliance with Executive Order 11593 resulted in a survey of the ORR for archeological and historic sites (Fielder 1974; Fielder, Ahler, and Barrington 1977). These early surveys documented and evaluated the location and status of previously known prehistoric and historic archeological sites and identified previously unrecorded sites within the boundaries of the ORR.

In the early 1990s, DOE ORO initiated an effort to ensure that all DOE ORO actions were being screened and carried out in compliance with Sections 106 and 110(f) of the NHPA and 36 CFR 800. At the same time, DOE ORO reviewed its environmental compliance program and initiated efforts to ensure full compliance with Sections 110(a)-(e) and (g)-(j), and Executive Order 11593. For example, in accordance with Sections 110(a)(1), DOE ORO recognized the historical significance of properties under its jurisdiction, continued to make full use of its properties, and examined potential future use and reuse of those properties that no longer support their original missions. In addition, DOE ORO, in conjunction with local citizens and the SHPO, played a significant role in the preservation and restoration of several properties under its jurisdiction that are included in the NRHP but do not have a role in its present and future missions (e.g., the New Bethel Baptist Church and George Jones Memorial Baptist Church) (see Section 3.4.8.1).

In accordance with Section 110(a)(2), DOE ORO initiated a phased approach to conducting systematic intensive surveys of its properties for NRHP eligibility. A discussion of these. surveys is provided in Sections 3.4.2.3 and 3.4.2.5. Also in accordance with Section 110(a)(2), DOE ORO evaluated the effects of its actions on properties included or eligible for inclusion in the NRHP and consulted with the SHPO and Advisory Council on those actions determined to have the potential to affect such properties. DOE ORO also prepared and ensured the ratification of MOAs pursuant to 36 CFR 800.8(c) and a PA pursuant to 36 CFR 800.13. In most cases, MOAs stipulated that structure and facility documentation be prepared for those properties that would be adversely affected by DOE ORO actions and that the appropriate documentation be prepared and submitted to the SHPO in accordance with Section 110(b).

Through the ratification ofthe PA, DOE ORO committed to conducting systematic intensive surveys of its properties on the ORR and to the completion of a draft CRMP

within 24 months of the ratification of the PA to be provided to the SHPO and Advisory Council for comment. The goal of the CRMP is to provide a mechanism by which DOE can develop and implement procedures, methods, and responsibilities for the identification of historic and cultural resources. This would allow DOE to determine appropriate treatments that would strike a balance between DOE ORO's mission and its cultural resources planning and preservation responsibilities.

3.5.2 American Indian Religious Freedom Act

The DOE ORO CRM Coordinator met with Chief Dugan and other tribal representatives of the Eastern Band of the Cherokee Indians on November 17, 1995, to discuss future consultation and correspondence transmitted to the Eastern Band of the Cherokee Indians and the Cherokee Nation of Oklahoma regarding development of this CRAP (Appendix G) and a copy of the DOE order *Indian Tribal Government Policy*.

No Native American traditional-use areas or ceremonial sites are known to exist on the ORR. In addition, no artifacts of Native American religious significance are known to exist or to have been removed from the ORR. Therefore, no compliance activities associated with the American Indians Religious Freedom Act of 1976 (PL 95-341, 16 U.S.C. 1996) have been conducted by DOE ORO.

3.5.3 Archaeological Resources Protection Act (ARPA)

3.5.3.1 ARPA, Section 10(c)

DOE ORO has made and continues to make strides toward increasing public awareness of its cultural resources through outreach activities and programs (see Sections 3.4.8.1, 3.4.8.2, 3.4.8.3, and 3.4.1.0). However, DOE ORO has not specifically established a program to increase public awareness of the significance of archeological resources on its lands. The main reason for this is that most DOE ORO archeological resources, particularly prehistoric sites, are located on parts of the ORR that cannot be continuously or easily patrolled. Although these sites are fairly inaccessible (i.e., access by boat or water craft only), knowledge of the sites coupled with site security complications would leave the sites open to the potential for vandalism or looting.

3.5.3.2 ARPA, Section 14

The recent focus on environmental restoration on the ORR and an awareness of environmental compliance regulations have resulted in more intensive and systematic culturalresource-oriented investigations. The focus of the surveys has been, in general, oriented toward evaluating the potential for surviving archeological sites within the three major plant areas (i.e., ORNL, the ETTP, and the Y-12 Plant) and in areas of the ORR that are being considered for development under proposed actions. The map location of those areas of the ORR that have undergone recent systematic intensive surveys for prehistoric and historic archeological sites was shown in Fig. 3.12. To date, a large portion of the previously disturbed areas have been evaluated for potential

archeological sites. The remainder of the ORR has seen little archeological investigation outside the project-specific areas or those areas reviewed by Fielder (1974) and Fielder, Ahler, and Barrington (1977) pursuant to Executive Order 11593. From the standpoint of cost effectiveness, systematic intensive surveys will continue to be conducted on a project-specific basis when a proposed action is planned in an area that has not been subjected to an intensive survey.

3.5.4 Native American Graves and Repatriation Act (NAGPRA)

3.5.4.1 **NAGPRA, Section 5**

Section 5 of the Native American Graves and Repatriation Act (NAGPRA) requires federal agencies that have possession or control over collections of Native American human remains and associated funerary objects to compile an inventory of such items and, to the extent possible, identify the geographical and cultural affiliation. A number of Native American burials have been excavated from archeological sites that are within the boundaries of the present ORR or that at some point were located on the ORR (e.g., archeological sites of the TVA CRBRP site). One human burial was excavated from site 40RE86 in 1981 under the jurisdiction of DOE ORO during archeological investigations of the Tennessee Synfuels Associates Site. At present, site 40RE86 is located on both DOE ORO property and property owned by Boeing, but the site was entirely on DOE ORO property at the time of the investigation. The burial consisted of a poorly preserved adult male skeleton in a loosely flexed position associated with a shell-tempered, cord-marked vessel. Other recovered artifacts include shell-tempered and limestone-tempered ceramics, one Category 10 projectile point/knife, various lithic implements, and flaking debris. Based on associated artifacts, the human burial at this site was interpreted to be of Mississippian period affiliation. Therefore, this burial is not clearly associated with any presently recognized tribes other than possibly the Cherokee, which could be lineal descendants of the exhumed individual. Other interments excavated from these sites were removed under the direction and jurisdiction of TVA as part of construction activities associated with the Norris, Watts Bar, and/or Melton Hill dams.

3.5.4.2 **NAGPRA, Section 6**

No Native American unassociated funerary objects, sacred objects, or objects of cultural patrimony have been curated by DOE ORO or on behalf of DOE ORO by a curation facility.

3.5.4.3 **NAGPRA, Section 7**

Because the Native American burial excavated from 40RE86 is believed to be of Mississippian period affiliation and cannot be clearly associated with any presently recognized tribes, efforts to repatriate the remains and associated funerary objects have not been made. However, consultation with the Cherokee Nation of Oklahoma and the Eastern Band ofthe Cherokee Indians has been initiated, and future consultations with

the Cherokee are planned to determine their interest and any special requests they may have for the disposition of these remains.

3.5.5 **36 CFR Part 79**

Prehistoric artifacts recovered from the ORR are curated at UTK, the. Frank H. McClung Museum (McClung Museum) and with the UTK Department of Anthropology. The archeological collections primarily consist of prehistoric lithic and ceramic remains recovered during Phases I and II archeological surveys; as discussed in Section 3.5.4.1, however, the remains of one Mississippian period human male and several associated funerary objects have also been recovered by or on behalf of DOE ORO and are curated at the McClung Museum . Historic period artifacts have also been recovered from the ORR and are curated at the UTK Department of Anthropology. The Historic period artifacts consist of material remains recovered during a Phase II investigation of the Jenkins House site (40RE188) and the Jones House site (40RE189) (Faulkner 1988). The inventory of prehistoric and historic artifacts composing the DOE ORO archeological collections curated at UTK is summarized in Appendix H. DOE ORO has not prescribed procedures for the preparation and curation of its archeological and historical collections but has instead utilized the experience and expertise of professional archeologists and historians (as well as established procedures in effect at curational facilities) to properly handle its collections.

4. CRM METHODS

4.1 RECORDS AND REPORTS

4.1.1 Cultural Resource Site Records

DOE ORO does not require the use of internally developed cultural resource site forms but instead uses the standard site forms developed by the Tennessee Historical Commission (THC) and the Tennessee Division of Archaeology (TDOA) to record data collected during cultural resource investigations. The standard site forms include the Tennessee Historical and Architectural Resource form and the Tennessee Archaeological Site form. Examples of these forms, along with current THC and TDOA guidelines for completing the forms, are provided in Appendix D. The standard historical and archeological resource forms contain locational data, along with other information such as data relevant to architectural features, historical or cultural affiliation, degree of disturbance, artifact inventory, and site/facility descriptions. Once completed, copies of site forms are provided to the THC or TDOA (depending on site type) for evaluation and assignment of permanent site numbers.

The Smithsonian Institution numbering system, which is a simple alphanumeric system that provides information as to state, county, and sequential site number recorded in the county, is used for site designation. For example, a number such as 40AN100 would indicate that the site is located in Tennessee (40 indicates the numerical order of the state as arranged alphabetically, where Tennessee is the fortieth), Anderson County (for which AN is the county abbreviation), and site 100 (sequential number based on previously recorded sites in the county).

Copies of all site records and documentation associated with site records (e.g., field notes and photographs) will be maintained by DOE ORO at the Y-12 Plant Environmental Compliance (EC) Document Center. Additional information as to site number, historical or cultural affiliation, and any other pertinent information will also be maintained. This information will serve as the primary site record system for specific cultural resource investigations/studies.

Documents at the EC Document Center are stored in a protected, secured vault to which access is allowed only by authorized personnel. Therefore, cultural resource site records are protected by existing security and document preservation measures. Those individuals allowed access to cultural resource site records will consist of the DOE ORO Cultural Resources Management (CRM) Coordinator and the Cultural Resources Coordinators representing the primary DOE ORO installations and/or prime contractors or their designees. Other individuals seeking access to site records will be required to consult with at least one of the above-listed individuals prior to gaining access to the site files.

A geographical information system (GIS) using MapInfo software has been developed for the Oak Ridge Reservation (ORR) that, aside from locational data, contains

information such as date of construction, structure/site number and name, cultural *affiliation*, and National Register of Historic Places (NRHP) eligibility. The GIS data is maintained on a networked server that allows the data to be shared among cultural resource coordinators on the ORR and the DOE ORO CRM Coordinator. Although this data is maintained on a networked server, the data is inaccessible to the general public through system securities. The data contained within the GIS will be updated by the DOE ORO CRM Coordinator or the prime contractor Cultural Resources Coordinators with new site information as new sites are identified and/or as additional information regarding known sites is developed (e.g., revised site boundaries/locations or the identification of cultural affiliation for sites previously not assigned to an affiliation).

4.1.2 Cultural Resource Project Records

A discussion of the types of cultural resource projects conducted under the jurisdiction of DOE ORO was provided in Section 3.4.1.2. Although a considerable number of cultural resource projects have been conducted by or on behalf of DOE ORO, particularly in recent years, no formal cultural resource project form, project numbering system, or project record cataloging system was developed.

Project records have been maintained by the individual DOE ORO sites [e.g., the Oak Ridge National Laboratory (ORNL), the ETTP, and the Y-12 Plant] and/or prime contractors (e.g., Oak Ridge Associated Universities) that are responsible for coordinating and preparing project documentation and by the DOE ORO CRM Coordinator. Copies of project records are also maintained by the EC Document Center, and databases containing information pertinent to cultural resource projects are maintained both at the site/prime-contractor level and by the EC Document Center. The security and access requirements for project records maintained by the sites/prime contractors are similar to those for the EC Document Center, which was discussed in Section 4.1.1.

A cultural resource project form has been developed by DOE ORO and will be used in the future to track the progress/status of projects in a database. The Cultural Resource Project Form is a simple checklist that provides information as to the project number, project title, principal investigator, and project type if applicable. A sample copy of the Cultural Resource Project Form that will be used is provided in Appendix D.

Most cultural resource projects carried out by or on behalf of DOE ORO have been initiated through the National Environmental Policy Act (NEPA) compliance organizations at DOE ORO's three major industrial complexes (i.e., ORNL, the ETTP, and the Y-12 Plant). Each complex has a NEPA checklist designed for the site to initiate the review and documentation process. Each of the NEPA compliance organizations maintains a database to log in and assign tracking numbers to individual projects. Therefore, the existing project numbering schemes used by these organizations will be adopted for use in the numbering of cultural resource projects. For example, ORNL cultural resource projects are logged into the ORNL NEPA Compliance Database and assigned an alphanumeric number consisting of a series of digits followed by an X (e.g.,

2000X), indicating a project being performed/managed by ORNL (or the X-10 Site), The ETTP and Y-12 Plant use a similar numbering scheme. An example of a site NEPA checklist form is shown in Appendix D. By using the existing NEPA database application to track cultural resource projects, a simple cross reference of NEPA and NHPA compliance activities can be maintained. Similarly, the cultural resource project title, in many instances, can be the same or similar to that of the NEPA documentation being prepared for the same project.

The principal investigator indicated for a cultural resource project may consist of a professional architectural historian or archeologist who is performing work associated with the project or someone such as a Cultural Resources Coordinator who is preparing project documentation [e.g., Section 106 Archeological and Historical Review (AHR) or Memorandum of Agreement (MOA)].

As previously noted, a number of cultural resource projects have been conducted in the past, ranging from architectural/historical evaluations of the Manhattan Project and later scientific to Phase II archeological investigations. A similar broad range in the types of cultural resource projects is anticipated in the future and will probably fall into the following three categories:

1. Architectural/Historical Assessment

    - Pre-World War II Historic period structures

    - Structures, facilities, and facility components/equipment of recent scientific significance (e.g., facilities reviewed in the future that had been previously determined to be not eligible for inclusion in the NRHP due to their age and/or lack of historical context within which they could have been evaluated)

2. Archeological Surveys

    - Phase I reconnaissance surveys

    - Phase II archeological site testing

    - Phase III archeological site excavation/mitigation

3. Section 106 and 110 Compliance Activities

    - Preparation of Section 106 AHRs (Project Summaries)

    - Preparation and ratification of MOAs

    - Section 110 facility mitigation/documentation projects

All documentation associated with cultural resource projects such as field notes, photographs (if taken), and letters of the State Historic Preservation Officer (SHPO) and Advisory Council on Historic Preservation (Advisory Council) consultation are included in the project record files. The locations or areas at which cultural resource projects take place are recorded on maps (where appropriate) and/or in the GIS using MapInfo software, and a hard copy of the map data is filed along with the cultural resource project information.

4.1.3 Other Cultural Resource Records

No other cultural resource records are maintained by DOE ORO.

4.1.4 Cultural Resource Reports

4.1.4.1 Standardized Report Outlines

Although DOE ORO has not prescribed the use of internally developed outlines for reporting the results of cultural resource activities such as surveys, standardized outlines have been developed as part of this cultural resource management plan for use in future CRM activities. The prime objective in using standardized outlines is to simplify document tracking and review and to provide the SHPO and Advisory Council consistent documentation, thereby simplifying the Section 106 consultation process. Standardized outlines have been developed for the following CRM activities:

1. Architectural/Historical Assessments

    - Structures, facilities, and facility components/equipment of recent scientific significance (e.g., facilities reviewed in the future that had been previously determined to be not eligible for inclusion in the NRHP due to their age and/or lack of historical context within which they could have been evaluated.

2. Archeological Surveys

3. Section 106 and 110 Compliance Activities

    - Preparation of Section 106 AHRs (Project Summaries)

    - Preparation and ratification of MOAs

    - Section 110 facility mitigation/documentation projects

Copies of the outlines are provided in Appendix E. A standardized outline has not been prepared for reporting the results of surveys or evaluations of pre-World War

II Historic period sites/structures since (1) most such structures on the ORR have been identified and evaluated (see DuVall and Souza 1996) and (2) any such structures found in the future will more than likely be identified during Phase I archeological reconnaissance surveys.

4.1.4.2 Report Library

The primary repository for copies of cultural resource site records, project records, and reports within the DOE ORO system in Oak Ridge will be the EC Document Center. However, the individual sites and/or prime-DOE ORO contractors responsible for coordinating and preparing cultural resource projects and documentation will also maintain copies of these records/reports and, in many instances, will be the source of original data and documents associated with cultural resource compliance activities.

The majority of records and report- have been assembled and placed into the central document repository through the direct efforts of individuals on the ORR cultural resources task team and through the efforts of professional historians and archeologists who in recent years have been contracted to conduct systematic intensive surveys of DOE ORO properties. To keep the report library up to date, copies of cultural resource records, reports, and associated documentation (e.g., letters of document transmittal and SHPO consultation) prepared in the future are to be sent to the EC Document Center for storage. Copies of cultural resource records, reports, and/or documents generated in the past but not yet assembled for storage in the EC Document Center will be acquired through direct research at existing cultural resource repositories such as the THC, TDOA, and The University of Tennessee, Knoxville, (UTK) McClung Museum.

Access to the cultural resources data stored in the EC Document Center and by the cultural resource compliance organizations at the DOE ORO sites/prime contractors will be controlled to avoid the release of sensitive information that could jeopardize the security or integrity of resources through activities such as looting. Individuals allowed access to cultural resource records and reports will consist of the DOE ORO CRM Coordinator and the Cultural Resources Coordinators representing the primary DOE ORO installations and/or prime contractors or their designees. Individuals not listed above seeking access to the cultural resources repository/report library will be required to consult with at least one of the above-listed individuals prior to gaining access to documents.

4.2 INVENTORY

4.2.1 Archival Searches

Archival research, which provides content and context for the evaluation of prehistoric and historic resources, will form an integral part of all cultural resource surveys undertaken by or on behalf of DOE ORO in the Oak Ridge area. The prehistoric context

of the region encompassing the ORR in East Tennessee has been adequately summarized by Glyn DuVall in the many Phase I archeological reconnaissance survey reports he has prepared over the recent years (e.g., see DuVall 1992a through m), in *An Archeological Reconnaissance and Evaluation of the Oak Ridge National Laboratory, Oak Ridge Reservation, Anderson and Roane Counties, Tennessee* (DuVall 1994), and in the report *An Evaluation of Previously Recorded and Inventoried Archeological Sites on the Oak Ridge Reservation, Anderson and Roane Counties, Tennessee* (DuVall and Souza 1996). This same prehistoric context was also provided in Section 3.2.2.

Historic contexts for the original, approximately 59,000-acre (approximately 23,886.64 ha) ORR were established in 1991 as part of the Cover Nomination and National Register Multiple Property Nomination prepared for the city of Oak Ridge (Thomason and Murphy 1991). The Cover Nomination justified three Historic Context Periods: (1) Valley Before World War II, ca. 1840-1942; (2) World War II Era, 1942-1945; and (3) Post-World War II Era, 1945-1959.

In March 1993, DuVall & Associates, Inc., was engaged to identify properties at ORNL that are included or eligible for inclusion in the NRHP. Integrating the three contextual periods identified by Thomason and Associates, DuVall's study delved into ORR prewar, industrial, and postwar histories. This body of work, coupled with the work of Thomason and Associates for the city of Oak Ridge and the Y-12 Plant and the work of the Jacobs Environmental Restoration Team for the ETTP, provides a sound academic base and is to be used in future research work into the evaluation of DOE ORO World War II and later resources in the Oak Ridge area.

Future prehistoric and historic research projects will explore all available contexts. With the passage of time, it is anticipated that additional contextual periods will be identified. Research methodology will integrate primary as well as secondary sources and will include, but not be limited to, the following:

- written local histories
- oral interviews conducted with the region's early residents, their descendants, and Manhattan Engineering District[U.S. Army Corps of Engineers personnel
- family photographs/records
- maps-topographic maps predating 1942 and acquisition maps developed ca. 1942 church and
- cemetery records
- courthouse records-wills, marriage/death certificates, census records, and tax digests
- photographs

Of special interest is an extensive collection of DOE photographs [now housed at the American Museum of Science and Energy (AMSE)) documenting the development of the ORR from its inception. Included in this collection is an aerial mosaic of the ORR in 1942 showing the location of many farmsteads, houses, and outbuildings prior to their demolition.

Repositories of information that could provide information on the ORR are the Tennessee State Library and Archives, the Oak Ridge Public Library, the Anderson County Public Library, the Roane County Public Library, East Tennessee Historical Society's McClung Collection, and the Hodges Library at UTK.

Archival research for archeological investigations is somewhat more limited. The THC and TDOA house numerous reports on a statewide basis. County site files and map collections located at these facilities may also prove beneficial in background research. The UTK McClung Museum maintains duplicate site files and an extensive library.

4.2.2 Ethnographic Field Work

The potential for future ethnographic fieldwork on the ORR is possible but limited. The area was relatively homogenous with a rural Euramerican flavor and settled by families who subsisted on modestly scaled farms. The region was isolated, but larger communities such as Oliver Springs, Harriman, Clinton, Kingston, and Knoxville provided a limited economic presence.

Ethnographic studies may be conducted as part of future cultural resource surveys as warranted by the nature and types of cultural resources encountered. Ethnographic studies would include activities such as (1) conducting oral interviews with individuals or descendants of individuals displaced by the Manhattan Project or descendants of Native American peoples that aboriginally occupied the area and (2) researching census/tax records.

4.2.3 Structure and Facility Surveys

DOE ORO has completed systematic structure/facility surveys (see Sections 3.3.4 and 3.4.2.3) of most of its properties in the Oak Ridge area. With the intention that this work meet accepted professional standards, DOE ORO has required that all survey work and research methodology be consistent with standards established in Section 100(a)(2) of the NHPA and the Department of Interior's Guidelines for Archeology and Historic Preservation (48 FR 44716-20).

Survey methodology has included (1) contacting the SHPO regarding NRHP-included and -eligible properties within the survey areas and (2) conducting research into the historical contexts of the properties of interest. Research into historical contexts typically involved (1) visiting the SHPO's office at the THC and examining files that contain information on the Oak Ridge area, (2) conducting research at the Tennessee

State Library and Archives and the Oak Ridge Public Library, (3) contacting noted DOE historians, and (4) conducting fieldwork.

Secondary research revealed resources such as the major historical and archeological surveys that have been conducted on DOE ORO lands in the Oak Ridge area (see Section 3.3.1, 3.3.2, and 3.3.4) and the three-volume history of the AEC (Hewlett and Anderson 1962; Hewlett and Duncan 1969; and Hewlett and Holl 1989) that provides a general national context for the period 1939 through January 1961. The AEC volumes specifically address trends affecting nuclear research and the development of the ORR. In addition, the AEC series is the basic reference work for the period; beyond this series, little scholarly work has been done to provide a contextual overview of nuclear research.

Fieldwork and research undertaken within the study areas have involved (1) reviewing site documents (such as current and past building directories); (2) reviewing histories written by the facilities (such as the ORNL division histories prepared as part of ORNL's fiftieth anniversary and the general history of ORNL prepared in 1992 by Leland Johnson and Daniel Schaffer); (3) reviewing site engineering records and drawings; (4) photographing the exterior and, in some instances, the interior of facilities; (5) describing the architectural, structural, and functional features of facilities and noting their condition and any alterations; and (6) describing important programs that contributed to DOE's mission.

Future structure and facility surveys will employ similar survey methods. In addition, any future surveys that are specifically designed to evaluate individual facility components or pieces of scientific equipment will use the historical contexts developed for the facilities at which they are located as the primary source of information against which their significance will be evaluated.

To this point, DOE ORO's survey methodology has been to examine each of the individual components of the original ORR (i.e., ORNL, the ETTP, the Y-12 Plant, and the Townsite) as opposed to looking at the ORR as a single historical entity. The topographic features of the ORR are historically related to the original selection of this area of East Tennessee for "Site X" of the Manhattan Project as well as to the development of the specific facilities.

4.2.4 Archeological Surveys

The survey methodology that will be employed in archeological surveys will vary with the terrain and resource features encountered. Although the survey methodology is determined by the Principal Investigator based on survey conditions, the typical and most effective survey methodology for vegetated areas with little or no disturbance will involve pedestrian transects spaced at 8-15meter intervals. Shovel tests (30 x 30 to 50 x 50 cm) screened through 0.25-inch mesh hardware cloth would be placed at like intervals (8-15 m) along the transects. The ability to screen soil is dependent on the moisture content of the soil. Saturated soils after periods of heavy rain are virtually

impossible to screen, and other methods such as careful shovel or trowel sorting may be appropriate under saturated conditions. The location of the transects and shovel test pits would be map located. Typical soil profiles, including Munsell soil colors, and documentary photographs of the survey area would be maintained for record.

An effective survey tool for upland areas is a standard fire rake. The fire rake is suited for scraping leaf litter and humic soils in areas with little or no soil development, which is typical for the uplands in the ORR. Normally, 1 x 1-meter scrapes would be made to provide a good sample of the soil conditions and to reveal any cultural material that may be present.

An effective method of survey on large tracts of land that are void of trees and successional growth is the use of a tractor and two bottom plows. In these areas, plow strips placed in linear fashion at 15-meter intervals across the tracts may be used to expose an approximately 1.5-meterwide strip and to provide a view of the subsoil. If time allows, the strips can be disked and allowed to be rained on for optimum conditions. The plow strips would be surface collected with concentrations of surface material mapped for additional shovel tests or Phase II testing. This method is very effective and does little damage to the archeological deposits, since the majority of the arable land in the area has been previously under cultivation.

Surveys on the river and creek floodplains and terraces present a totally different survey problem. The potential for buried cultural deposits is present on both of these landforms, and in most cases the deposits may lie deeper than manual tests can reach. In such cases, a backhoe, the most effective method for identifying and evaluating buried cultural strata, would be used. Trenches 5 m long and 60 cm to 1 m wide and spaced at 30- to 50-m intervals could be made to provide adequate coverage to identify cultural strata. When cultural strata are identified, the profiles would be drawn and photographed with the trench locations accurately mapped so that they could be relocated at a later date. Also, in most cases in which trench excavations are made, a geomorphologist would be employed to evaluate soil profiles to determine the age of the deposits and soil characteristics.

4.3 EXCAVATION

4.3.1 Test Excavations

Standard test methods will be employed for Phase II testing of prehistoric and historic archeological sites on the ORR. In most cases, the methodology to be employed will be determined by the archaeologist in consultation with DOE ORO and/or DOE ORO's prime-contractor representatives.

A typical testing scheme for prehistoric archeological sites would involve clearing trees and brush from the sites, plowing and disking site areas, and either waiting for a rain or manually watering the sites with an equivalent of 1" of rain. Following rain and/or the watering of the sites, baselines and grids would be placed across the sites,

and controlled surface collections would be made. Visual observations of cultural material concentrations, including items such as lithic debitage, ceramics, bone, fire-cracked rock, and burned limestone, would be recorded for later analysis. The visual observations would then be correlated with density maps obtained during controlled surface collections to identify high-density areas that can be sampled by manual shovel tests to further quantify cultural material density and to view the subsoil to identify any cultural features present.

A backhoe with a toothless or smooth bucket is very effective on both shallow sites and sites requiring deep testing and could be used to open larger areas or remove the plow zone. Features encountered would be bisected and one side excavated; the opposing side would be inspected for stratification, and, if present, the remainder of the feature would be excavated in natural layers. Flotation samples (10 L) for botanical recovery would be taken from all features. Likewise, when sufficient charcoal is present, charcoal samples would be removed and placed in aluminum foil for storage and possible radiometric dating in the laboratory. All features identified would be drawn in plan and profile view and photographed.

Historic period sites, in most cases, are generally more compact and contain some surface indications of where structures or other features such as wells, cisterns, cellars, foundations chimneys, or privies may have stood. The baseline and grid placement would be placed to encompass the focal point of the site. Manual shovel testing could then be performed to identify activity areas and/or determine the integrity of the site. The decision to perform deeper testing (such as by the use of a backhoe) on a Historic period site would be made cautiously, since many Historic period sites are shallow and could be seriously damaged by the equipment. If deeper testing is used, the same procedures used for the excavation and sampling of prehistoric cultural features could be employed.

4.3.2. Large-Scale Excavations

Since all sites are different and the methodology employed on a site depends on the type of site, findings of Phase II test excavations, terrain setting, and cultural period(s), the methods employed in large-scale excavations would be determined by the archaeologists conducting the excavation in consultation with DOE ORO and/or DOE ORO's prime-contractor representatives. This would generally be done in the proposal and research design phase of a project. This phase of a project formulates questions to be answered and the methodology that will be used to answer such questions. In addition, proposals and research designs developed for large-scale excavations would be provided to the SHPO and State Archeologist for review and approval prior to the initiation of any excavation activities.

4.4 STRUCTURE AND FACILITY MANAGEMENT

4.4.1 Structure and Facility Documentation

Structure and facility documentation prepared by DOE ORO will be in accordance with Section 110 of the NHPA and will include information such as (1) physical descriptions of facilities; (2) discussions of the history and use of facilities; (3) recent and historical photographs taken of facilities; (4) copies of facility drawings, schematics, and maps showing the evolution of facilities; and (5) maps showing the location of facilities and surrounding streetscapes and/or landscapes.

DOE ORO will also assess the need for Historic American Buildings Survey (NABS) and Historic American Engineering Record (HAER) documentation of facilities in consultation with the SHPO. If required, HABS and HAER documentation will be prepared in accordance with all applicable standards. In many instances, however, existing engineering documentation (such as facility drawings and equipment schematics) meet or exceed the requirements for HABS and HAER.

4.4.2 Structure and Facility Maintenance

The maintenance of DOE ORO properties will involve a myriad of routine, activities to maintain the functional use of facilities in support of DOE ORO missions. Classes of typical maintenance activities such as those listed as cultural resource exclusions in Section 5.1.2 will be reviewed to determine their potential to affect properties that are included or eligible for inclusion in the NRHP. Maintenance activities will be performed in accordance with approved procedures and, where practicable, will involve in-kind replacement of components or materials or refurbishment of existing components/materials.

4.4.3 Structure and Facility Mitigation

Structure and facility mitigation activities/projects will include, but not be limited to, the following methods:

Resiting. DOE ORO undertakings that would adversely affect properties included and/or eligible for inclusion in the NRHP will be considered, as a matter of necessity, for resiting to a location that would eliminate or reduce the effects of the undertaking on such properties.

Architectural Design and Screening. DOE ORO undertakings such as new building constructions will consider designs consistent with existing facilities that surround the building site and will be coordinated with the SHPO. Undertakings such as facility repainting or major modifications to facilities such as residing will consider the appearance and integrity of the facilities and will be coordinated with the SHPO. In addition, mitigation of undertakings may involve the use of various landscaping techniques/designs to reduce the visual impact new facilities or modifications of existing facilities would have on surrounding NRHP-included and/or -eligible properties.

Recordation. When other mitigation measures are determined, in consultation with the SHPO, to be infeasible (i.e. demolition), facility documentation projects similar to those described in Section 3.4.4.1 will be employed to record the existence of structures/facilities.

Dismantlement/Reconstruction. When determined to be consistent with DOE ORO missions or determined to be of value to the public/nation, DOE ORO, in consultation with the SHPO, will undertake the dismantlement and reconstruction of structures/facilities at a new location.

4.5 LABORATORY TREATMENT

4.5.1 Processing

The processing of cultural material recovered from the ORR will be coordinated by a Principal Investigator at an offsite processing laboratory. The processing will begin with an initial assignment of an inventory number to the bag or container of the material at the time the bag/container is accepted by the laboratory. The same number will also be assigned in a Master List which follows the material from initial processing through curation. The bag/container and Master List will contain, at a minimum, the site number, provenance of the material, the date the material was recovered, and the archeologist/historian responsible for the site investigation. Some materials require more thorough washing than others. For example, it is not critical to excessively washfire-cracked rock or other unmodified materials. Such materials are generally roughly analyzed for ground/polished stone or abraded items and then counted or weighed and discarded. Hand washing of cultural material is recommended; this is typically accomplished with a soft brush using clean tap water. Fragile artifacts may require special handling. Special care will be taken with ceramic sherds to ensure that surface treatment is not created, altered, or obliterated by brushing. Other artifacts. such as fragile bone will not be scrubbed with a brush but rather will be washed by rinsing under a low-pressure water nozzle.

The recent laboratory development of residual blood analysis may dictate that some lithic tools not be washed at all. This will be up to the Principal Investigator based upon knowledge of provenance and circumstances from which artifacts are recovered. Special treatment requirement for specific artifacts will be relayed to the laboratory director upon submittal of the material to the laboratory. Special instructions for processing should be placed both on the bag/container and the Master List.

Numerous methods are acceptable for the drying of artifacts. The provenance should be maintained with the cultural material at all times. This can be accomplished by leaving the bag/ container with the cultural material or by transcribing the data from the bag/container to a 3 x 5-in. index card. The card would be placed with the cultural material until the material is repackaged in a clean container. The provenance data would be transcribed to the clean container at this time and the old container and/or card returned to the laboratory director for recording and disposal.

The processing of organic and metal artifacts requires special treatment and is discussed in Section 4.6.1.

4.5.2 Analysis

Analysis of prehistoric lithic artifacts shall emphasize interpretation as to temporal-functional variation in raw material usage, implement frequency, and representation of particular debitage classes. As a basis for drawing inferences about the structure of activities within each component identified at a site, emphasis shall be placed on interpreting patterns of raw material acquisition, reduction practices, and functional aspects of tool usage. For comparative purposes, the basic classification format for lithic artifacts shall follow those compiled from previous excavations in the region.

The analysis of prehistoric ceramic materials shall be directed toward description and classification, with an emphasis on accurate characterization of variability in temper, paste, and surface treatment attributes. Given suitable samples of ceramic remains, more detailed examination of formal/functional vessel characteristics may be possible.

Carbonized botanical remains shall be extracted from samples of feature fill by flotation and sorted from water-screened materials. Identification of carbonized materials shall be conducted by an acknowledged professional in the field. Plant foodstuffs and wood charcoal shall be quantified and identified to the level of species or taxa, as appropriate. Distributional characteristics of recovered species will then be assessed with respect to implications for seasonality and subsistence organization. Well-documented assemblages of plant remains from regional sites of similar age, including those from the Tellico Reservoir, would be used as a source of comparative information.

The analysis of Historic period artifacts/materials shall be conducted in accordance with accepted typologies for the region. The processing of the artifacts shall, at a minimum,-consist of cleaning, sorting, and cataloging. Special precautions will be taken in the cleaning of fragile artifacts such as soft bone; low-fired and unglazed ceramics; overglazed-decorated ceramics; and enameled, gilded, or other plated metals. Artifacts requiring further stabilization shall be identified, noted on the catalog, and stored separately. Several types of artifacts-primarily those constructed of organics such as textile, leather, shell, or bone-shall have immediate intervention for preservative purposes.

4.6 CURATION

4.6.1 Preservation

The degree of preservation is dependent on the types and quantity of cultural material recovered from a site. Likewise, the level of survey (i.e. Phase I, II, or III) will determine the amount and classes of cultural material that will have to be processed and preserved. It is typical for PhaseI-level surveys to recover only minimal amounts of

cultural material. These are typically specimens that require only the basic preparation for preservation.

The presence of both prehistoric archeological and historic Euramerican archeological sites on the ORR is typical for the region. Due to the climate and acidic soils of the area, the recovery of cultural material, with the exception of carbonized remains, is generally limited to lithic (stone), ceramic, shell, and metal artifacts. Bone, in some instances, is recoverable when associated with pH neutralizing agents such as calcium-rich limestone or shell.

A decision on materials which have not been stabilized in the field shall be made upon arrival at the laboratory. Materials that have been slated for conservation shall receive immediate attention. A decision will be made by the laboratory director or conservation specialist as to which items are "treatable" based on the relative condition and composition of the objects, the treatment level required for preservation, and whether or not the artifact is too fragile to withstand the conservation process.

Although there are standard conservation and curation practices, the designated curation facility shall be consulted for preferred treatment and stabilization procedures on particular classes of artifacts. Organic materials are generally the most problematical from a stabilization standpoint. When bone or bone artifacts must be treated, they shall be carefully cleaned by hand and then stabilized with applications of an acetone and DUCO cement mixture. Well-preserved leather objects can usually be brushed clean and successfully treated with multiple applications of anhydrous lanolin.

Metal artifacts shall be carefully examined for evidence of enameling, plating, or painting. To remove corrosion from common ferrous artifacts (nails or unplated hardware), an appropriate air-propelled abrasive to "excavate"-the corrosion bloom on the original artifact can be used. This process would be followed by either annealing (recommended for mass processing of nails and other commonplace items) or the application of a polymeric sealant/rust converter such as CONQUEST. For solid artifacts, this approach is preferable to electrolysis and better suited to recovering the original surface and details of the artifacts. This process is also less time consuming than electrolysis.

Copper, brass, lead, and pewter artifacts would be manually cleaned or their patina left intact. More specialized treatment of fragile metal artifacts, particularly composite artifacts, shall be considered on a case-by-case basis.

Curation of Federally-Owned and Administered Archeological Collections: Final Rule (36 CFR 79) and the National Park Service's "Curatorial Care of Archeological Objects" provide recommended treatment, cleaning, and storage for specific artifacts such as glass, cloth, and fragile materials. In addition to procedures established by professional archeologists and historians, laboratory directors, and curating-facility managers, these procedures shall be followed to ensure the proper processing, analysis, and preservation of cultural materials.

4.6.2 Inventory, Accession, Labeling, and Cataloging

The Master List (see Section 4.5.1 above) containing information about cultural materials recovered, processed, analyzed, preserved, and/or curated as a result of cultural resource investigations of DOE ORO properties shall serve as the primary source of information for updating and maintaining a DOE ORO artifact inventory. The inventory shall include, at a minimum, the site number, provenance of the material, the date the material was recovered, the archeologist responsible for the site investigation, and the accession number as established by the cultural material processing laboratory director or curational facility manager. Accession numbers shall be assigned to recovered materials in one of two manners. First, accession numbers may be assigned by the laboratory director responsible for processing, analyzing, and preparing cultural materials for curation to maintain control of the material throughout the laboratory processing and analysis phase. The second method of assigning accession numbers, which is the preferred method by DOE ORO, is to contact the curation facility to obtain the permanent accession number(s) that will be used by the facility so that consistency is maintained throughout the entire process.

Containers such as bags and storage boxes shall be legibly labeled with site number, provenance, date, and accession number using permanent ink. All cultural material shall be placed in acid=free containers prior to final curation.

4.6.3 Identification, Evaluation, and Documentation

The primary documentation for DOE ORO collections of cultural material will consist of the inventory database described in Section 4.6.2. Other sources of documentation will consist of that generated as a result of the cultural material recovery through curation process (e.g., Master Lists, field notes, and laboratory notes) and reports outlining the results of surveys or excavations.

4.6.4 Storage and Maintenance

Archeological material recovered from properties under the jurisdiction of DOE ORO and its predecessor agencies are curated at the UTK McClung Museum, UTK Department of Anthropology, and the American Museum of Science and Energy. At present, however, DOE ORO does not have a contractual relationship with either of these facilities to curate cultural materials recovered during future investigations. Instead, DOE ORO will arrange for curatorial services on a project-by-project basis.

This method of obtaining curatorial services for the long-term storage and maintenance of DOE ORO collections is anticipated to be the most efficient, since DOE ORO has not historically performed cultural resource investigations that produce archeological material requiring curation on a frequent basis. Furthermore, DOE ORO does not plan to initiate any program or projects that would involve the need to transfer materials to a curation facility on a frequent basis. However, when future curatorial services are

needed from an organization outside the DOE ORO system, the facility will be required, at a minimum, to meet requirements and standards pursuant to 36 CFR 79.9. All cultural material recovered from DOE ORO properties will be prepared for curation in accordance with guidelines prescribed by the curating facility that will ultimately be responsible for the storage and maintenance of materials. In addition, curational facilities will be required to demonstrate the ability to provide adequate environmental controls and facility security.

DOE ORO maintains on-site facilities for the curation of records and reports that can be considered DOE ORO's cultural resource records and reports. Examples of these records include drawings, schematics, plans, and maps maintained by various engineering organizations, photographs and negatives maintained by photography departments (e.g., Y-12 Photography) throughout the DOE ORO system, and records maintenance organizations such as ORNL Laboratory Records. Storage and maintenance of these records are carried out in accordance with existing procedures designed to ensure their proper security, maintenance, and disposition.

Artifacts that might be lost or destroyed in the course of facility downsizing, decommissioning, or reorganization should be saved. There are over 1000 buildings for which DOEORO is the steward on the ORR, and contents of these buildings have not been fully evaluated. Many items exist that once supported early missions on the ORR, and some of these items are quite unique. Some items, such as scientific instruments that are now obsolete could have historical significance. As a preliminary step, these items (large and small) will be salvaged whenever feasible and stored until such time as a formal evaluation can be made by a qualified historian. When possible, storage of such items will be in humidity controlled areas that are properly secured. These type of storage areas will be under the management of the site CRM Coordinator or their designee.

4.6.5 Periodic Inspection and Remedial Preservation

A DOE ORO representative shall at five-year intervals physically inspect the curating facility or facilities and review the collections. Notes shall be taken during the inspections as to the condition of storage containers and the physical condition of the repository with respect to maintenance. Photographs of existing conditions may be taken during inspections to determine if any changes in the condition of storage containers from environmental factors have occurred or if the repository is deteriorating with respect to maintenance. The curating facility should notify DOE of any changes in its status as an acceptable repository.

The DOE ORO representative shall provide the results of the inspection(s) to the DOE ORO CRM Coordinator, who shall in return notify the SHPO in writing of the inspection and its results. Any discrepancies, problems, or comments with the repository or the collections will be addressed at this time.

4.6.6 Study

DOE ORO collections will be made available to persons, organizations, or groups meeting the criteria pursuant to 36 CFR 79.9(a), (b), and (c) and under the terms and conditions as stipulated in 36 CFR 79.10(d-g). All facilities providing curational services for DOE ORO collections will be required to maintain records on the use of DOE ORO collections in research activities.

4.7 PRESERVATION

4.7.1 Protection from Natural Forces

Historic archeological sites on the ORR are presently exposed to natural forces: In the case of historic house sites and support facilities (other than NRHP-included properties) such as cisterns, wells, sheds, smokehouses, and barns, the current practice is to avoid disturbance of the structures and to not engage in preservative maintenance. Many of the structures are located outside developed areas in parts of the ORR that possess little potential for disturbance, and most are experiencing little natural erosion due to their locations on flat hilltops or in flat hollows. Many contain cellars which are slowly filling with humus; however, this is a natural protective mechanism that will ensure the sealing of any cultural deposits that may exist in the depressions. DOE ORO plans to maintain its present policy of avoidance and to evaluate the effects proposed DOE ORO undertakings may have on the natural environment in the vicinity of known and newly identified sites pursuant to 36 CFR 800 and 36 CFR 60.4.

Prehistoric archeological sites pose a problem somewhat different from historic archeological sites based on their topographic location. Prehistoric archeological sites in upland settings are similar to historic house sites in that little additional disturbance can be expected; many lie on severely deflated landforms and probably do not represent significant resources. However, prehistoric archeological sites located along the Clinch River and its major tributaries (e.g., Poplar Creek and East Fork Poplar Creek) are susceptible to natural forces such as flooding and water fluctuations. Such natural forces cause slumping of the banks and horizontal beach erosion. The inundation of the Clinch River (although a natural force under normal circumstances) by the construction of Watts Bar Reservoir and Melton Hill Lake and discharge from Melton Hill Dam expedite the erosion process considerably.

The NRHP eligibility of known prehistoric archeological sites on the ORR has been determined by DuVall and Souza (1996). If justified by findings during periodic site inspections, DOE ORO shall evaluate sites that have been determined to be eligible for inclusion in the NRHP to understand the current rate of erosion and degradation to the sites and to identify the need for site stabilization. Extant Historic period sites and structures (including pre-World War II and Manhattan Project as well as later structures) that are included or eligible for inclusion in the NRHP receive (at a minimum) routine surveillance and/or maintenance to protect them from deterioration or degradation caused by natural forces.

4.7.2 Protection from Human Forces

4.7.2.1 Authorized Actions

As described in Section 3.4.6.2.1, DOE ORO utilizes an existing mechanism to protect and preserve cultural resources from authorized actions. This is accomplished through the NEPA process, which involves the screening of DOE ORO actions for their potential effects on NRHP-eligible and -included properties. Specifically, the screening process for actions that possess a significant potential to affect the environment involves a comprehensive environmental, safety, and health review. This process also includes a review of the potential effects that actions would have on properties included or eligible for inclusion in the NRHP and that have been carried out in accordance with the Programmatic Agreement (PA). Small-scale actions such as routine maintenance activities are typically handled by project managers, project planners and estimators, and other individuals who have been trained by compliance personnel in the application of the PA provisions incorporated in this CRMP and have been instructed to bring potential concerns/issues to the compliance support organizations for further review. Personnel responsible for area management and surveillance, as well as security patrol personnel, are made aware of properties of historical significance (not necessarily limited to properties included or eligible for inclusion in the NRHP) and are instructed to stop any actions they may find that are affecting or could have an effect on those properties as well as to contact the appropriate compliance staff members to resolve issues of concern.

The review of actions through the NEPA process is well documented and carefully tracked using database systems. This existing review mechanism has proven to be an effective tool in the management of the ORR and in the protection of DOE ORO cultural resources. DOE ORO plans to continue using cultural resource protection and preservation methods outlined here and in Chapter 5 of this document and will improve the process as new methods, procedures, and mechanisms are introduced. In addition, personnel responsible for area surveillance and management will be trained in cultural resource protection, preservation, and identification to provide a more rounded approach to cultural resources management.

4.7.2.2 Illegal Acts

DOE ORO plans to maintain the current method of protecting and preserving cultural resources from illegal acts and to initiate a program to periodically inspect known sites, particularly those most susceptible to looting or vandalism. This program will involve surveillance by individuals trained, at a minimum, in cultural resources identification and cultural resources regulations. The objective of the surveillance activities will be to inspect known sites and record present condition of the sites, as well as to assess whether the sites have been disturbed by natural and/or human forces since they were last visited.

4.8 OUTREACH

4.8.1 Activities on the DOE Site

DOE ORO has actively pursued cultural resources and scientific outreach activities (as funding permits) on a local and regional scale. Examples of these activities are provided in Section 3.4.8.1. Most outreach activities are coordinated through the DOE ORO Public Relations Office, through the public relations offices at the three industrial complexes on the ORR, and by the AMSE. Outreach activities typically involve coordination with local government, interest groups, and other interested parties on issues regarding cultural-resources-related activities and publication of information in local newspapers.

The AMSE is an educational institution that is dedicated to personalizing science, technology, and history. The AMSE has served as the primary center for preserving the history of the Manhattan Project and Oak Ridge's role in many of the programs that followed. A section of the museum is dedicated to telling the Oak Ridge story, which includes a portrayal of life in the area prior to arrival of the U.S. government in 1942. Also on display at AMSE are exhibits which include historic and scientific artifacts and archives of the ORR that may be used for research, study, and exhibition. Admission to the museum is free as are the public tours conducted by the museum of the three main sites that make up the ORR. The tours are offered from March through October and originate at the AMSE, where visitors board a bus and receive a narrated tour of the site they choose. The AMSE has displays for the public which show the production, use, storage, and environmental issues associated with all types of energy production, highlighting the benefits of radioisotopes, nuclear medicine, and radioactivity in society.

4.8.2 Activities Not on the DOE Site

DOE ORO does not have a formal program that involves off-site outreach activities for cultural resources. AMSE has an outreach program with off-site activities including the Native American Heritage month program. Existing on-site outreach activities allow for interested persons or parties that live near or visit the ORR to become acquainted with cultural resources on the ORR. No plans now exist to develop methods and procedures designed solely for purposes of off-site cultural resource outreach activities.

5. CRM PROCEDURES AND ADMINISTRATION

5.1 COMPLIANCE PROCEDURES- NHPA, EXECUTIVE ORDER 11593, 36 CFR PARTS 60,63,65,79, AND 800

The ultimate success of a CRMP depends as much on the implementation process as it does on the quality of the plan. The following section outlines the procedures that DOE ORO shall follow to fulfill its responsibilities under the National Historic Preservation Act (NHPA) and other cultural resource laws and regulations. Unless otherwise specified, it shall be the responsibility of the DOE ORO Cultural Resources Management (CRM) Coordinator (working with the various DOE ORO programs, sites, and functions) and prime-contractor Cultural Resources Coordinators to ensure that these procedures are followed and carried out in accordance with the letter and spirit of the law. In some instances, however, specific responsibilities of the DOE ORO CRM Coordinator or other individuals are called out in a procedure to emphasize the role and authority of such persons.

5.1.1 Compliance Procedures for Undertakings

5.1.1.1 Preconstruction Project Planning and Evaluation

The Oak Ridge Reservation (ORR) includes substantial land area, security forces, fire protection, roads, and other infrastructure in support of its wide variety of land uses. Development pressures are constantly exerted on the ORR similar to pressures exerted on counties, cities, or towns. With finite resources and budget constraints, proper planning is of paramount importance to ensure logical and safe facility development. Therefore, many of the planning methodologies used by municipal planners are applicable to the ORR.

DOE ORO long-range planning is a complex, multifaceted, and dynamic process that is dictated by a DOE order that includes site development planning involving many participants. This order requires that DOE sites have in place a process that involves planning for and developing real property holdings to support the mission of the site. To implement this order, Technical Site Information (TSI) documents for use by technical and staff personnel and Site Development Plans (SDPs) for use by senior managers have been developed. A TSI document has been developed for the ORR that summarizes DOE ORO resources in the Oak Ridge area, and an SDP has been developed to deal with central issues such as land use and reuse. These documents also include technical site information and planned uses for DOE ORO properties not located on the ORR proper.

The DOE ORO ORR Management Team (ORRMT) oversees the implementation of DOE ORO's TSI and SDP documents and is the organization that recommends further consideration of proposed facilities development or land use changes for the ORR to the ORR Manager. The ORRMT consists of DOE ORO program and oversight representatives and is supported by the ORR Resource

Management Organization (RMO) The RMO consists of representatives from DOE ORO prime contractors with expertise in site planning and development, plant management, natural resources preservation/management, and environmental compliance. In general, the RMO reviews proposed actions and land-use changes and recommends approval or disapproval through the ORRMT. Proposals submitted for review are initiated by programs, sites, or functions as projects; however, should the need be identified for a project without a sponsor/user, the RMO or planning staff would initiate the proposal.

The implementation of physical changes in land use and facilities utilization is accomplished primarily through the DOE funding categories: Line Items (LIs), General Plant Projects (GPPs), and Expense projects. These funding categories are defined as follows:

- **LI** - a capital construction project with a total estimated cost in excess of $1.2 million

- **GPP** - a capital construction project with a total estimated cost equal to or less than $1.2 million

- **Expense** - a project funded from the annual plant or laboratory operating (or expense) budget

Steps from conception to implementation of projects typically involve authorization, Titles I and II design, and procurement/construction. Typical actions associated with these steps are outlined below.

Authorization

- Managing contractor prepares a directive request for project funding.

- DOE ORO submits financial plan and directive to DOE Headquarters for review and congressional authorization.

- Managing contractor prepares a contract management plan.

- Managing contractor issues internal authorization (engineering service orders, purchase orders, and/or maintenance work orders).

Titles I and II Design

- DOE ORO and managing contractor conduct an architect-engineer (A-E) kickoff meeting.

- DOE ORO and managing contractor approve the A-E job plan.

- Titles I and II engineering are initiated with 30%, 60%, and 90% design reviews and, finally, a constructability review.

Procurement/Construction

- DOE ORO and managing contractor award procurement and construction contracts.

- Managing contractor monitors and maintains controls of project baselines.

- Start-up and verification occurs.

- Project closeout occurs.

An important tool used by DOE ORO is the National Environmental Policy Act (NEPA) planning and evaluation process. NEPA requires federal agencies to take into account the effects of their actions on the human environment, including factors such as cultural and natural resources, socioeconomics, and transportation. DOE ORO compliance with NEPA is dictated by the NEPA permeate the entire DOE ORO system, including procedures that apply to all prime contractor employees and those that apply to site-specific employees and operations.

Proposed DOE ORO actions approved for the authorization phases of funding are considered to be in the conceptual design phase. At this point, proposed actions are entered into the NEPA review process and cannot proceed with further design and implementation until the proper NEPA documentation has been prepared and approved in accordance with 10 CFR 1021.210(b). Within the DOE ORO system, compliance with the NHPA is inextricably tied to compliance with NEPA. In fact, the DOE ORO CRM Coordinator and the Cultural Resources Coordinators employed by DOE ORO prime contractors [e.g., the Oak Ridge National Laboratory (ORNL), the ETTP, and Y-12 Plant] are all members of the NEPA compliance organizations. Therefore, all DOE ORO actions reviewed for NEPA compliance are concurrently reviewed for NHPA compliance.

The process by which DOE ORO implements NEPA and, therefore, NHPA review and compliance requires a basic understanding of the DOE NEPA implementing procedures (10 CFR 1021) and how DOE ORO is structured to carry out these procedures. In accordance with 10 CFR 1021.300 and 10 CFR 1021, Subpart D, DOE ORO reviews proposed projects, actions, and/or programs (hereafter referred to as actions or undertakings when discussing NHPA requirements) to determine whether they (1) would require the preparation of an Environmental Impact Statement (EIS), (2) would require the preparation of an Environmental Assessment (EA), or (3) are categorically excluded from the preparation of an EIS or an EA. The initial review of actions for NEPA compliance is handled at the prime-contractor level by the appropriate NEPA compliance staff (e.g., undertakings proposed at the K-25 Site are initially reviewed by the ETTP NEPA Coordinator or his/her designee). After initial

review, the prime-contractor NEPA compliance staff prepares a summary of the review containing an assessment of the level of NEPA documentation that would be required should the action be carried out. The documentation is provided to the DOE ORO NEPA Compliance Officer, who reviews the assessment and either concurs with the assessment or renders an independent determination of the level of NEPA review required.

Most proposed actions reviewed under NEPA are found to meet the criteria, pursuant to 10 CFR 1021.4 10, for categorical exclusion and, therefore, do not require the preparation of an EIS or an EA; however, DOE ORO does manage proposals for actions that may pose a significant potential to impact the human environment and, therefore, actions requiring EAs or EISs. Unlike most federal agencies, DOE ORO requires the preparation and approval of documentation for actions that meet the criteria for categorical exclusion, except for those actions listed at 10 CFR 1021, Subpart D, Appendix A (e.g., routine administrative/financial/personnel actions), which do not normally require review and documentation. This documentation [Categorical Exclusion (CX)] provides a description of the action's purpose and need, activities required to carry out the action, and the location at which the action would take place. The DOE ORO NEPA Compliance Officer or his/her designee has final signatory authority over the categorically excluded actions, and no categorically excluded actions are allowed to take place without this approval. The DOE ORO CRM Coordinator and DOE ORO NEPA Compliance Officer are staff members within the DOE ORO Office of the Assistant Manager for Environment, Safety, and Quality.

One aspect of all NEPA reviews conducted by DOE ORO is the evaluation of potential effects that actions would have on properties included or eligible for inclusion in the National Register of Historic Places (NRHP); such effects must be considered regardless of the level of NEPA review conducted. In addition, DOE ORO recognizes that, even though an action has been properly reviewed and approved (including a consideration of effects to cultural resources) in accordance with NEPA, its obligations and responsibilities under Section 106 of NHPA or other cultural resource laws and regulations may not be met. For example, although a Memorandum of Agreement (MOA) has been executed in accordance with Section 106, DOE ORO's obligations with respect to the MOA would not be satisfied until it has complied with all of the stipulations in the MOA.

5.1.1.2 Identification of Projects That May Affect Cultural Resources

To identify proposed actions that require consideration for their potential effects to properties included or eligible for inclusion in the NRHP, DOE ORO shall rely on the definition of undertaking established by the NBPA, as amended, which states that an undertaking "means any project, activity, or program funded in whole or part under the direct or indirect jurisdiction of a Federal agency, including (A) those carried out by or on behalf of the agency; (B) those carried out with Federal financial assistance; (C) those requiring a Federal permit, license, or approval; and (D) those subject to State or local regulations administered pursuant to a delegation of approval by a Federal agency." This

definition is not unlike that for a DOE action that requires review under NEPA. Therefore, DOE ORO shall utilize the existing NEPA compliance program to identify and review undertakings that may affect cultural resources. It shall be the responsibility of the DOE ORO CRM Coordinator, working with DOE ORO program and project managers and DOE ORO prime contractor Cultural Resources Coordinators, to identify proposed undertakings that may have the potential to affect cultural resources.

Based on the activities required by the undertakings, physical and/or visual impacts the undertakings would have on properties, and the potential of the undertakings to change the use of properties, DOE ORO has identified types of undertakings that could affect properties included or eligible for inclusion in the NRBP, which include, but are not limited to, undertakings involving

(1) construction of new or temporary facilities or permanent or temporary addition to existing facilities;
(2) decontamination and decommissioning (D&D) of facilities;
(3) replacement of equipment or facility components;
(4) facility renovations;
(5) modifications to facility use, operation, or function;
(6) routine maintenance activities;
(7) site characterization and remedial investigation activities;
(8) ground-disturbing activities;
(9) transfer, disposal, or lease of properties; and
(10) demolition of facilities

5.1.1.3 Determination of Extent of Section 106 Review Responsibilities

The criteria set forth below have been developed pursuant to 36 CFR 800.15 for use by DOE ORO to comply with Section 106 of the NBPA. A flowchart depicting the flow-down process of these procedures is shown in Fig. 5.1. To identify known cultural resources that may be affected by an undertaking, DOE ORO shall consider the nature, extent, and purpose of the undertaking and define an area of potential effect pursuant to 36 CFR 800.4(a)(1).

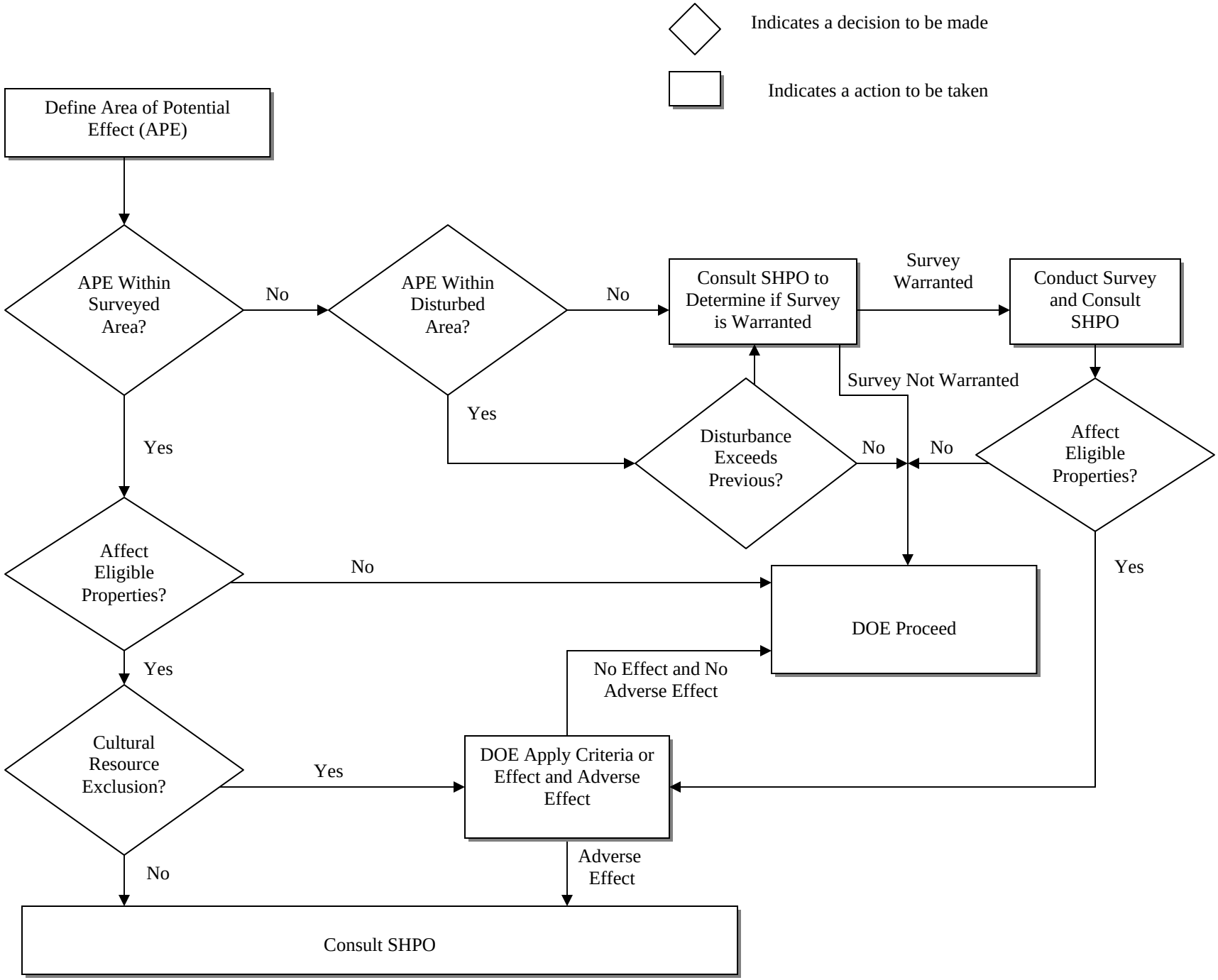
A. If DOE ORO determines that the area of potential effect is entirely within a *previously surveyed area* and the survey has been reviewed and accepted by the State Historic Preservation Officer (SHPO), DOE ORO shall review the survey to identify any NRHP-included or -eligible properties that may be affected.
   1. If DOE ORO determines that no NRHP-included or -eligible properties are located within the area of potential effect pursuant to 36 CFR 800.4(d) (i.e., no cultural resources would be affected), DOE ORO shall proceed with the undertaking with no review by either the SHPO or the Advisory Council on Historic Preservation (Advisory Council).

2. If DOE ORO determines that NRHP-included or –eligible properties are located within the area of potential effect pursuant to 36 CFR 800.4(e) (i.e., cultural resources could be affected) *and*

    a. the undertaking is a cultural resource exclusion listed in Section 5.1.2, DOE ORO shall apply the Criteria of Effect and Adverse Effect (36 CFR 800.9) to the undertaking in accordance with the procedures under Section 5.1.4.1.

        (1) If DOE ORO determines that the undertaking would not have an adverse effect on NRHP-included or -eligible properties, DOE ORO shall proceed with the undertaking with no review by either the SHPO or the Advisory Council.
        (2) If DOE ORO determines that the undertaking would *have* an adverse effect on properties included or eligible for inclusion in the NRHP, DOE ORO shall consult with the SHPO an initiate the review procedures under Section 5.1.4.2.

Fig. 5.1 Review process for determining Section 106 consultation requirements.



b. the undertaking is *not* a cultural resource exclusion listed in Section 5.1.2, DOE ORO shall consult with the SHPO and apply the Criteria of Effect and Adverse Effect (36 CFR 800.9) in accordance with Section 5.1.4.1.

(1) If DOE ORO determines, in consultation with the SHPO, that the undertaking *would not* have an adverse effect on NRHP-included or -eligible properties, DOE ORO shall proceed with the undertaking with no review by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking, pursuant to 36 CFR 800.8, for possible review by the Advisory Council.

(2) If DOE ORO determines, in consultation with the SHPO, that the undertaking *would have* an adverse effect on NRHP-included or -eligible properties, DOE ORO shall initiate the review as described in Section 5.1.4.2.

B. If the undertaking would involve ground disturbance in a *previously disturbed* area and the new disturbance would not exceed the depth and extent of previous ground disturbance in the area, DOE ORO shall proceed with the undertaking without consulting the SHPO or Advisory Council regarding the need for an archeological survey.

C. If the undertaking would involve ground disturbance in a *previously disturbed* area and the new disturbance would exceed the depth and extent of previous ground disturbances in the area, *or* if the undertaking would involve ground disturbance in an *undisturbed* area, DOE ORO shall consult with the SHPO to determine whether an archeological survey is warranted (36 CFR 800.4(a)(2) and (b)] *and*

1. if DOE ORO determines, in consultation with the SHPO, that a survey is *not* warranted, DOE ORO shall document the consultation with the SHPO and proceed with the undertaking with *no* review by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking,

pursuant to 36 CFR 800.8, *for* possible review by the Advisory Council;

2. if DOE ORO determines, in consultation with the SHPO, that a survey is warranted, DOE ORO shall initiate a survey in accordance with Section *5.1.3 and*

   a. if the survey (after having been reviewed and accepted by the SHPO) indicates that *no* NRHP-included or -eligible properties would be affected, DOE ORO shall document the consultation with the SHPO and proceed with the undertaking with no review by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking, pursuant to 36 CFR 800.8, for possible review by the Advisory Council.

   b. if the survey (after having been reviewed and accepted by the SHPO) indicates that NRHP-included or-eligible properties would *be affected,* DOE ORO shall consult with the SHPO and apply the Criteria of Effect and Adverse Effect (36 CFR 800.9) in accordance with Section 5.1.4.1.

      (1) If DOE ORO determines, in consultation with the SHPO, that the undertaking would *not* have an adverse effect on NRHT-included or -eligible properties, DOE ORO shall proceed with the undertaking with no review by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking, pursuant to 36 CFR 800.8, for possible review by the Advisory Council.

      (2) If DOE ORO determines, in consultation with the SHPO, that the undertaking would *have* an adverse effect on NRHP-included or -eligible properties, DOE ORO shall initiate the review as described in Section 5.1.4.2.

5.1.1.4 CERCLA Actions and Section 106 Review Responsibilities

Portions of the ORR that contain areas of soil and groundwater contamination are included on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List and are undergoing or are due to undergo investigation and environmental restoration under provisions of the National Contingency Plan (40 CFR 300). In 1992, DOE entered into a Federal Facilities Agreement (FFA) with the U.S. Environmental Protection Agency (EPA), Region IV,

and the Tennessee Department of Environment and Conservation that details the scope of the environmental restoration activities, including schedules, deliverables, other directives, and appendices that list facilities slated for restoration under CERCLA. A number of DOE ORO facilities included or eligible for inclusion in the NRHP are included in the FFA appendices, and recent additions to the appendices include D&D program facilities, which under current joint EPA and DOE guidance issued May 1995 indicate that D&D may also take place under CERCLA.

The NEPA review process described above in Section 5.1.1.3, which typically initiates the review of DOE ORO undertakings for compliance with cultural resource laws and regulations, is not required for CERCLA actions. The reason for this if; contained in the Secretarial Policy on the *National Environmental* Policy Act (Secretarial Policy) issued by Hazel R. O'Leary, Secretary, DOE, on June 13, 1994, which states, "DOE will hereafter rely on the CERCLA process for consideration of NEPA values." NEPA values, including an analysis of potential effects on sensitive resources such as cultural resources, are provided for in the Secretarial Policy. Guidance on how to consider cultural resources in the CERCLA process is provided in the *CERCLA Compliance with Other Laws Manual,"* Part II (Office of Solid Waste and Environmental Responsive Directive 9234.1-02). The DOE ORO NEPA and CRM Coordinators review CERCLA actions to ensure NEPA values, including cultural resources, have been considered. It is understood that certain circumstances, such as emergency response actions or time-critical removal actions under CERCLA, may preclude initiation or completion of the Section 106 process described in Section 5.1.1.3 above. In other cases of CERCLA actions (i.e., nontime-critical removal actions and remedial actions), there should be adequate time to address cultural resources and procedural requirements.

5.1.2 Cultural Resource Exclusions

Provided below are the cultural resource exclusions referenced in Section 5.1.1.3 above. Undertakings listed as cultural resource exclusions can be implemented by DOE ORO without further review by the SHPO or Advisory Council provided that (1) DOE ORO has reviewed the undertakings, (2) DOE ORO has applied the Criteria of Effect and Adverse Effect to the undertakings, and (3) DOE ORO has found that the undertakings would have no effect or no adverse effect to properties included or eligible for inclusion in the NRHP.

A. **Communications and Computer Systems**: Siting, installation, maintenance, repair, removal, or replacement of communications and computer systems, including public address systems, facsimile systems, microwave/radio systems, fiber optic cables, phone systems, and computers/peripheral systems (including transmitters).

B. **Electrical Systems**: Installation, maintenance, repair, removal, or replacement of plant and building electrical systems including (but not limited to) switchyards, building conduit, wiring and lighting, emergency

lighting, circuits and wiring, meters, transformers, utility poles, crossarms, insulators, and downed transmission lines.

C. **Emergency Situations**: Activities required by emergency situations (e.g., health and safety-related emergencies) as determined on a case-by-case basis, including those emergency activities in compliance with federal, state, or local regulatory requirements, including (but not limited to) EPA, FFA, CERCLA, Resource Conservation and Recovery Act, Superfund Amendments and Reauthorization Act, Occupational Safety and Health Act (OSHA), etc. Emergency activities that will have an effect on historic properties shall be handled in accordance with 36 CFR Part 800.12.

D. **Energy Conservation**: Actions to conserve energy.

E. **Environmental Monitoring**: Installation, operation, maintenance, repair, replacement, or abandonment of environmental devices/stations including (but not limited to) monitoring wells and well-monitoring devices, monitoring weirs, flow meters, rain gauges, instrumentation/equipment buggies sampling devices, meteorological towers, geochemical/geophysical monitoring and survey devices, and actions necessary for conducting site monitoring and characterization activities (including but not limited to sampling water, soil, rock, flora, and fauna).

F. **Fire Protection System:** Routine upgrades and modifications to fire-protection systems, including fire-alarm systems, smoke detectors, and sprinkler systems.

G. **General Equipment**: Direct replacement or removal of equipment or facility components.

H. **Habitat Protection**: Actions in researching, protecting, restoring, or improving fish and wildlife habitat.

I. **Hazard Prevention:** Installation and maintenance required for hazard prevention, including fabrication, removal, installation, and repair of safety railings, machine guards, hand rails, guard rails, ladders, frames, and fences; installation of nonskid surfaces and anchoring floor mats; and grounding of structures and equipment.

J. **Heating and Air Conditioning Systems**: Installation, maintenance, removal, repair, or replacement of heating/ventilating/air-conditioning systems and high efficiency particulate air filters.

K. **Leasing of Property**: Leasing of historical properties when the lease would not involve, at any time, major modifications or alterations to the properties such that their historical integrity would be adversely affected.

L. **Occupational Safety and Health Act (OSHA) Regulations and Permit Compliance**: Installation, maintenance, repair, or replacement of equipment used in current operations designed to maintain compliance with permits and regulations of OSHA and the Americans with Disabilities Act.

M. **Personnel Safety**: Installation or modification of personnel safety systems and devices, including (but not limited to) safety showers, eye washes, emergency exit lighting systems, emergency ingress/egress routes; protective additions to electrical equipment; personnel accountability/assembly systems and stations; improvements to walking and working surfaces or areas; fabrication and installation of platforms, rails, shields and guards; and stairway modifications and installations.

N. **Process and Laboratory Equipment**: Installation, maintenance, repair, storage, relocation, removal, or replacement of process or laboratory equipment and associated systems such as presses, rolling mills, foundry equipment, cranes, glove boxes and hoods, fans and tanks, ultrasonic cleaners, machine shop equipment, heat exchangers, ovens and furnaces, salt baths, centrifuges, bag houses and scrubbers, conveyors, motors, piping, valves, autoclaves, compressors, pumps, hydroforms, recovery equipment, metal-forming equipment, inspection equipment, motor control centers, and cyclone separators.

O. **Removal of Asbestos**: Asbestos removal and renovation activities, including cleanup, encapsulation, and removal and/or disposal of asbestos-containing materials from existing buildings and structures.

P. **Removal of Polychlorinated Biphenyl Contaminated Items**: Removal of polychlorinated biphenyl (PCB)-contaminated items such as electrical transformers and capacitors possibly requiring temporary removal of walls, ceilings, fences, power lines, or other obstacles which would prevent forklift or crane access to the item targeted for removal. Some transformers may have contaminated pads and/or soil around the base. The surrounding substrate will be sampled and, if determined to be contaminated, will be excavated and removed.

Q. **Repair and Maintenance of Buildings**: Maintenance, repair, modification, or direct in-kind replacement (when available) associated with structures or buildings, including (but not limited to) painting, siding, roofing, and mounting/hanging wall items; door, ceiling, wall,

window, floor, and floor covering repair/replacement; cabinet/shelf fabrication and installation; and elevator repair.

R. **Routine Activities:** Routine administrative, contractual, security, preventative maintenance, financial, or personnel activities.

S. **Routine Plant Service Activities:** Mowing and trimming of grass, shrubs, or trees; moving and assembling of furniture and equipment; snow removal; routine vegetation and erosion-control activities; janitorial and housekeeping services: small-scale use of pesticides; small-scale road, sidewalk, and parking lot repair; maintenance and repair of plant vehicles and heavy equipment; maintenance of plant safe/vaults and locks; busing and plant transportation; minor relocation of access roads; maintenance or repair of industrial machinery; maintenance, repair, or installation of fencing; maintenance, repair or installation of indoor or outdoor signs; construction of scaffolding, calibration, testing, repair, and maintenance of laboratory and/or electronic equipment; corrective and preventative actions to maintain and preserve buildings, structures, and equipment in a suitable condition; and routine decontamination of tools, surfaces, and equipment.

T. **Sale or Transfer of Property**: Sale or transfer of historical properties when the sale or transfer includes deed stipulations requiring that management of the properties is conducted in compliance with the NHPA and undertakings involving modification, alteration, or destruction of the properties is coordinated with the SHPO and the Advisory Council.

U. **Security Systems**: Installation, maintenance, removal, and repair of security systems, including computer security, detection, monitoring, surveillance, and alarm systems.

V. **Steam Condensate and Chemical Treatment Systems**: Modification to steam/Condensate systems, including (but not limited to) repair or replacement of associated piping, pumps, and condensers to maintain system integrity (excluding aboveground steam lines); extension of systems to accommodate new construction or building modification; and repair of any associated chemical treatment systems.

W. **Training, Planning, and Tests**: Training exercises; emergency preparedness planning; various tests and demonstrations (including but not limited to) transport packaging tests for radioactive/hazardous material, tank car tests, research and development demonstrations, and small-scale pilot demonstrations.

X. **Water Systems**: Siting, installation, maintenance, repair, removal, and operation of plant water systems including (but not limited to) water wells, cooling water systems, potable water systems, storm sewers, wastewater treatment systems, plant drainage, and plumbing.

Y. **Waste Treatment. Storage and Disposal Activities**: Operation and maintenance of waste treatment, storage, and disposal facilities; maintenance of landfills; spill cleanup activities; maintenance, repair or replacement of liquid retention tanks, dikes, and piping; and maintenance or repair of lagoons and small basins.

5.1.2 Conducting Surveys and Other Field Studies

DOE ORO has completed a number of cultural resource surveys to evaluate known properties for NRHP eligibility. A discussion of these surveys is provided in Section 3.4.2.3, and we results are provided in Section 3.5. In addition, DOE ORO has conducted a number of reconnaissance-level surveys on the ORR for proposed undertakings to identify and evaluate known and unknown cultural resources that could be affected by undertakings (see Section 3.4.2.5).

Although DOE ORO has placed a great deal of emphasis on identifying and evaluating properties under its jurisdiction for NRHP eligibility, a considerable amount of acreage on the ORR has not yet received a reconnaissance-level survey. DOE ORO will continue to conduct surveys on the ORR to identify and evaluate presently unknown resources under its jurisdiction that may be affected by proposed undertakings. These surveys shall be conducted using a phased approach on an as-needed basis and shall, in general, be funded through programmatic channels (i.e., through funds allocated for project planning and evaluation). However, should the need arise, DOE ORO shall conduct surveys or other field studies that are not necessarily driven by proposed undertakings. Examples of surveys or other field studies for nonprogrammatic undertakings include (but would not be limited to) investigations into (1) methods to protect and preserve properties from degradation due to natural forces, (2) damage to properties resulting from authorized and unauthorized human activities, and (3) the historical significance of specific pieces of equipment or documentation associated with NRHP-included or -eligible properties.

Pursuant to Section 5.1.1.3, Item C.2 above or Section 5.1.6, Items A.2. and B below, if DOE ORO and the SHPO agree that a survey or other field study is required for an undertaking, DOE ORO shall conduct, or cause to have conducted, a survey in accordance with the following procedures:

1. A professional historian and/or archeologist (hereafter referred to as Cultural Resource Specialist) who meets the *Professional* Qualification Standards, 36 CFR 61 (also outlined at 48 FR 44738-9), or is otherwise deemed qualified by the SHFO, would be engaged to conduct a survey or other field study.

2. The Cultural Resource Specialist shall be provided information relevant to the scope, purpose, need, and proposed location of the undertaking and any specific survey requirements requested by the SHPO. The Cultural Resource Specialist will be instructed to follow all applicable methods outlined in Chapter 4 of this document; and all survey activities must, at a minimum, be consistent with the Department of the Interior's Guidelines *for Archaeology and Historic Preservation (48 b It 44'/ 15),* the *Section 110 Guidelines* (52 FR 4727-46), and applicable DOE standards. In addition, the Cultural Resource Specialist shall be required to review any previously identified and evaluated properties within the survey area.

3. The Cultural Resource Specialist, in evaluating cultural resources for NRHP eligibility, shall be required to use the criteria established at 36 CFR 60.4 and, to the maximum extent practicable, follow the established requirements and methods of evaluation outlined in National Register Bulletin 15, How to *Apply the National Register Criteria for Evaluation,* or any revised bulletins and guidelines that are issued.

4. After completion of fieldwork, the Cultural Resource Specialist shall be required to provide DOE ORO with a draft copy of the survey results for review and comment. DOE ORO shall review the results and provide any comments to the Cultural Resource Specialist for incorporation into the report. In this review, DOE ORO shall consider whether the determinations of NRHP are appropriate, consistent with determinations made for similar types of resources found on the ORR and in the region, and were made using the appropriate criteria.

5. DOE ORO shall provide a copy of the survey results (which shall include an evaluation of any cultural resources identified within the survey area for NRHP eligibility) to the SHPO for review and comment.

    a. If the SHPO concurs with the results of the survey and, therefore, concurs with any determinations made by DOE ORO regarding the NRHP eligibility of cultural resources identified within the survey area, DOE ORO shall proceed with satisfying its Section 106 review responsibilities beginning at Section 5.1.1.3, Item C.2.a. above.

    b. If the SHPO, after reviewing the results of the survey, disagrees with determinations of NRHP eligibility made by DOE ORO, or if the Advisory Council or the National Park Service so requests, DOE ORO shall request a formal determination of eligibility from the Keeper of the National Register, pursuant to 36 CFR 800.(4)(c), whose determination shall be final. After resolution of any disagreements or other comments on the survey report, DOE

shall proceed with satisfying its Section 106 review responsibilities beginning at Section 5.1.1.3, Item C.2.a. above.

5.1.4 Assessing and Avoiding or Reducing Effects on Cultural Resources

5.1.4.1 Assessing Effects

To determine whether a DOE ORO undertaking would affect NRHP-included or -eligible properties, DOE ORO shall apply the criteria of effect established at 36 CFR 800.9(x), which states that "an undertaking has an effect on a historic property when the undertaking may alter characteristics of the property that may qualify the property for inclusion in the National. Register." '1 'o determine effect, alteration to features of the property's location, setting, or use shall be considered relevant, depending on a property's significant characteristics.

To determine whether an undertaking would have an adverse effect on NRHP-included or -eligible properties, DOE ORO shall consider all direct and indirect activities associated with the undertaking. If DOE ORO determines that the undertaking would diminish the integrity of an NRHP included or -eligible property's location, design, setting, materials, workmanship, feeling, or association, the undertaking shall be considered to have an adverse effect on the property. To augment this determination, DOE ORO shall use the examples of adverse effects listed at 36 CFR 800.9(b), which include (but are not limited to)

(1) physical destruction, damage, or alteration of all or part of a property;

(2) isolation of a property from or alteration of the character of a property's setting when that character contributes to the property's qualification for the National Register.

(3) introduction of visual, audible, or atmospheric elements that are out of character with a property or alter its setting;

(4) neglect of a property resulting in its deterioration or destruction; and

(5) transfer, lease, or sale of a property

Those undertakings that DOE ORO determines to *not* meet the above criteria shall be considered to have no adverse effect on NRHP-included or -eligible properties.

5.1.4.2 Identifying Ways to Avoid or Reduce Effects

DOE ORO undertakings will be implemented to meet programmatic needs (or other missions) regardless of whether or not the undertakings would affect NRHP-included or -eligible properties. However, DOE ORO will consider alternatives and methods to mitigate impacts to NRHP-included or -eligible properties and avoid adverse affects whenever possible. Pursuant to Section 5.1.1.3, Items A.2.1.(2), A.2.b.(2), and

C.2.b.(2) above (or 5.1.6, Item B.2. below), if DOE and the SHPO agree on measures to be implemented by DOE ORO that would result in *no* adverse affect on NRHP included or -eligible properties, as determined by applying the exceptions to the Criteria of Adverse Effect at 36 CFR 800.9(c) pursuant to 36 CFR 800.5(e), the undertaking need *not* be reviewed by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking, pursuant to 36 CFR 800.8, for possible review by the Advisory Council. Measures to be implemented by DOE ORO to avoid, reduce, or mitigate undertaking effects include, but are not limited to,

(1) **resetting** proposed undertakings to new locations;

(2) **rehabilitating** affected properties in accordance with *The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings;*

(3) **designing** additions to historic buildings and structures that take into account the significant architectural characteristics or elements of the original buildings or structures;

(4) **salvaging** the architectural or scientific/engineering elements of structures. or buildings; and

(5) **recording** as a last resort when other mitigations are determined to be infeasible. At a minimum, recordation shall include, but not be limited to, photographs, floor plans, drawings, and written histories (when not precluded by security classification priorities) to the standards of the Historic American Buildings Survey or the Historic American Engineering Record (HAB S/HAER: National Park Service, Washington, D.C.) or in accordance with SHPO standards and directions.

The above measures to avoid or reduce impacts to NRHP-included or -eligible properties shall be carried out in consultation with the SHPO and shall- be appropriately documented. No undertaking shall be initiated until consultation has been completed and the appropriate documentation has been accepted by the SHPO and (if so required) the Advisory Council and interested parties.

5.1.5 Consultation and Documentation

5.1.5.1 Consultation

For all DOE ORO undertakings requiring and/or involving consultation with the SHPO, Advisory Council, Native American tribes, local government, or other interested parties regarding DOE ORO cultural resources, the DOE ORO CRM Coordinator shall be the key point of contact. The level or degree of consultation and resulting documentation required for undertakings shall be dictated by the circumstances

associated with the undertakings (e.g., the nature, extent, and proposed location of undertakings and the number and types of cultural resources that would be affected).

Consultation with the SHPO

In general, initial consultation activities for undertakings shall involve contact by the DOE ORO CRM Coordinator or his/her designee with the SHPO either 'by telephone or in writing. Consultation with the SHPO shall involve (but not be limited to)

(1) seeking the SHPO's guidance in identifying any individuals, organizations, or groups that may have a special interest in DOE ORO undertakings affecting cultural resources that DOE ORO may not be aware of;

(2) notifying the SHPO that DOE ORO has identified an undertaking that could have an adverse effect on NRHP-included or -eligible properties pursuant to Section 5.1.1.3, Item A.2.a.(2) above;

(3) notifying the SHPO that DOE ORO has identified an undertaking that could affect NRHP-included or-eligible properties pursuant to Section 5.1.1.3, Item A.2.b. above and, therefore, shall be applying the Criteria of Effect and Adverse Effect (36 CFR 800.9) to the undertaking;

(4) contacting the SHPO to determine if a survey should be initiated for an undertaking pursuant to Section 5.1.1.3, Item C. above;

(5) providing the SHPO with information regarding new surveys initiated and completed by DOE ORO and requesting that the SHPO review and concur with survey reports and associated documentation (if any);

(6) seeking the SHPO's concurrence with DOE ORO determinations of effect pursuant to Section 5.1.1.3, Items A.2.b.(1), A.2.b.(2), C.2.b.(1), and/or C.2.a.(2) above and entering into MOAs with DOE ORO, as warranted;

(7) identifying and resolving ways to avoid or reduce effects to NRHP-included or - eligible properties in accordance with Section 5.1.4.2 and pursuant to Section 5.1.1.3, Items A.2.b.(1), A.2.b.(2), C.2.b.(1), and/or C.2.a.(2) above; and

(8) requesting that the SHPO, after agreeing with DOE ORO on how effects of undertakings shall be taken into account, enter into an MOA with DOE ORO pursuant to 36 CFR 800.5(e)(4);

Consultation with Advisory Council

Consultation with the Advisory Council shall be conducted in the same manner as consultation with the SHPO in that the DOE ORO CRM Coordinator shall contact the Advisory Council either by telephone or in writing. However, the procedures set forth in Section 5.1.1 above have been designed to streamline the Section 106 process and, therefore, to minimize the need for consultation with the Advisory Council (i.e., rely on the SHPO more heavily for guidance and compliance with cultural resource laws and regulations). Consultation with the Advisory Council shall involve, but not be limited to, the following:

(1) seeking the Advisory Council's guidance on measures to avoid or minimize effects of undertakings on NRHP-included or -eligible properties, as warranted;

(2) notifying the Advisory Council that DOE ORO has consulted with the SHPO and intends to prepare an MOA; and

(3) requesting the Advisory Council's acceptance and/or participation in MOAs involving DOE ORO undertakings.

Consultation with Native American Tribes

DOE ORO shall make special efforts to consult with Native American tribes for undertakings that are determined to have the potential to affect Native American cultural remains (e.g., habitation sites and burials). In the case of DOE ORO property in the Oak Ridge area, the Cherokee is the tribe affiliated with, having the closest cultural affiliation with, or having aboriginally occupied the area. The Cherokee include two presently recognized bands: the Eastern Band of the Cherokee Indians and the Cherokee Nation of Oklahoma. Therefore, most DOE ORO interactions, consultations, or discussions with Native American peoples will be with the Cherokee. Consultation with Native American tribes shall involve, but not be limited to, the following:

(1) notifying Native American tribes that DOE ORO has identified an undertaking that could affect Native American cultural remains and seeking their guidance and/or input to avoid or mitigate adverse effects to the remains;

(2) notifying Native American tribes when cultural remains have been located by a survey and requesting their assistance in identifying the affiliation and significance of the remains or material; and

(3) requesting that Native American tribes participate in MOAs for undertakings that affect or may affect Native American cultural remains.

Consultation with Interested Parties

Should DOE ORO, in consultation with the SHPO, identify an undertaking that warrants consultation with organizations other than those internal to DOE, the SHPO, Advisory Council, or Native American tribes, DOE ORO shall identify the interested parties (e.g., individuals, organizations, local government, and historical societies) and initiate consultation either by phone or in writing. Consultation with interested parties shall involve, but not be limited to, the following:

(1) notifying interested parties that DOE ORO has identified an undertaking that could be of special interest to the parties;

(2) seeking input and/or comments from interested parties regarding undertakings and incorporating their concerns or suggestions into the undertakings, as warranted; and

(3) requesting that interested parties participate in DOE ORO MOAs, as warranted.

5.1.5.2 Documentation

DOE ORO shall document cultural resource compliance activities conducted in accordance with Section 5.1.1 and in accordance with any other applicable cultural resource laws, regulations, or requirements. Documentation shall be used to record the result of cultural resource activities associated with DOE ORO undertakings such as consultation with the SHPO, Advisory Council, Native American tribes, and interested parties. Documentation shall consist of, but not be limited to, the following:

(1) internal environmental review documents that address cultural resource compliance and review requirements for undertakings (e.g., Project Review Summary prepared by ORNL and the Review Report prepared by the ETTP and Y-12);

(2) memos of teleconference between cultural resource compliance staff members within the DOE ORO system and between the DOE ORO CRM Coordinator and the SHPO, Advisory Council, Native American tribes, and interested parties;

(3) written correspondences between cultural resource compliance staff members within the DOE ORO system and between the DOE ORO CRM Coordinator and the SHPO, Advisory Council, Native American tribes, and interested parties (e.g., DOE ORO letters to the SHPO requesting concurrence with DOE ORO determinations of effect and NRHP eligibility determinations);

(4) Archeological and Historical Reviews (AHRs) (project summaries) designed to provide information to the SHPO, Advisory Council, Native American tribes, and interested parties regarding DOE ORO undertakings

and DOE ORO's determinations of effect that undertakings would have on NRHP-included or-eligible properties (see Section 4.1.4.1 and Appendix E for more detailed information on AHRs);

(5) MOAs designed to take into account the effects of undertakings on NRHP-included or -eligible properties (see Section 4.1.4.1 and Appendix E for more detailed information on MOAs);

(6) documentation prepared pursuant to Section 110 of NHPA and/or stipulations made in MOAs that are designed to record information (e.g., written histories, photographs, and maps) about NRHP-included or -eligible properties that may be adversely affected by undertakings; and

(7) survey reports that record the results of cultural resource surveys conducted for an undertaking or for any other reason or requirement.

To determine the appropriate level of documentation required for an undertaking, DOE ORO shall proceed in accordance with Section 5.1.1.3 above and use the following criteria:

(1) If DOE ORO finds that an undertaking meets the review criteria at Section 5.1.1.3, Items A.1. and A.2.a.(1), DOE ORO shall document (or cause to have documented) the finding, provided that the nature of the undertaking is such that it warrants review and documentation for reasons other than solely for Section 106 purposes (e.g., NEPA review and documentation). In such instances, documentation shall typically consist of internal environmental reviews such as the Project Review Summary (ORNL) or Review Report (ETTP and Y-12).

(2) If DOE ORO finds an undertaking requires consultation with the SHPO (or other parties, as warranted), in accordance with Section 5.1.1.3, DOE ORO shall document the consultation process in writing using memos of teleconference and/or letters of consultation to and from the SHPO (or other parties, as warranted). In addition, DOE ORO shall prepare, or cause to have prepared, an AHR, MOA, Section 110 documentation, or a survey report, as warranted. Undertakings that DOE ORO finds to have no *adverse effect* without the need for mitigation measures (after applying the Criteria of Effect and Adverse Effect pursuant to Section 5.1.1.3, Items A.2.a., A.2.b., or C.2.b.) are typically documented using an AHR that is transmitted to the SHPO for review and concurrence. Undertakings that DOE ORO finds would *have an adverse effect* are typically documented using an AHR, MOA, and Section 110 documentation as agreed upon during the consultation process.

DOE ORO shall make special efforts to include interested parties in the Section 106 process and to provide copies of documentation prepared as a result of the Section

106 process when undertakings directly or indirectly affect properties that are included or eligible for inclusion in the NRHP. For example, copies of MOAs involving DOE ORO properties included in the NRHP, and NRHP-eligible properties accessible to the public, shall be provided to interested parties and placed in the DOE Reading Room.

5.1.6 Unanticipated Discoveries of Cultural Resources

Should cultural resources be identified during the implementation of (or after the appropriate review and approval of) an undertaking, DOE ORO shall initiate the following, which have been developed pursuant to 36 CFR 800.11:

A. In instances where DOE ORO finds an in-progress undertaking for which compliance procedures have been completed in accordance with Section 5.1.1.3 above and which will affect previously unidentified cultural resource(s) *not* associated with or *consisting* of human remains or suspected human remains, DOE ORO shall stop (or cause to have stopped) field activities associated with the undertaking that could further affect the resource(s) and immediately contact the SHPO.

1. If DOE ORO finds, in consultation with the SHPO, that the previously unidentified resource(s) is/are not significant and, therefore, not eligible for inclusion in the NRHP, DOE ORO shall document the consultation and proceed with the undertaking without further review by the SHPO or the Advisory Council.

2. If DOE ORO finds, in consultation with the SHPO, that the previously unidentified resource(s) may be significant, DOE ORO shall evaluate, or cause to have evaluated, the resource(s) for NRINP eligibility in accordance with Section 5.1.3 above; and

a. if DOE ORO finds, in consultation with the SHPO, that the resource(s) is/are not eligible for inclusion in the NRHP, DOE ORO shall document the evaluation and consultation process and proceed with the undertaking without further review by the SHPO or the Advisory Council;

b. if DOE ORO finds, in consultation with the SHPO, that the resource(s) is/are eligible for inclusion in the NRHP, DOE ORO shall proceed in accordance with Section 5.1.4.2 above.

B. In instances where DOE ORO finds an in-progress undertaking for' which compliance procedures have been completed in accordance with Section 5.1.1.3 above and which will affect previously unidentified

cultural resource(s) associated with or consisting of human remains or suspected human remains, DOE ORO shall stop, or cause to have stopped, field activities associated with the undertaking that could further affect the resource(s) and immediately contact the SHPO.

1. If DOE ORO, in consultation with the SHPO, determines that the previously unidentified cultural resource(s) is/are associated with or consist of human remains, DOE ORO shall

    a. engage, or cause to have engaged, a professional archeologist to evaluate the cultural affiliation of the cultural resource(s) and human remains;

    b. notify appropriate local authorities (e.g., Oak Ridge Police Department and county Coroner's Office) that human remains have been inadvertently disturbed and request their assistance in the identification and evaluation of the human remains and compliance with State of Tennessee burial laws TCA 39-17-311 and TCA 3917-312, as warranted;

    c. notify the appropriate Native American tribe(s) that the potential exists that DOE ORO has inadvertently disturbed a Native American burial and provide the tribe(s) with an opportunity to participate in the inspection and evaluation of the discovery.

2. If DOE ORO determines that the human remains are of Euramerican affiliation, DOE ORO shall notify the previously contacted Native American tribe(s) of the finding, and

    a. if the remains are determined through initial inspection to be modern/recent, DOE ORO shall turn the matter over to the local law enforcement agency with jurisdiction over the discovery and continue to play an active role in activities associated with the discovery, as warranted.

    b. if the remains are determined through initial inspection to be historic (i.e., not recent), DOE ORO shall retain jurisdiction over the remains and conduct, or cause to have conducted, archival searches and/or interviews with descendants of individuals that are known to have lived in the area in which the discovery was made to locate the next of kin for reburial. If DOE ORO cannot establish the next of kin, or the next of kin cannot be found, DOE ORO

shall arrange for reburial in a suitable on-site or off-site cemetery.

3. If DOE ORO determines that the human remains are of Native American affiliation, DOE ORO shall retain jurisdiction over the discovery for the period immediately following the discovery and proceed in accordance with Section 5.4.2.

5.1.7 National Register of Historic Places Nominations

Section 110 of NHPA requires federal agencies to be responsible for the preservation of historic properties under their jurisdiction and to establish a program for the identification, evaluation, and nomination of properties to the NRHP. To meet these requirements, DOE ORO has developed this CRMP, has conducted and plans to continue to conduct surveys to identify and nominate properties to the NRHP, and will maintain property integrity whenever feasible.

Properties DOE ORO has identified as eligible for inclusion in the NRHP shall be considered, in consultation with the SHPO, for inclusion in the NRHP. Properties, districts, sites, or objects deemed to warrant inclusion through the consultation process shall be nominated to the Keeper of the National Register pursuant to 36 CFR 63 and in accordance with National Register Bulletin 16A, How to Complete the National Register Forms, If DOE ORO and the SHPO do not agree on the rood to nominate specific properties, DOE ORO shall seek input from the Advisory Council and/or the Keeper of the National Register, whose determination shall be final.

5.1.8 National Historic Landmarks Designation and Recognition

DOE ORO owns and maintains the Graphite Reactor, a National Historic Landmark (NHL), and recognizes that other properties under its jurisdiction, particularly some Manhattan Project Era facilities at the ETTP and Y-12 Plant, may qualify for NHL designation. In accordance with Section 101 of the NHPA and 36 CFR 65, DOE ORO shall consider all properties found to be eligible for inclusion in the NRHP for NHL status. DOE ORO shall accomplish this during the nomination process described in Section 5.1.7 above and by applying the NHL criteria at 36 CFR 65.4. If DOE ORO determines that a property or properties meet the criteria for NHL designation, DOE ORO shall contact the National Park Service to initiate any additional thematic or specific studies necessary to review the eligibility of the property or properties as an NHL pursuant to 36 CFR 65.5. Should a DOE ORO property be designated as an NHL, DOE ORO shall, in accordance with 3 6 CFR 65.6, properly mark the property or properties and be a lead participant in any ceremonies of recognition of the property or properties.

5.2 ARCHAEOLOGICAL RESOURCES PROTECTION ACT COMPLIANCE PROCEDURES

5.2.1 Increasing Public Awareness

DOE ORO properties in the Oak Ridge area are, in general, restricted-access facilities that provide reasonable security to prevent large-scale looting or disturbance of sensitive archeological sites. Most unpaved roads on the ORR are barricaded and locked to restrict access. The most sensitive areas are riverine in nature and directly accessible by boat. The potential for disturbance/looting increases during the winter draw down of the reservoirs. Much of the Clinch River and Poplar Creek shorelines on or along the ORR are posted as government property, access to which is limited to authorized personnel.

Portions of the ORR are open each fall for approximately six weekends to deer hunters for scouting and hunting, and plans for other game hunting (e.g., turkey) are being considered. Hunting is restricted and controlled by the Tennessee Wildlife Resources Agency (TWRA), and hunters are required to adhere to all laws, rules, and regulations. To protect cultural resources, active excavations would be posted to prevent entry, and ORR security personnel and TWRA officers would be advised of the need for protection and enforcement.

5.2.2 Planning and Scheduling Archeological Surveys

As stated in Section 5.1.3 above, DOE ORO shall conduct (or cause to have conducted) surveys, including those specifically designed to address archeological resources. The surveys shall be conducted using a phased approach on an as-needed basis following the methods outlined in Chapter 4 of this document. DOE ORO shall identify the need for archeological surveys following the procedures beginning at Section 5.1.1.3, Item C. Individuals responsible for initially identifying the need for, planning, and scheduling of archeological surveys shall be the DOE ORO prime contractor Cultural Resources Coordinators working with other NEPA compliance staff members (e.g., NEPA Coordinators) at/within their respective sites/programs. The Cultural Resources Coordinators shall be responsible for contacting the DOE ORO CRM Coordinator to initiate the procedures beginning at Section 5.1.1.3, Item C. above and for ensuring that archeological surveys are conducted following all applicable methods and procedures.

5.2.3 Reporting Suspected Violations

Surveillance and inspections of known prehistoric and historic archeological sites under the jurisdiction of DOE ORO shall be conducted on a periodic basis to determine the present condition of the sites and disturbance by natural and/or human forces since the sites were last visited. Should disturbance of a site be noted during surveillance activities, the DOE ORO prime-contractor Cultural Resources Coordinators and the DOE ORO CRM Coordinator shall be notified immediately and an assessment made to determine if the disturbance to the site is associated with a violation of the Archaeological Resources Protection Act (ARPA). If a violation of ARPA is suspected, the DOE ORO CRM Coordinator shall consult with the SHPO and initiate (or cause to have initiated) any survey or assessment activities by a professional archeologist deemed

necessary. Special protective measures designed to deter or prevent future disturbance to the site(s) shall be evaluated and initiated as warranted. Suspected violations of ARPA shall be documented on the surveillance/site inspection form used to record inspection activities, in records of consultation with the SHPO, and in any survey or assessment reports generated as a result of investigations into the extent of disturbance.

5.3 AMERICAN INDIAN RELIGIOUS FREEDOM ACT PROCEDURES

Although the known archeological sites associated with Native American activities located on the ORR predate occupation of this area of East Tennessee by any recognized Native American tribes, DOE ORO recognizes that the sites are affiliated with direct or indirect lineal ancestors of the Cherokee. Therefore, DOE ORO has determined that the Eastern Band of the Cherokee Indians and the Cherokee Nation of Oklahoma may have traditional interests in the cultural resources that exist on the ORR. DOE ORO has initiated consultation through written correspondence with the two bands of the Cherokee regarding development of this CRMP. In addition, the DOE ORO CRM Coordinator met with Chief Dugan and other tribal representatives of the Eastern Band of the Cherokee Indians on November 17, 1995, to discuss future consultation and coordination activities. No Native American traditional-use areas or ceremonial sites are known to be present on the ORR. Also, no artifacts of Native American religious significance are known to exist or to have been removed from the ORR. Should such sites or artifacts be identified during future studies, DOE ORO shall

(1) consult with the appropriate Native American tribe or tribal representatives;

(2) initiate, or cause to have initiated, any American Indian Religious Freedom Act studies deemed necessary and appropriate through consultation with Native American tribe or tribal representatives; and

(3) coordinate, participate in, or otherwise permit Native American tribes or tribal representatives (unless not possible due to health and safety or security reasons) to use for cultural activities any Native American religious sites or traditional use areas that may be identified as under the jurisdiction of DOE ORO.

5.4 NATIVE AMERICAN GRAVES PROTECTION AND REPATRIATION ACT COMPLIANCE PROCEDURES

The Native American Graves Protection and Repatriation Act (NAUPRA) requires the protection and repatriation of Native American cultural items (e.g., human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony) found or removed from federal or tribal lands. For the purposes of the following procedures, the term Native American tribe (tribe) shall mean any recognized Native American tribe, group, or organization consisting of individuals whose culture and/or ancestors are indigenous to the United States. In the case of DOE ORO property in the Oak Ridge area, the Cherokee is the tribe affiliated with, having the closest cultural

affiliation with, or having aboriginally occupied the area. The Cherokee include two presently recognized bands and one tribe: the Eastern Band of the Cherokee Indians, the United Keetoowah Band, and the Cherokee Nation of Oklahoma. Therefore, most DOE ORO interactions, consultations, or discussions with Native American peoples will be with the Cherokee. However, should an instance occur where Native American cultural items or materials under the jurisdiction of DOE ORO cannot be identified or affiliated with the Cherokee, DOE ORO shall consult with the SHPO and Tennessee Division of Archaeology to determine if there is another tribe or other Native American descendent(s) that could be culturally affiliated with the items or materials.

No known historic archeological sites on DOE ORO property in the Oak Ridge area have been identified as being culturally affiliated with the Cherokee or any other known or recognized tribe. Most Native American sites on the ORR have been interpreted to be affiliated with a Woodland period of habitation or a combination of habitation periods that includes the Woodland period (see Chapter 3, Section 3.3.1 above). Therefore, Native American cultural items or materials known to have been removed from the ORR or known to presently reside on the ORR are considered to be culturally unaffiliated.

5.4.1 Intentional Excavation and Removal of Native American Cultural Items

5.4.1.1 Consultation or Consent

Prior to (1) excavation or removal of Native American cultural material or human remains from DOE ORO property or (2) issuing any permits pursuant to 18 CFR 1312.8 for activities that would involve the excavation or removal of Native American cultural material or human remains from DOE ORO property, DOE ORO shall contact the lineal descendent(s) or tribe with the closest ties to the material or human remains to initiate consultation. DOE ORO shall not knowingly permit any Native American cultural material or human remains to be excavated or removed from DOE ORO property until consultation with the appropriate lineal descendent(s) or tribe has been completed. DOE ORO shall retain all documentation generated as a result of the consultation process as auditable records.

Exhumation of Native American human remains and associated funerary objects shall be conducted in accordance with the following procedures:

A. Exhumation following any ceremonies deemed appropriate and prudent, given the concern of the lineal descendent(s) or tribe, shall be conducted by qualified professionals, and the lineal descendent(s) or tribe shall be invited to observe and participate in the exhumation if they so desire. Records (including the collection of photographic documentation) of the exhumation process shall be maintained as work progresses. At the request of the descendent(s) or tribe with ties to the remains, photographic documentation will not be collected if the unanticipated discovery is

determined to be associated with, or suspected to be associated with, an ARPA violation.

1. Skeletal remains, soil samples, and any associated funerary objects recovered during exhumation shall be taken to a designated laboratory facility for study. Analyses of the human remains, with permission from the lineal descendent(s) or tribe, may include (but not be limited to) osteological description and forensic analyses to determine the age, gender, stature, cause of death, pathologies, handedness, musculature, and any congenital abnormalities. Analyses of associated funerary objects and soil analyses may also be conducted to determine the time of burial (stylistic analysis or radiometric dating) and diet and/or season of death (e.g., analyses of soil samples from abdominal cavities). All analyses shall be completed within a time span agreed upon by DOE ORO and the lineal descendent(s) or tribe.

2. After analysis, all human remains and associated funerary objects shall be reentered, repatriated, curated, or otherwise disposed of in accordance with the means agreed upon between DOE ORO and the lineal descendent(s) or tribe, and the applicable procedures in Sections 5.4.5.1 and/or 5.5.5 below.

5.4.1.2 Ownership and Right of Control

Native American cultural material and human remains intentionally excavated or removed from DOE ORO property shall remain the property of DOE ORO unless otherwise repatriated to the appropriate lineal descendant(s) or tribe in accordance with the procedures set forth in Section 5.4.5.1 below. Following the intentional excavation or removal and analysis of Native American cultural material and human remains, the ownership and right of control of the items shall be determined using the following criteria:

(1) All excavated items, except human remains and associated funerary objects, shall remain the property of DOE ORO and shall be curated at an appropriate repository in accordance with the procedures set forth in Section 5.5.5 below.

(2) The ownership and right of control over human remains and associated funerary objects shall reside with the lineal descendant(s) or tribe. DOE ORO shall consult with the lineal descendent(s) or tribe regarding the transfer, repatriation, and/or final disposition or reburial of such items.

(3) If the human remains and associated funerary objects cannot be traced to lineal descendent(s) or a tribe, after consultation with the SHPO and Tennessee Division of Archaeology to assist in locating descendent(s)

and tribes, the items shall remain the property of DOE ORO and be curated at an appropriate repository in accordance with the procedures set forth in Section 5.5.5 below.

5.4.2 Inadvertent Discovery of Native American Cultural Items

5.4.2.1 Discovery

Should Native American human remains and associated and/or unassociated funerary objects, sacred objects, or objects of cultural patrimony be inadvertently discovered or encountered during the conduct of a DOE ORO undertaking or through any other means (e.g., surveillance activities), DOE ORO shall consult with the appropriate lineal descendent(s) or tribe and the SHPO regarding disposition and control of the items in accordance with the procedures set forth in Section 5.4.2.2. below. In addition, the DOE ORO CRM Coordinator shall provide written notification of the discovery to (1) the Secretary, DOE, or his/her designee, pursuant to Section 3(d)(1) of NAGPRA, and (2) the DOE Federal Preservation Officer.

5.4.2.2 Disposition and Control

Any inadvertently discovered Native American human remains and associated funerary objects shall remain the property of DOE ORO unless otherwise repatriated to the appropriate lineal descendant(s) or tribe in accordance with the procedures set forth in Section 5.4.5.1 below. In accordance with Section 5.4.2.1 above, DOE ORO shall consult with the appropriate lineal descendent(s) or tribe regarding the disposition of inadvertently discovered human remains and cultural materials. Disposition shall be determined using the following procedures:

A. If conditions favor protection in place, and if this course of action is preferable to the descendent(s) or tribe, DOE ORO shall take the necessary steps to preserve the remains in place, as warranted.

B. If protection is not feasible, or if the descendent(s) or tribe is/are not satisfied with protection as an alternative, the remains shall be exhumed, following any ceremonies deemed appropriate and prudent.

   1. Exhumation of human remains and associated funerary objects shall be conducted by qualified professionals, and the descendent(s) or tribe shall be invited to observe and participate in the exhumation if they so desire. Records (including the collection of photographic documentation) of the exhumation process shall be maintained as work progresses. At the request of the descendent(s) or tribe with ties to the remains, photographic documentation will not be collected unless the unanticipated discovery is determined to be associated with, or suspected to be associated with, an ARPA violation.

2. Skeletal remains, soil samples, and any associated funerary objects recovered during exhumation shall be taken to a designated laboratory facility for study. Analyses of the human remains, with permission from the tribe, may include (but not be limited to) osteological description and forensic analyses to determine the age, gender, stature, cause of death, pathologies, handedness, musculature, and any congenital abnormalities. Analyses of associated funerary objects and soil analyses may also be conducted to determine the time of burial (stylistic analysis or radiometric dating) and diet and/or season of death (e.g.., analyses of soil samples from abdominal cavities). All analyses shall be completed within a time span agreed upon by DOE ORO and the descendent(s) or tribe.

3. After analysis, all human remains and associated funerary objects shall be reentered, repatriated, curated, or otherwise disposed of in accordance with the desired means of the descendent(s) or tribe and in Sections 5.4.5.1 and/or 5.5.5 below.

5.4.3 Inventory for Native American Human Remains and Associated Funerary Objects

5.4.3.1 Inventory Compilation

Only one Native American burial is known to have been excavated and removed from the ORR under the jurisdiction of DOE ORO or its predecessor agencies. The material was excavated from a burial at site 40RE86 and consisted of the skeletal remains of a single adult male associated with one shell-tempered, cord-marked vessel. The recovered items were interpreted to be affiliated with a Late Mississippian Dallas Phase period of habitation and are now curated at The University of Tennessee, Knoxville (UTK), McClung Museum under the title 40RE86, Trench 1, Feature 2.

5.43.2 Consultation

Because the remains of only one Native American individual with one associated funerary object is now known to have been removed from DOE ORO property under the jurisdiction of DOE ORO, no special procedures addressing consultation with lineal descendent(s) or tribes on compiling an inventory of DOE ORO holdings or collections of Native American human remains and associated funerary objects are necessary.

5.4.3.3 Supplemental Documentation

Upon request, DOE ORO shall provide copies of the report prepared by GAI Consultants (1981) that addresses the Native American human burial and associated

funerary objects known to have been excavated under the jurisdiction of DOE ORO to any legitimate descendants or tribes requesting such information.

5.4.3.4 Notification

The UTK McClung Museum presently curates the only Native American human remains that have been removed from the ORR under the jurisdiction of DOE ORO. The UTK McClung Museum has compiled a listing of sites culturally affiliated with Native Americans from which human remains,, associated funerary objects, or unassociated funerary objects have been removed and has provided the listing to the SBPO. This information has been provided to potential lineal descendent(s) or tribes for review and comment.

5.4.4 Summary of Native American Unassociated Funerary Objects, Sacred Objects, and Cultural Patrimony

5.4.4.1 Summary

DOE ORO does not have control over, possess, or have jurisdiction over any known unassociated funerary objects, sacred objects, or objects of cultural patrimony.

5.4.4.2 Consultation

See Section 5.4.4.1 above.

5.4.43 Access

See Section 5.4.4.1 above.

5.4.5 Repatriation of Native American Cultural Items

5.4.5.1 Repatriation of Culturally Affiliated Native American Human Remains and Associated Funerary Objects

DOE ORO does not now have control over, possess, or have jurisdiction over any known culturally affiliated human remains and associated funerary objects. Should DOE ORO, in consultation with the appropriate lineal descendent(s) or tribe, identify any culturally affiliated Native American human remains and associated funerary objects under its jurisdiction either, through ongoing evaluations of its archeological collections or during future cultural resource investigations, DOE ORO shall repatriate, reenter, or otherwise curate those items in accordance with the following:

A. DOE ORO shall consult with the descendent(s) or tribe, in writing, to establish their preference for the disposition of the items.

1. If the descendent(s) or tribe so request, DOE ORO shall return the human remains and associated funerary objects to the descendent(s) or tribe.

   a. If the human remains and associated funerary objects were excavated or removed as a result of past activities and are currently curated, DOE .ORO shall, within 90 days of receiving a request, prepare the items and transfer them to the descendent(s) or tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the item(s) is/are ready for transfer. The transfer shall take place at a mutually agreeable location previously determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall maintain a copy of the letter as an auditable record of compliance.

   b. If the human remains and associated funerary objects are intentionally excavated or removed in accordance with the procedures in Section 5.4.1 above, or are excavated or removed as a result of an inadvertent discovery in accordance with the procedures in Section 5.4.2 above, DOE ORO shall, at the request of the descendent(s) or tribe and after completing research and analysis of the items (normally completed within one year from completion of the excavation or removal), prepare the items and transfer them to the descendent(s) of tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the item(s) is/are ready for transfer. The transfer shall take place at a mutually agreeable location previously determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall maintain a copy of the letter as an auditable record of compliance.

2. If the descendent(s) or tribe so request, DOE ORO shall reenter the human remains and associated funerary objects. Reinterment, following any ceremonies deemed appropriate and prudent given the concern of the descendent(s) or tribe, shall take place at a location that is mutually agreeable to DOE ORO and the descendent(s) or tribe.

3. If the descendent(s) or tribe so request, or are not interested in retaining the ownership and right of control over or the reinterment of culturally affiliated human remains and associated funerary objects, DOE ORO shall curate the human remains and associated funerary objects at a repository in accordance with Section 5.5.5.

5.4.5.2 Repatriation of Culturally Affiliated Native American Unassociated Funerary Objects, Sacred Objects, or Objects of Cultural Patrimony

DOE ORO does not now have control over, possess, or have jurisdiction over any known culturally affiliated unassociated funerary objects, sacred objects, or objects of cultural patrimony. Should DOE ORO, in consultation with the appropriate lineal descendent(s) or tribe, identify any culturally affiliated Native American unassociated funerary objects, sacred objects, and/or objects of cultural patrimony under its jurisdiction, either through ongoing evaluations of its archeological collections or during future cultural resource investigations, DOE ORO shall repatriate, reenter, or otherwise curate those items in accordance with the following:

A. DOE ORO shall consult with the descendent(s) or tribe, in writing, to establish their preference for the disposition of the items.

1. If the descendent(s) or tribe so request, DOE ORO shall return the objects to the descendent(s) or tribe.

a. If the objects were excavated or removed as a result of past activities and are currently curated, DOE ORO shall, within 90 days of receiving a request, prepare the items and transfer them to the descendent(s) or tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the item(s) is/are ready for transfer. The transfer shall take place at a mutually agreeable location previously determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall retain a copy of the letter as an auditable record of compliance.

b. If the objects are intentionally excavated or removed in accordance with Section 5.4.1 above or are excavated or removed as a result of an inadvertent discovery in accordance with Section 5.4.2 above, DOE ORO shall, at the request of the descendent(s) or tribe and after completing research and analysis of the items (normally completed within one year from completion of the excavation or removal), prepare the items and transfer them to the descendent(s) or tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the item(s) is/are ready for transfer. The transfer shall take place at a mutually agreeable location previously

determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall retain a copy of the letter as an auditable record of compliance.

2. If the descendent(s) or tribe so request, DOE ORO shall reenter the objects. Reinterment, following any ceremonies appropriate and prudent given the concern of the descendent(s) or tribe, shall take place at a location that is mutually agreeable to DOE ORO and the descendent(s) or tribe.

3. If the descendent(s) or tribe so request, or are not interested in retaining the ownership and right of control over or the reinterment of the objects, DOE ORO shall curate the objects at a repository in accordance with Section 5.5.5.

5.4.5.3 Repatriation of Culturally Unaffiliated or Uninventoried Native American Human Remains and Funerary Objects

Culturally unaffiliated or uninventoried Native American human remains and associated funerary objects now in the control or possession of DOE ORO, or excavated or removed from DOE ORO property under the jurisdiction of DOE ORO, shall be repatriated, reentered, or otherwise curated in accordance with the following:

A. Upon request by the lineal descendent(s) or tribe that has/have the closest cultural affiliation with the remains and objects or the lineal descendent(s) or tribe that is/are recognized as aboriginally occupying the area in which the remains and objects were found, DOE ORO shall consult with the lineal descendant(s) or tribe, in writing, to establish their preference for the disposition of the items.

1. If the descendent(s) or tribe so request, DOE ORO shall return the human remains and associated funerary objects to the descendent(s) or tribe.

a. If the human remains and associated funerary objects were excavated or removed as a result of past activities and are currently curated, DOE ORO shall, within 90 days of receiving a request, prepare the items and transfer them to the descendent(s) or tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the item(s) is/are ready for transfer. The transfer shall take place at a mutually agreeable location previously determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the

time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall maintain a copy of the letter as an auditable record of compliance.

b. If the human remains and associated funerary objects are intentionally excavated or removed in accordance with Section 5.4. 1 above or are excavated or removed as a result of an inadvertent discovery in accordance with Section 5.4.2 above, DOE ORO shall, at the request of the descendent(s) or tribe and after completing research and analysis of the items (normally completed within one year from the completion of the excavation or removal), prepare the items and transfer them to the descendent(s) or tribe. DOE ORO shall notify the descendent(s) or tribe by registered letter when the items) is/are ready for transfer. The transfer shall take place at a mutually agreeable, location previously determined during consultation. In addition, DOE ORO shall prepare a letter of transmittal to accompany the item(s) to be signed at the time of transfer by representatives of DOE ORO and the descendent(s) or tribe. DOE ORO shall retain a copy of the letter as an abdicable record of compliance.

2. If the descendent(s) or tribe so request, DOE ORO shall reenter the human remains and associated funerary objects. Reinterments, following any ceremonies deemed appropriate and prudent given the concern of the descendent(s) or tribe, shall take place at a location that is mutually agreeable to DOE ORO and the descendent(s) or tribe.

3. If the descendent(s) or tribe so request, or are not interested in retaining the ownership and right of control over or the reinterments of the human remains and associated funerary objects, DOE ORO shall curate the human remains and associated funerary objects at a repository in accordance with Section 5.5.5.

5.4.5.4 Sharing of Information

DOE ORO shall, upon receiving a request from legitimate Native American descendants or tribes, share any information it has regarding Native American human remains, associated and unassociated funerary objects, sacred objects, and objects of cultural patrimony under its jurisdiction. The DOE ORO CRM Coordinator shall be the point of contact for the sharing of such information and shall be responsible for compiling the information and transmitting it to those descendants or tribes making the request.

5.5 36 CFR PART 79 COMPLIANCE PROCEDURES

5.5.1 Management and Preservation of Collections

5.5.1.1 Pre-existing Collections

Cultural material recovered from properties under the jurisdiction of DOE ORO and its predecessor agencies are curated at die UTIL McClung Museum and with the UTk Department of Anthropology (see Chapter 3, Section 3.5.5 above). DOE ORO shall at five-year intervals inspect, or cause to have inspected, the curation facilities (hereafter referred to as repositories) pursuant to 36 CFR 79.5(x). Inspection shall include, but not be limited to, evaluating the condition of storage containers, facility access controls, facility environmental controls, preservation status of artifacts, cataloging procedures, and documentation associated with curated materials. The completeness of the collections shall also be evaluated against existing documentation on artifact inventories to determine if materials are being properly cataloged, managed, stored, and secured in a retrievable manner. DOE ORO shall require repositories to properly control access to its cultural materials and to maintain records on when, how, and why the DOE ORO collections are/have been used.

To augment the repository inspection process, DOE ORO has developed the Repository Review Checklist provided in Appendix D. The checklist shall be used to document repository inspections and to note any achievements or deficiencies found during inspections. The DOE ORO CRM Coordinator or his/her designee shall be responsible for implementing the repository inspection process and for ensuring that repositories are properly handling DOE ORO collections.

Repository Review Checklist, and the DOE ORO CRM Coordinator. shall be notified (if he/she is not a member of the inspecting party). The DOE ORO CRM Coordinator shall provide written notification of the deficiency to the repository manager and the SHPO and proceed with any consultations or actions necessary to rectify the situation.

Should the DOE ORO CRM Coordinator determine at any time that existing collections are not being properly managed and/or preserved by a repository or that a repository is incapable of continuing to provide adequate services, DOE ORO shall remove the collections from the repository, pursuant to 36 CFR 79.5(a)(2), and place them in another repository that is capable of providing services in accordance with the requirements set forth at 36 CFR 79.

5.5.1.2 New Collections

Although cultural material recovered from properties under the jurisdiction of DOE ORO and its predecessor agencies is curated at UTK repositories, DOE ORO does not have an ongoing contractual relationship with UTK or another repository for the curation of cultural material recovered during future investigations. DOE ORO shall arrange for future curatorial services on a project-by-project basis.

Prior to obtaining curatorial services for new collections, DOE ORO shall evaluate, or cause to have evaluated, the proposed repository in accordance with 36 CFR 79.5(b). As part of the evaluation process, DOE ORO shall (1) consider the repository's ability to provide long-term curatorial services in accordance with 36 CFR 79.9; (2) review the repository's policies and procedures to ensure that they are consistent with 36 CFR 79; and (3) require that the repository provide to DOE ORO, in writing, certification that DOE ORO's collections shall be cared for, maintained, and made accessible in accordance with 36 CFR 79. In addition, DOE ORO shall ensure, prior to disposition of any cultural material, that cultural material has been properly

prepared and organized in accordance with the methods outlined in Chapter 4 of this document and in accordance with the repository's processing and documentation procedures.

5.5.13 Administrative Records

In accordance with 36 CFR 79.5(c), DOE ORO shall retain records on the disposition of collections recovered from properties under its jurisdiction including, but not limited to, the following:

(1) the name and location of the repositories where collections are deposited;

(2) catalog listings of the contents of the collections;

(3) catalog listings of any other DOE ORO-owned property that has been furnished to repositories for curatorial services;

(4) copies of contracts, memorandums, agreements, or other written documentation among DOE ORO, repositories, and any other parties associated with curatorial services;

(5) copies of Repository Review Checklists and any other documentation developed as a result of repository inspections prepared in accordance with Section 5.5.1.1 above; and

(6) records on the permanent transfer of collections from one repository to another.

These records, along with copies of all other types of cultural resource site and project records, shall be retained by DOE ORO at the EC Document Center. As new collections or individual artifacts are recovered from DOE ORO properties and placed into a repository, DOE ORO shall ensure that the Master List (see Chapter 4, Section 4.5.1) used to maintain the inventory of cultural materials recovered as they are processed and analyzed is used to maintain a catalog listing of its collections. In addition, the name and location of the repositories at which newly recovered cultural materials are to be deposited shall be maintained as part of the Master List and/or the catalog listing.

5.5.2 Methods of Securing Curatorial Services

DOE ORO has consulted with the UTK McClung Museum, which has agreed to provide curatorial services for future DOE ORO collections on a case-by-case basis. However, due to a lack of large-scale excavations planned for DOE ORO properties in the Oak Ridge area, DOE ORO does not anticipate recovering large volumes of cultural material requiring curation. Although the UTK McClung Museum is not owned, leased, or otherwise operated by DOE ORO or by another federal agency, the curation of DOE ORO-owned collections at this repository would allow the material to (1) remain in the state of origin, (2) be curated with other collections that have been recovered from DOE ORO properties, and (3) be curated with other collections from the same geographic region/cultural area. In addition, by curating new collections at the UTK McClung Museum, which is geographically near the Oak Ridge area, the collections would be easily accessible for inventory and inspection by DOE ORO. Also, the collections would be curated at a research institution where they would be readily accessible for scientific study by interested persons.

Should DOE ORO require curatorial services for newly recovered collections, DOE ORO shall (1) consult with the Repository Official and other appropriate

individuals or organizations (e.g., DOE's Federal Historic Preservation Officer, the SHPO, the Tennessee State Archeologist, the Smithsonian Institution, acid Native American tribes) to ensure DOE ORO's needs for the collections are met (including any special needs with respect to religious or human remains) and to ensure that any resulting contracts, memoranda, agreements, or other written documentation (hereafter referred to as agreements) are sufficient and (2) enter into agreements designed to ensure the proper management, preservation, and long-term curation of the collections.

5.5.3 Methods of Funding Curatorial Services

DOE ORO has completed a number of cultural resource surveys to identify known and previously unknown cultural resources under its jurisdiction and to evaluate those resources for NRHP eligibility. DOE ORO, as indicated in Section 5.1.3 above, plans to continue to conduct surveys to identify and evaluate presently unknown resources that may be affected by its undertakings. However, these surveys shall be conducted using a phased approach on an as-needed basis and shall, in general, be funded through programmatic channels. DOE ORO anticipates using the same funding channels to provide funding for the processing, analysis, and curation of any new collections that may be generated as a result of the surveys/investigations. Therefore, as part of any new cultural resource survey or investigation, DOE ORO shall evaluate, or cause to have evaluated, the potential for the curation of new collections and to include in the survey budget line items for the proper handling and curation of the collections.

5.5.4 Terms and Conditions of Contracts, Memoranda, and Agreements for Curatorial Services

DOE ORO plans to utilize UTK curatorial services on a case-by-case basis. Should DOE ORO enter into an agreement with a repository for the curation of the collections, the agreement shall be developed using the guidance provided at 36 CFR 79.8 and 36 CFR 79, Appendix B. Agreements shall include, whenever possible and appropriate, conditions for the ownership and control of the collections, terms of the agreement, curatorial fees, access for the research and scientific study of the collections, the transfer and disposition of the collections, DOE ORO’s inspection rights, and the security of collections. DOE ORO shall review any agreements for curatorial services at five-year intervals to coincide with the interval set for the inspection and inventory of its collections as outlined in Section 5.5.1.1 above. This agreement shall also stipulate that DOE ORO collections are to be maintained by the repository in perpetuity or until such time that DOE ORO makes arrangements for and transfers the collections to its own facilities or another facility that meets the requirements set forth at 36 CFR 79.9 (see Section 5.5.5 below).

5.5.5 Repository Standards

Prior to transferring any new collections to a repository, DOE ORO shall determine if the repository meets the minimum standards for long-term curational services by applying the criteria at 36 CFR 79.9. DOE ORO shall also use the standards outlined at 36 CFR 79.9 during its five-year inspections of repositories to evaluate whether the repositories containing existing DOE ORO collections are being administered in accordance with the regulations.

5.5.6 Use of Collections

5.5.6.1 Scientific and Educational Uses

Access requirements for DOE ORO collections by researchers, historians, archeological contractors, conservators, collection managers, Native American tribal representatives, and DOE ORO shall be an integral part of any agreement DOE ORO

makes with a repository for curational services. Any requests to access the DOE ORO collections shall be required to be in writing and must include, at a minimum, the name of the institution or individual(s) requesting access,, the purpose for which the collections shall be used; and the time frame in which the collections are to be used, borrowed, or temporarily transferred for research purposes. To allow for effective and efficient management of DOE ORO collections, however, DOE ORO shall provide stipulations in agreements for specific persons (e.g., curation or collection managers) to have direct access to its collections without the need for written DOE ORO permission.

5.5.6.2 Religious Uses

Access to DOE ORO collections containing religious items for religious rituals or spiritual activities shall be allowed to legitimate parties. The requirements for gaining access to the collections for such purposes shall be the same as those for scientific and educational uses as specified in Section 5.5.6.1 above.

5.5.6.3 Terms and Conditions of Uses

The terms and conditions for access to DOE ORO collections shall be clearly indicated in any agreements between DOE ORO and a repository and shall be consistent with those terms and conditions outlined at 36 CFR 79.10(d)--(g).

5.5.6.4 Written Agreements for Use

Written agreements for the use of collections will be stipulated pursuant to the written agreements between DOE ORO and the repository.

5.5.7 Conduct of Inspections and Inventories

DOE ORO shall at five-year intervals physically inspect repositories containing DOE ORO collections and the cultural material contained therein. As part of the inspections, DOE ORO shall complete a Repository Review Checklist (Appendix D) and request to review all documentation and records associated with the collections. Inspections may also include the collection of photographic documentation to record the condition of the repository facilities and the collections to determine if physical changes (e.g., deterioration of storage boxes, water damage, loss of artifacts, etc.) have occurred or are occurring.

5.6 PROTECTION PROCEDURES

5.6.1 Natural Forces

5.6.1.1 Monitoring

Three major types of cultural resources are under the jurisdiction of DOE ORO in the Oak Ridge area: (1) prehistoric archeological sites; (2) historic archeological sites; and (3) historic sites or structures, which include, for the purposes of the following discussions, pre-World War II structures included in the NRHP and Manhattan Project and later scientific facilities included or eligible for inclusion in the NRHP. Prehistoric and historic archeological sites, although different in historic context and cultural affiliation, are similar in their physical attributes (i.e., most of information about these sites can be obtained only by using archeological techniques) and their general location outside security-fenced regions (e.g., the three industrial complexes on the ORR).

DOE ORO shall monitor the effects of natural forces on prehistoric and historic archeological sites using a periodic sites inspection program involving, but not limited to (1) surveillance of known sites by individuals trained, at a minimum, in cultural resources identification and cultural resources laws and regulations; (2) recondition of the present condition of sites, including collecting photographic documentation, as warranted; (3)

comparing the present condition of the sites with information regarding the previous condition of the sites when last visited to determine if the sites are being adversely affected by natural forces (e.g., deterioration, degradation, and erosion); and (4) maintaining abdicable records of the site inspection/monitoring activities.

Historic sites and structures differ from archeological sites in that they typically receive routine surveillance and maintenance because they play a continuing role in DOE ORO missions. Therefore, most maintenance activities performed at DOE ORO facilities are carried out to maintain the functional use of facilities rather than for the sole purposes of maintaining the historical integrity of facilities, although maintenance projects are carried out to maintain significant properties (e.g., the Freels Cabin, New Bethel Baptist Church, and George Jones Memorial Baptist Church) for purposes other than functional reasons. The surveillance and maintenance of historic sites and structures include the protection of these types of resources against natural forces and are carried out in compliance with current NEPA program requirements. Therefore, the monitoring of historic sites and structures can be considered an ongoing operation that is carried out, planned for, and implemented on a fiscal basis.

5.6.12 Consultation

The need and process by which DOE ORO shall consult with the SHPO in instances where NRHP-included or -eligible properties are being affected by natural forces shall be dictated by following the procedures set forth in Section 5.1.1.3 above.

5.6.1.3 Restoration and Repair

Should DOE ORO determine that an NRHP-included or -eligible property is in need of restoration, repair, or stabilization (hereafter referred to collectively as restoration) due to the effects of natural forces, in accordance with Section 5.1.1.3 above and having found that the restoration activity would not meet the criteria for cultural resources exclusion, DOE ORO shall consult with the SHPO and any interested parties regarding the selection and implementation of appropriate restoration activities. As part of the selection process, the latest procedures for restoration shall be researched and the most effective method selected for the site/structure. Examples of restoration activities include, but are not limited to

(1) protection of properties from surface water drainage by making minor alteration to drainage patterns in the immediate vicinity of the site or structure;

(2) sealing a site with clean soil or sand;

(3) planting vegetation or installing manmade barriers or baffles around sites to protect them from wave action along the shoreline of the Clinch River, Watts Bar Lake, and Melton Hill Lake;

(4) in-kind (whenever feasible) replacement of portions of a structure that is deteriorated or damaged causing additional deterioration of other parts of the structure (e.g., damaged roofing materials); and

(5) mitigation by data recovery (e.g., excavation) when the cost of restoration is determined to not be economically feasible.

DOE ORO's current practice of preserving and protecting historic archeological sites under its jurisdiction is to avoid disturbance to the sites using administrative means (e.g., see Section 5.6.2 below) and to not engage in preservative maintenance.

Many of the structures are located outside developed areas in parts of the ORR that possess little potential for disturbance, and most are experiencing little natural erosion due to their locations on flat hilltops or in flat hollows. Many sites contain cellars and cisterns which are slowly filling with humus; however, this is a natural protective mechanism that will ensure sealing of any deposits that may exist in the depressions. With respect to historic archeological sites, DOE ORO plans to maintain its present policy of avoidance and to evaluate the effects proposed DOE ORO undertakings may have on the natural environment in the vicinity of known and newly identified sites in accordance with Section 5.1.1.3 above.

Prehistoric archeological sites pose a somewhat different problem than historic archeological sites based on their topographic location. Prehistoric archeological sites in upland settings are similar to historic house sites in that little additional disturbance can be expected (many such sites lie on severely deflated landforms and probably do not represent significant resources). However, prehistoric archeological sites located along the Clinch River and its major tributaries (e.g., Poplar Creek and East Fork Poplar Creek) and Watts Bar Lake and Melton Hill Lake are susceptible to natural forces such as flooding and water fluctuations. Such natural forces cause slumping of the banks and horizontal beach erosion. Inundation of the Clinch River (although a natural force under normal circumstances) resulting from construction of Watts Bar and Melton Hill lakes and discharge from Melton Hill Dam expedite the erosion process considerably. With respect to prehistoric archeological sites, DOE ORO's current practice is to avoid disturbance to the sites using the same administrative means as that for historic archeological sites. DOE ORO plans to maintain its present policy of avoidance and to evaluate the effects proposed DOE ORO undertakings may have on the natural environment in the vicinity of known and newly identified sites in accordance with Section 5.1.13 above.

5.6.2 Authorized Actions

5.6.2.1 Project Screening and Tracking

Procedures addressing the protection of DOE ORO properties included or eligible for inclusion in the NRHP from authorized actions are well outlined in Section 5.1. Project screening and tracking are carried out under the existing DOE ORO NEPA compliance program, which includes a full review of undertakings for compliance with cultural resource laws and regulations. Selected actions (particularly those having a moderate to high potential to affect NRHP-included or -eligible properties) authorized for implementation through the NEPA compliance and review process are subjected to field verification for NEPA/NHPA compliance adherence.

5.6.2.2 Monitoring

Authorized actions are monitored through existing NEPA/NHPA verification and adherence procedures involving activities such as (1) field inspections of selected undertakings that have been reviewed through the NEPA process prior to, during, and/or following field activities associated with the undertakings; (2) review of maintenance actions that are screened by project managers, planners, estimators, etc., who have been properly trained in NEPA/NHPA review and compliance and the application of the procedures set forth in Section 5.1.1.3 above; and (3) surveillance of DOE ORO properties by area managers, security personnel, and environmental compliance personnel to ensure that authorized actions do not take place, or continue to take place, without proper NEPA/NHPA review and compliance.

5.6.23 Consultation

In the event that an authorized undertaking has an unintentional or unanticipated effect on an NRHP-included or -eligible property, DOE ORO shall consult with the SHPO and interested parties, as warranted. Appropriate mitigation or restoration activities shall be developed through the consultation process and implemented in accordance with any agreements reached.

5.6.2.4 Restoration and Repair

Should DOE ORO determine that an authorized action is or has had an unintentional or unanticipated effect on an NRHP-included or -eligible property, DOE ORO shall stop, or cause to have stopped, the undertaking or those activities associated with the undertaking that are causing the effect, apply the Criteria of Effect and Adverse Effect (36 CFR 800.9) to the undertaking in accordance with the procedures set forth in Section 5.1.4.1 above, and consult with the SHPO.

A. If DOE ORO and the SHPO agree on measures to be implemented by DOE ORO that would result in no adverse effect on NRHP-included or -eligible properties as a result of proceeding with the undertaking, as determined by applying the exceptions to the Criteria of Effect at 36 CFR 800.9(c), DOE ORO shall document the consultation with the SHOO, implement the agreed-upon measures, and proceed with the undertaking. In such instances, the undertaking and occurrence of the unintentional or unanticipated affect need not be reviewed by the Advisory Council. However, DOE ORO shall retain all documentation associated with the undertaking, pursuant to 36 CFR 800.8, for possible review by the Advisory Council. Examples of measures DOE ORO may take to avoid, reduce, or mitigate the effects of the undertaking are listed in Section 5.1.4.2, Items 1-4 above.

B. If DOE ORO determines, in consultation with the SHPO, that the unintentional or unanticipated effects have had a adverse effect on NW-included or -eligible properties, DOE ORO shall implement, or cause to have implemented, any actions deemed necessary (including entering into MOAs) to take into account the effects. DOE ORO shall document the consultation with the SHPO and any agreements made pursuant to the consultation.

5.6.3 Illegal Acts

5.6.3.1 Detection

Illegal acts affecting DOE ORO properties included or eligible for inclusion in the NRHP shall be detected through area surveillance by area managers, security personnel, and environmental compliance personnel and through inspection activities specifically designed to review the status of known properties (see Section 5.6.1.1 above). Evidence of, or suspected evidence of, illegal acts shall be brought to the attention of the DOE ORO CRM Coordinator who shall be responsible for coordinating investigations into suspected violations and resulting activities.

5.6.3.2 Investigation

If disturbance to an NRHP-included or -eligible property is observed during area surveillance or site inspection activities and the disturbance is associated with, or believed to be associated with, an illegal act, DOE ORO shall conduct, or cause to have

conducted, a preliminary investigation into the incident including, but not limited to (1) an evaluation of the nature and extent of the disturbance, (2) attempts to determine if the disturbance was intentional or a result of some other activity, and (3) collecting photographic documentation. The results of the preliminary investigation shall be summarized in an AHR that is to be transmitted to the SHPO and to other interested parties such as Native American tribes, as warranted. The need for more detailed investigations into the disturbance, such as that involving the expertise of a professional historian or archeologist, shall be worked out in consultation with the SHPO.

5.63.3 Prosecution

If DOE ORO determines that disturbance to an NRHP-included or -eligible property was intentional and for the purpose of removing artifacts from DOE ORO property, DOE ORO shall monitor, or cause to have monitored, the disturbed site for further illegal activity. DOE ORO shall make every attempt to take appropriate legal action against apprehended individuals under the current ARPA guidelines and any other applicable federal, state, or local laws.

5.6.3.4 Consultation

In the event that an illegal act is found to have affected an NRHP-included or -eligible property, DOE ORO shall consult with the SHPO and interested parties (as warranted). Consultation procedures shall be consistent with those set forth in Section 5.1.5.1 above and documented in accordance with the procedures set forth in Section 5.1.5.2 above. Appropriate mitigation or restoration activities shall be developed through the consultation process and implemented in accordance with any agreements reached.

5.63.5 Restoration and Repair

Restoration of NRHP-included or -eligible properties damaged by illegal acts shall be conducted in the same manner as that for properties damaged by natural forces. Procedures addressing restoration activities are described in more detail in Section 5.6.1.3 above.

5.63.6 Prevention

The existing security measures in place at DOE ORO properties in the Oak Ridge area (see Chapter 3, Section 3.4.6.2.2 for more detail) prevent public direct access to many of the cultural resources under the jurisdiction of DOE ORO. Sites located along the Clinch River and Watts Bar and Melton Hill lakes' are the easiest to access and, therefore, the most susceptible to looting or vandalism. DOE ORO and DOE ORO prime-contractor security personnel routinely patrol DOE ORO properties, and TWRA officers patrol the Clinch River and Watts Bar and Melton Hill lakes. The presence of security personnel and TWRA officers provides a visible deterrent to collecting and unauthorized digging on DOE ORO property. In addition, 'No Trespassing" signs posted along the shoreline of DOE ORO property are designed to alert people that only authorized access to the government property is permitted.

5.7 TREATY RIGHTS PROCEDURES

5.7.1 Technical Actions

No treaty rights are involved on the ORR.

5.7.2 Regulatory Compliance

No treaty rights are involved on the ORR.

5.73 Administrative Procedures

No treaty rights are involved on the ORR.

5.7 CRM ADMINISTRATION

5.8.1 Staffing and Contracting

DOE ORO shall appoint a CRM Coordinator who is responsible for implementation of this CRMP. The DOE ORO CRM Coordinator and DOE ORO prime-contractor Cultural Resources Coordinators are members of the NEPA Compliance staff within their respective programs or sites, which is in turn a part of the overall environmental compliance and management structure within the DOE ORO system. The DOE ORO CRM Coordinator and DOE ORO crime-contractor Cultural Resources Coordinators are trained in the interpretation and application of cultural resource laws and regulations. In general, DOE ORO does not *maintain* or require its prime contractors to maintain staff members with advanced academic training in cultural resources expertise such as that required to assess the historical or archeological significance. of properties (e.g., professional historians or archeologists) but instead hires, or causes to have hired, individuals with this expertise on an as needed basis.

5.8.2 Training

DOE ORO and DOE ORO prime-contractor personnel responsible for cultural resource compliance activities are provided technical training in the interpretation and application of cultural resource laws and regulations. Examples of training courses provided to cultural resource staff members include (1) *Introduction to Federal Projects and Historic Preservation* Law provided by the Advisory Council; (2) *Advanced Seminar on Preparing Agreement Documents Under Section* 106 of *the National Historic Preservation Act* sponsored by the Advisory Council and the University of Nevada, Reno; *(3)Archeology for Managers* sponsored by the Archeological Assistance Division, National Park Service, and the University of Nevada, Reno; and (4) various Section 106 Workshops provided by the SHPO.

5.8.3 Permitting

The DOE ORO CRM Coordinator shall be the point of contact for the coordination of cultural resource permits for parties external to DOE ORO requesting to

conduct cultural resource investigations on DOE ORO property. Internal DOE ORO cultural resource compliance activities are carried out on a daily basis and do not require any special permission to initiate or complete. Cultural resource research actions are typically carried out in response to a need for a survey or evaluation of cultural resources and are coordinated by DOE ORO prime-contractor Cultural Resources Coordinators in *consultation* with the DOE ORO CRM Coordinator, the SHPO, and other interested parties, as warranted.

Any external investigation into DOE ORO-owned cultural resources shall be coordinated through the DOE ORO CRM Coordinator and shall not be given start-work authority until the DOE ORO CRM Coordinator has given the proper permission to proceed. Permission for the study or removal of DOE ORO cultural resource collections (or portions of collections) maintained by a repository must also be coordinated through the DOE ORO CRM Coordinator. In addition, should Native American tribes or tribal representatives identify traditional or sacred lands on DOE ORO property in the Oak Ridge area, access to those lands by Native American tribal representatives shall be coordinated through the DOE ORO CRM Coordinator.

5.8.4 CRM Facilities

DOE ORO does not maintain a designated facility for conducting of CRM activities but rather relies on the existing management structure (see Section 5.1 above for more detail) to provide facilities to house personnel and records associated with CRM activities.

5.8.5 Consultation on Administration

The purpose of this CRMP is to ensure that DOE ORO complies with cultural resource statutes, addresses cultural resources in the early planning process of its undertakings, and implements necessary protective measures for its cultural resources prior to initiating an undertaking. The CRMP is the basis of the DOE ORO CRM program and is intended to strike a balance between DOE ORO missions and its cultural resources planning and preservation responsibilities. This CRMP was prepared in consultation with the Advisory Council, the SBPO, Native American tribal representatives, and other interested parties (e.g., local government officials) and is to be maintained as a living document that serves as the cornerstone of DOE ORO's CRM program. To ensure this plan is kept current and in a form that is useful in the day-to-day operations of DOE ORO facilities in the Oak Ridge area, the following procedures have been developed:

A. DOE ORO shall, on a periodic basis, evaluate the information, methods, and procedures contained in the CRMP. The purpose of the evaluation shall be to identify areas of the plan that need improvement or modification based on the most recent data available and the most current methods and procedures developed to carry out the responsibilities of the DOE ORO CRM in the most effective and efficient manner possible. The evaluation shall consist of independent reviews of the CRAP by personnel both directly and indirectly associated with the implementation of the plan and shall be coordinated by the DOE ORO CRM Coordinator.

B. After completion of an evaluation, DOE ORO shall consult with the Advisory Council, SBPO, and interested parties regarding any suggested or needed modifications or changes to the information, methods, or procedures contained in the CRMP.

C. Once DOE ORO has completed the consultation process and made necessary changes to the CRMP, the revised portions of the CRMP shall be properly distributed and now methods and procedures implemented.

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APPENDIX A

GLOSSARY

GLOSSARY A-3

GLOSSARY

Advisory Council on Historic Preservation: An agency established pursuant to Section 201 of Title II of the National Historic Preservation Act (NHPA) (1) that is to be afforded reasonable opportunity under Sections 106 and I 10(f) of the NHPA to comment with regard to proposed federal or federally licensed, assisted, approved, or delegated undertakings; (2) that reviews federal programs pursuant to Section 202(a)(6) ofthe NHPA; and (3) with whose regulations outlining the procedures for complying with the requirements of Section 106 of the NHPA ("Protection ofHistoric Properties" found at 36 CFR Part 800), in accordance with Section 110(a)(2)(E)(i), other federal agencies' procedures for compliance with Section 106 must be consistent.

Analysis: Examination and classification of cultural resources or data about them. Important types of analysis are typological (what the resource is), chronological (how old it is), technological (how it was made), functional (how it was used), and stylistic (important characteristics of its appearance).

Archeological Research: The scientific study of cultural resources through the analysis ofprehistoric and historic material remains and related data recovered during archeological survey, excavation, and analysis.

Archeological Resource: ". . . Any surface, subsurface, or submerged location such as a site, building, structure, shipwreck, cave, rockshelter, midden, or feature which contains material remains of prehistoric and historic human life or activities that are at least 100 years of age and are of archeological interest" (36 CFR Part 79: Curation of Federally-Owned and Administered Archeological Collections, Section .4[a]).

Archeological Survey: The process used to locate and record basic information about prehistoric and historic cultural resources in the field. Archeological survey methods include walking over the project area, walking over and shovel-testing the area, and walking over the area following plowing and disking.

Archeological Survey Report: A type of cultural resource report that documents the methods, findings, and any other important information about an archeological survey.

Architectural or Engineering Survey: The process used to produce or collect measured drawings, photographs, and written records that document historic buildings and structures, as well as objects such as equipment and apparatus. The data-gathering techniques involved may be required to meet the Historic American Buildings Survey (NABS) or Historic American Engineering Record (HAER) standards of the National Park Service.

Archival Records: Unpublished documentary records of past human existence that are deposited in archives. Examples of important types of archival information are Historic period chronicles of Native American groups and sites; period descriptions of the construction, occupancy, and use of historic buildings and other structures; and documentary records of properties associated with recent scientific achievements.

Archival Search: The process used to locate and retrieve information from archival records relating to cultural resources.

Artifact: An object made or modified by humans.

Artifact Type: A class or group of objects in an artifact classification system, defined on the basis of some type of shared physical, measurable, and observable attributes.

Authorized Action: A formally approved project, activity, or other undertaking at the facility or program area.

Avoidance: Modification of a project or other undertaking to prevent effects on cultural resources that would have resulted from the originally designed actions.

Building: A ". . . structure created to shelter any form of human activity, such as a house, barn, church, hotel, or similar structure. Building may refer to a historically related complex such as a courthouse and jail or a house and barn" (36 CFR Part 60: National Register of Historic Places, Section .3[a]).

Collection: Any ". . . material remains that are excavated or removed during a survey, excavation, or other study of a prehistoric or historic resource, and associated records prepared or assembled in connection with the survey, excavation, or other study" (36 CFR Part 79: . Curation of Federally-Owned and Administered Archeological Collections, Section .4[b]; definitions ofthe terms "material remains" and "associated records" are provided in Sections .4[a] and .4[b], respectively).

Consultation: The process used to obtain the views or advice of parties concerned with the management of cultural resources. Consultation is required by law or regulation in some instances and is advisable whenever concerned or interested parties are known to exist. Examples of the types of parties who might be contacted in the consultation process are the Advisory Council on Historic Preservation; the State Historic Preservation Officer; other federal, state, local, ortribal government officials; members ofthe public; Native Americans; members ofother ethnic groups; and professional or avocational archaeologists, historians, and anthropologists.

Context: The locations at which cultural resources, such as sites, artifacts, features, or specimens, occur as a result of the human behavior that produced them. Context is extremely important because most past human behavior is reflected not by material objects themselves but by how such objects are situated in relationship to one another.

Cultural Resource: "Cultural resources include, but are not limited to, the following broad range of items and locations: (1) archeological materials (artifacts) and sitar, dating to the Prehistoric, Historic, and Ethnohistoric periods that are currently located on the ground surface or are buried beneath it; (2) standing structures that are over 50 years of age or are important because they represent a major historical theme or era; (3) cultural and natural places, select natural resources, and sacred objects that have importance for Native Americans; and (4) American folklife traditions and arts" (DOE Guidance Memorandum of February 1990).

Cultural resources include anything that is a "historic property" as defined in 36 CFR Part 800: Protection of Historic and Cultural Properties, Section .2(e); an "Archeological resource" as defined in 43 CFR Part 7: Archaeological Resources Protection Act, Section 3, and the Act's Uniform Regulations, Section .3(a); a Native American "cultural item" as defined in PL 101-601: Native American Graves Protection and Repatriation Act, Section 2(3); or part of a "collection" as defined in 36 CFR Part 79: Curation of Federally-Owned and Administered Archeological Collections, Section .4(b).

Major types of cultural resources referenced in the Plan Development Guidance are prehistoric resources, historic resources, resources of ethnic importance, and properties of recent scientific significance. Other specific types referred to include prehistoric, historic, and protohistoric sites, structures, artifacts, specimens, and isolated features; sacred sites, traditional-use resources, and Native American cultural items; recent structures, facilities, equipment, and apparatus that have scientific significance; and environmental samples (e.g., carbon and microbotanical samples from flotations).

Cultural Resource Location Base Map: A map that serves as the permanent record of the locations of known cultural resource sites.

Cultural Resources Management (CRM): Management of the cultural resources at facility or program areas in accordance with the applicable laws and regulations, DOE guidance, and professional scientific standards. The overall goal ofCRM is preservation ofcultural resources, either in situ or through appropriate scientific recovery and curation of either the resources themselves or information about them.

Cultural Resource Professional: Individuals with training and experience qualifying them as professionals in fields related to the study and management of cultural resources, such as prehistoric archeology, historic archeology, history, and

ethnography. Their training and experience should be appropriate for the area and position in which they work. (48 FR 44739: Secretary of the Interior's Standards for Archeology and Historic Preservation)

Cultural Resource Project Records: The records system used to document legal compliance and other CRM activities at facility or program areas.

Cultural Resource Records: Cultural resource site records, cultural resource project records, and other forms designed specifically to document and track inventory, excavation, laboratory treatment, curation, preservation, research, outreach, legal compliance, and any other CRM activities.

Cultural Resource Reports: Written reports documenting CRM or research activities, such as inventory or excavation.

Cultural Resource Research: Archeological, historic, or ethnographic research on topics such as chronology, environmental reconstruction, settlement pattern and site location models, demography, technology, economic organization, social organization, political organization, religion and ideology, art, language and oral traditions, historical events and personages, recent scientific achievements, and CRM methodology.

Cultural Resource Site: A place where cultural resource materials, such as artifacts, features, and specimens, have been deposited as a result of some purposeful form of human activity.

Cultural Resource Site Form: A form used to record basic, inventory-level information about cultural resources.

Cultural Resource Site Records: The records system used to document cultural resources found at the facility or program area. These records include site forms, site catalogs, and site location base maps.

Curation: ". . . The management and care of collections according to common, professional museum practices, including but not limited to: (1) inventorying, accessioning, labeling, and cataloging collections; (2) identifying, evaluating, and documenting collections; (3) storing and maintaining collections under appropriate environmental conditions and physically secure controls; (4) periodically inspecting collections and taking any necessary actions as may be necessary to preserve them; (5) providing access to and facilities for studying collections; and (6) cleaning, stabilizing,

and conserving collections" (36 CFR Part 79: Curation of Federally-Owned and Administered Archeological Collections, Section 4[c]).

Curatorial Services: The activities involved in ".. . managing and preserving a collection according to professional museum and archival practices" (36 CFR Part 79: Curation of Federally-Owned and Administered Archeological Collections, Section.4[b]; the specific types of activities involved also are identified in Section .4[b]).

Damage Assessment: The procedures carried out by a professional archaeologist to identify and document the archeological elements of the damage in a violation of laws or regulations protecting cultural resources (for example, the determination of commercial value, archeological value, and cost of restoration and repair in an Archaeological Resources Protection Act case).

Detection: Discovery of a violation of laws or regulations protecting cultural resources that results in an investigation of the violation and an attempt to prosecute the suspected violator(s).

District: A ". . . geographically definable area-urban or rural--possessing a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united by past events or aesthetically by plan or physical development. A district may also comprise individual elements separated geographically but linked by association or history" (36 CFR Part 60: National Register of Historic Places, Section .3[d]).

Effect: An action involving a cultural resource that ". . . may alter characteristics of the property that may qualify the property for inclusion in the National Register" (36 CFR Part 800: Protection of Historic and Cultural Properties, Section .9[a]: the criteria of adverse effect are identified in Section .9[b]).

Ethnic Importance: Of religious value or other cultural significance to Native Americans or other ethnic groups.

Ethnographic Fieldwork: The process used to identify and document resources of ethnic importance. Examples of important types of ethnographic fieldwork are recordation of oral histories, informant interviews, and observation and documentation of current uses and practices.

Ethnographic Research: The scientific study of cultural resources through the analysis of data gathered during ethnographic fieldwork.

Ethnohistoric: Pertaining to periods when the history of an ethnic group was maintained and passed on orally rather than by written records.

Evaluation: Application of ". . . the National Register criteria to [cultural resource] properties that may be affected by ... [an] undertaking and that have not been previously evaluated for National Register eligibility" (36 CFR Part 800: Protection ofHistoric and Cultural Properties, Section .4[c]). Evaluation can also be the "process of determining whether identified properties meet defined criteria of significance and therefore should be included in an inventory of historic properties determined to meet the criteria. The criteria employed vary depending on the inventory's use in resource management" (48 FR 44739: Secretary of the Interior's Standards for Archeology and Historic Preservation).

Excavation: The controlled exposure of subsurface deposits at prehistoric and historic cultural resource sites to scientifically recover archeological materials and data from these sites. The two basic types of excavations are test excavations and large-scale excavations.

Facility: Buildings and other structures and their functional systems and equipment, including site development features such as landscaping, roads, walks, and parking areas; outside lighting and communications systems; central utility plants; utilities supply and distribution systems; and other physical plant features (DOE Order 4700.1: Project Management System).

Feature: An object that is not portable, such as a dwelling or storage facility.

Federal Lands: ". . . Any land other than tribal lands which are controlled or owned by the United States, including lands selected by but not yet conveyed to Alaska Native Corporations and groups organized pursuant to the Alaska Native Claims Settlement Act of 1971" (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[5]).

Historic: The period after the advent of written history in a geographic region. For example, the Historic period in what is now the southeastern United States began with the arrival of Europeans in that region in the early 1500s.

Historic Archeological Site: A surface, subsurface, or submerged site, building, structure, or other feature which contains material remains of human life or activities that date to the Historic period.

Historic Context: A particular historic theme that is further delineated by a time period and a geographic area.

Historic Property: A ". . . prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register" (36 CFR Part 800: Protection of Historic and Cultural Properties, Section .2[e]).

Historic Research: The scientific study of cultural resources through the analysis of data gathered from written records, either published sources or archival records.

Historic Resource: A cultural resource dating to the Historic period.

Historic Site: A cultural resource site dating to the Historic period.

Historic Structure: A building or other constructed facility dating to the Historic period.

Human Forces: The result of authorized actions and illegal acts by humans with the potential to affect cultural resources.

Illegal Acts: Acts that violate the Archaeological Resources Protection Act or any of the other laws and regulations protecting cultural resources by causing prohibited types of damage or loss of these resources.

Indian Lands: ". . . Lands of Indian tribes, or Indian individuals, which are either held in trust by the United States or subject to a restriction against alienation imposed by the United States, except for subsurface interests not owned or controlled by an Indian tribe or Indian individual" (43 CFR Part 7: Protection of Archeological Resources, Section .3[e]).

Indian Tribe: ". . . Any tribe, band, nation, or other organized group or community of Indians, including any Alaska Native village (as defined in, or established pursuant to, the Alaska Native Claims Settlement Act), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians" (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[7]).

In Situ: The condition of objects that are situated in the location in which they were deposited by the people who originally produced or used them.

Inventory: The process of locating cultural resources and gathering information about them through archeological surveys, ethnographic fieldwork, or archival searches.

Investigation: The collection of evidence and information at crime scenes and elsewhere that leads to the identification and prosecution of those responsible for committing the illegal acts.

Isolated Feature: Nonportable artifacts that are not formally identified as cultural resource sites or components of such sites.

Known Cultural Resource: A cultural resource that has been identified and formally recorded by archaeologists, ethnologists, or other cultural resource professionals or that is known through ethnohistoric traditions or in any other way to Native Americans, other ethnic groups, or the public.

Laboratory Treatment: Activities conducted in a laboratory to process or analyze cultural resources or data about these resources. The principal goals of laboratory treatment are immediate preservation ofthe cultural resources and data and recognition ofthoir information valuc. (Long-term managcmcnt and preservation of collections of cultural resources and data are accomplished through curatorial services.)

Large-Scale Excavation: Extensive excavation of a cultural resource site, usually involving the exposure of large portions of the site surface or surfaces and the features present. Basic methods are horizontal exposure of the site surface in stratigraphic or arbitrary levels and systematic, controlled excavation of stratigraphic levels working downward.

Legal Compliance: The process of meeting legal requirements placed on CRM activities by the applicable federal, state, local, or tribal laws and regulations.

Mitigation: Measures carried out to avoid or reduce the effects of undertakings on cultural resources. These measures may include actions such as relocation or other modifications ofthe undertaking itself or recovery of materials and data from the cultural resources site to be affected.

Monitoring: Periodic inspection of cultural resources to ascertain their condition and assess the effects of natural forces, authorized actions, or illegal acts.

National Historic Landmark: "A district, site, building, structure, or object, in public or private ownership, judged by the Secretary [of the Interior] to possess national significance in American history, archeology, architecture, engineering, and culture, and so designated by him" (36 CFR Part 65: National Historic Landmarks Program, Section .3[i]).

National Register of Historic Places: A register ". . . composed of districts, sites, buildings, structures, and objects significant in American history, architecture, archeology, engineering, and culture" maintained by the Secretary of the Interior; also referred to as "the National Register" (National Historic Preservation Act, Section 101 [a][1][A]).

National Register Status: The status of a cultural resource with regard to listing in the National Register of Historic Places. This status will be one of the following: unevaluated for eligibility, determined not eligible for inclusion, determined eligible for inclusion, nominated for inclusion, listed, or designated as a National Historic Landmark.

Native American: "Of, or relating to, a tribe, people, or culture that is indigenous to the United States" (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[9]).

Native American Cultural Items: Human remains, associated funerary objects, Unassociated funerary objects, sacred objects, and objects of cultural patrimony (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[3]).

Native Hawaiian: "Any individual who is a descendant of the aboriginal people who, prior to 1778, occupied and exercised sovereignty in the area that now constitutes the State of Hawaii" (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[10]).

Native Hawaiian Organization: "Any organization which (A) serves and represents the interestsof Native Hawaiians, (B) has as a primary and stated purpose the provision of services to Native Hawaiians, and (C) has expertise in Native Hawaiian Affairs, and shall include the Office of Hawaiian Affairs and Hui Malama I Na Kupuna O Hawaii Nei" (PL 101-601: Native American Graves Protection and Repatriation Act, Section 2[l 1]).

Natural Forces: Forces of nature, such as wind and water erosion, wildfire, and frost heave, that can affect cultural resources.

No Effect: The situation in which an action involving a cultural resource will not ". . . alter characteristics of the property that may qualify the property for inclusion in the National Register" (36 CFR Part 800: Protection of Historic and Cultural Properties, Section .9[a]).

Object: A ". . . material thing of functional, aesthetic, cultural, historical, or scientific value that may be, by nature or design, movable yet related to a specific setting or environment" (36 CFR Part 60: National Register of Historic Places, Section .3[j]).

Outreach: Activities designed to inform and educate the public about cultural resources and cultural resource management. These activities may be conducted on-site at facility or program areas or off site in the community.

Permit: An agency-issued document authorizing excavation and removal of cultural resource from lands under the agency's jurisdiction. Such permits are issued under the authority of the Archaeological Resources Protection Act.

Plow and Disk Survey: A type of archeological survey in which cultural resources are located by plowing and disking the surface of the survey area with agricultural implements to expose artifacts and other cultural materials buried beneath recent overburden.

Prehistoric: The period before the advent of written history in a geographic region. The Prehistoric period in the various regions of North America is the time before the arrival of Europeans in each . of these regions.

Preservation: Protection of cultural resources from the effects of either natural or human forces, either in situ or in collections.

Prevention: Reduction or elimination ofthe destructive effects ofnatural or human forces on cultural resources before these effects occur.

Processing: The initial phase of laboratory treatment of cultural resources or data about them, including activities such as sorting, cleaning, numbering, cataloging, photography, drawing, conservation, or restoration.

Program: An organized set of activities directed toward a common purpose, or a goal undertaken or proposed in support of an assigned mission area. A program is characterized by a strategy for accomplishing a definite objective(s), which identifies

the means of accomplishment, particularly in quantitative terms, with respect to work force, materials, and facilities requirements. Programs are typically made up of technology-based activities, projects, and supporting operations (DOE Order 4700.1: Project Management System).

Project: A unique major effort within aprogram that has firmly scheduled beginning-, intermediate-, and ending-date milestones; prescribed performance requirements; prescribed costs; and close management, planning, and control. A project is a basic building block in relation to a program that is individually planned, approved, and managed. A project is not constrained to any specific element of the budget structure (e.g., operating expense or plant and capital equipment). Construction, if required, is part of the total project. Authorized and at least partially appropriated projects will be divided into three categories: major system acquisitions; major projects, and other projects (DOE Order 4700.1: Project Management System).

Protection:. Measures carried out to reduce or eliminate the effects of natural or human forces that cause damage or loss of cultural resources. Types of protection measures for natural and human forces resulting from authorized actions include monitoring, project screening and tracking, and restoration and repair. When human forces result from illegal acts, types of protection measures include detection, investigation, prosecution, restoration and repair, and prevention.

Protohistoric: Pertaining to the transition period between the Prehistoric and Historic periods, after the advent of written history in a geographic region, but before all groups have entered the Historic period.

Recent Scientific Significance: Significance or importance derived from association with recent scientific advancements in the last 50 years, such as the development of nuclear energy technology.

Resources of Ethnic Importance: Cultural resources that have ethnic importance. These include sacred sites, traditional-use resources, Native American cultural items, and any other resources that have ethnic importance.

Restoration and Repair: Activities including, but not limited to, ". . . (1) reconstruction of the archeological resource; (2) stabilization of the archeological resource; (3) ground contour reconstruction and surface stabilization; (4) research necessary to carry out reconstruction or stabilization; (5) physical barriers or other protective devices, necessitated by the disturbance of the archeological resource, to protect it from further disturbance; (6) examination and analysis of the archeological resource including recording remaining archeological information, where necessitated

by disturbance, in order to salvage remaining values which cannot be otherwise conserved; (7) reinterments of human remains in accordance with religious custom and State, local, or tribal law, where appropriate, as determined by the Federal land manager; (8) preparation of reports relating to any ofthe above activities" (43 CFR Part 7: Protection ofArcheological Resources, Section 14[c]).

Sacred Site: A place or location associated with the religious beliefs or practices ofNative Americans or other ethnic groups. In addition to churches and other formal religious or ceremonial sites, these may include natural places or locations used for religious purposes or important in religious beliefs.

Shovel-Test Survey: A type of archeological survey in which buried cultural resources are located by small, shovel-size excavations at regular intervals.

Site: The ". . . location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself maintains historical or archeological value regardless of the value of any existing structure" (36 CFR Part 60: National Register of Historic Places, Section .3[l]). See also Cultural Resource Site.

State Historic Preservation Officer: "The official appointed or designated pursuant to Section 101(b)(1) of the [National Historic Preservation] Act to administer the State historic preservation program" (36 CFR Part 800: Protection of Historic and Cultural Properties, Section .2[n]).

Stewardship: The faithful management of resources as assets that must be turned over to the next generation (Legacy Cultural Resource Management Program, U.S. Department of Defense).

Structure: A ". . . work made up of independent and interrelated parts in a definite pattern of organization. Constructed by man, it is often an engineering project large in scale" (36 CFR Part 60: National Register of Historic Places, Section .3 [p]).

Test Excavation: Excavation of a small portion of a cultural resource site to determine the types and extent of the materials present. Basic test excavation methods are hand excavation of test pits in a grid or test trenches and machine excavation of test trenches.

Test Pit: A type of test excavation dug by hand that is usually relatively small in size. Units l meter in surface area are commonly used for test pits.

Test Trench: A linear type of test excavation dug by hand or by machine that is designed to transect cultural resource sites or features and expose the vertical faces of the deposits. Backhoes are sometimes used to excavate test trenches.

Traditional-Use Resource: Natural resources such as plants, animals, minerals, and natural features traditionally collected or otherwise utilized by Native Americans or other ethnic groups.

Treaty: A bilateral agreement between the United States and an Indian Nation that essentially guarantees that tribes will possess in perpetuity sufficient land and resources to continue to be self-sustaining, with the intention that the tribes maintain sovereignty within their homelands and not be subject to incursions by the laws of the states. These agreements also recognize a duty by the federal government to protect land, rights, and resources, notwithstanding that there is a broad federal power over Indian affairs. (Congress brought the treaty-making period to a close by enactment of the 1871 Appropriations Act.) (See Black, 1968).

Undertaking: "Any project, activity, or program that can result in changes in the character or use of historic properties . . ." and is carried out ". . . under the direct or indirect jurisdiction of a Federal agency or [is] licensed or assisted by a Federal agency" (36 CFR Part 800: Protection of Historic and Cultural Properties, Section .2[o]).

Walk-Over Survey: A type of archeological survey in which cultural resources are located simply by walking over the existing ground surface. In areas characterized by thick vegetation or extensive depositional forces, this method is effective in location-only standing structures.

APPENDIX B

LEGISLATION GOVERNING THE MANAGEMENT OF CULTURAL RESOURCES

LEGISLATION GOVERNING THE MANAGEMENT OF CULTURAL RESOURCES B-3

LEGISLATION GOVERNING THE MANAGEMENT

OF CULTURAL RESOURCES

Antiquities Act of 1906 (PL 59-209)

Historic Sites Act of 1935 (PL 74-292)

The Reservoir Salvage Act of 1960 (PL 86-523)

National Historic Preservation Act of 1966, as amended (PL 89-655 through PL 102-575)

National Register of Historic Places (36 CFR. 60)

Determination of Eligibility for Inclusion in the National Register of Historic Places (36 CFR 63) (36 CFR 63 is slated for future incorporation with 36 CFR 60)

National Historic Landmark Program (36 CFR 65)

Waiver of Federal Responsibilities under NHPA (36 CFR 78)

Curation of Federally-Owned and Administered Archeological Collections (36 CFR 79)

Protection of Historic and Cultural Properties (36 CFR 800)

National Environmental Policy Act (PL 91-190)

Council on Environmental Quality Implementing Regulations (40 CFR 1500)

Executive Order 11593: Protection and Enhancement of the Cultural Environment (1971)

Archeological and Historic Preservation Act of 1974 (PL 93-291)

American Folklife Preservation Act of 1976 (PL 94-201)

American Indian Religious Freedom Act of 1978 (PL 95-341)

Archacological Resources Pretection Act of 1979, as amended (PL 96-95)

Abandoned Shipwreck Act of 1987 (PL 100-298)

Native American Graves Protection Repatriation Act of 1990 (PL 101-601)

APPENDIX C

U.S. DEPARTMENT OF ENERGY CRM DOCUMENTS AND OTHER RELATED DOCUMENTS

CULTURAL RESOURCE MANAGEMENT DOCUMENTS C-3

DEPARTMENT OF ENERGY

CULTURAL RESOURCES MANAGEMENT INFORMATION BRIEFS.....C-3

U.S. DEPARTMENT OF INTERIOR

HISTORIC BUILDINGS PRESERVATION BRIEFS #1-14..... C-4

U.S. DEPARTMENT OF INTERIOR

HISTORIC PRESERVATION GUIDELINES.....C-6

U.S. DEPARTMENT OF INTERIOR NATIONAL REGISTER BULLETINS.....C-6

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33. *Guidelines for Identifying, Evaluating, and Registering Historic Mining Properties..*

APPENDIX D

CHECKLISTS AND FORMS

APPENDIX D-1
EXAMPLE OF A TYPICAL NEPA PROJECT REVIEW CHECKLIST D-3
REPOSITORY REVIEW CHECKLIST D-7
CULTURAL RESOURCE PROJECT FORM D-13
TENNESSEE HISTORICAL AND ARCHITECTURAL RESOURCE FORM D-11
TENNESSEE ARCHAEOLOGICAL SITE SURVEY FORM D-15

EXAMPLE OF A TYPICAL NEPA PROJECT REVIEW CHECKLIST

ORNL NEPA PROJECT REVIEW CHECKLIST

(Revised 7/06/98)

TOP SECTION FOR NEPA STAFF USE ONLY		
Date Received:	**Project Number:**	**CX Cited:**
CRADA Number:		
Project Title:		
Date:	Estimated Start Work Date:	
Project Engineer/Manager (Print Name and Sign):	Bldg/MS/Phone/Fax No.:	
Project Location (Plant, Site, Area, Bldg No.). Attach maps if appropriate.		
Facility Manager(s):	Division Representative:	
Division/Office:	Division/Office Director:	
Project Funding Category: LI__ GPP__ EXP__ GPE__ Other__	Check Funding Source: DP__ EM__ ER__ NE__ TD__ WM__ Other__	
Charge No:	FY 19___	

1. ENVIRONMENTAL SUMMARY: Please answer Y (yes), N (no), or U (unknown) if your project generates, uses, or causes disturbance to the following:

1. Air emissions		14. Threatened and/or endangered species	
2. Liquid effluents		15. Clearing or excavation	
3. Floodplain disturbance		16. Activity outside area fence	
4. Wetland disturbance		17. Archeological/cultural resources	
5. Solid waste		18. Elevated noise levels	
6. Radioactive waste		19. Rad./haz. substance chemical exposures	
7. Radioactive soil		20. Pesticide/herbicide use	
8. Hazardous or PCB waste		21. Explosive	
9. Mixed waste (rad & haz)		22. Transportation issues	
10. Petroleum storage/use		23. Surface water	
11. Chemical storage/use		24. Groundwater	
12.Volatile/toxic/water reactive		25. Undeveloped area	
13.Asbestos waste		26. Other	

2. PURPOSE AND NEED FOR PROPOSED ACTION: Provide background information that leads to the purpose and need for your project. State the purpose and need.

3. DESCRIPTION OF PROPOSED ACTION: Describe your project in detail, providing as much specific information as possible. Is this a CERCLA action? If so, provide cost and time data. Include attachments where appropriate.

4. DESCRIPTION OF MATERIALS/WASTES: Describe the kinds and approximate amounts of wastes that would be generated and how they would be disposed of.

ENVIRONMENTAL, SAFETY, AND HEALTH

INSTRUCTION: The following is intended to provide information on the use of equipment, materials, etc., and activities that would be involved in the proposed project. Please answer each subject heading Y (yes) or N (no). If the subject is "Y," check all applicable areas under the subject heading.

INDUSTRIAL SAFETY? Y___ N___	**RESPIRATORY PROTECTION?** Y___ N___	**INDUSTRIAL HYGIENE PROTECTION?** Y___ N___
__ Excavation/Trenching/Clearing	__Abrasive Blasting	__High Noise Level
__ Utilities Lockout/Tagout	__Acid or Alkali Cleaning of Metals	__Extreme Temperature
__Crane Operations	__Degreasing	__Nonionizing Radiation
__Welding/Cutting	__Decontamination	__Ergonomic Situations
__Confined Space Entry	__Use of Coolant/Cutting Fluids	__Respirator/Other Air Purifying Device
__Blocking of Plant Roads	__Welding, Cutting, or Brazing	__Anticontamination Protective Clothes
__Use of Scaffolds	__Grinding, Polishing, Buffing	__Confined Space
__Use of Corrosives	__Metal Thermal Spraying	__Biohazards
__Use of Incompatible Chemicals	__Painting	__Sanitation
__Use of Compressed Gas Cylinders	__Electroplating	__Other
__High Operating Pressures	__Metal Alloy Heat Treatment	
__X rays	__Boiler Deslagging	
__Other Hazards	__Furnaces	
	__Hoods	
	__Respirator/Other Air Purifying Device	
EQUIPMENT? Yes___ No___	**RADIOLOGICAL AREAS?** Yes__ No___	**RADIATION SOURCES?** Yes__ No__
__Transformers	__Low-Level Radiation Sources Area	__X-ray Machine/Generator
__Capacitors	__Airborne Radioactivity Area	__Sealed Radioactive Material
__Hydraulic Presses	__Radiation Area	__Accelerator
__Other Hydraulic Equipment	__Contamination Area	__Unsealed Radioactive Material
__Large Light Ballasts	__Respirator Area	__Other
__Vacuum Pumps	__Other	
__Other		

RADIATION PROTECTION CONTROL? Yes ___ No___	**BELOWGROUND STORAGE?** Yes___ No____	**EMERGENCY RESPONSE?** Yes ___ No ___

__Radiation Work Permit	__Radioactive	__MSDS Sheets
__Radiation Worker Training	__Hazardous or Toxic	__Spill Control/Containment Materials
__Respirator/Other Air Purifying Device	__Mixed	__Phone Numbers
__Anticontamination Protective Clothes	__Other	__Portable Fire Extinguishers
__Supplementary Dosimetry		__Warning Placards
ABOVEGROUND STORAGE? Yes ___ No ____	**PERMITTING?** Yes ___ No ___	**OTHER ES&H ISSUES**
__Radioactive	__Excavation/Penetration	
__Hazardous or Toxic	__Burning Permit	
__Mixed	__Safety Work Permit	
__Flammable Materials	__Aquatic Resources Alterations Permit	
__Reactive Materials	__Air Permit	
__Corrosive Materials	__Fugitive Emissions Permit	
__Explosive Materials	__NPDES	
__Shelf Chemicals	__RCRA/CERCLA	
__Old Chemicals	__COE	
__Oil	__NESHAPs	
__Pesticides/Herbicides	__Other	
__Petroleum		

5. POLLUTION PREVENTION/WASTE MINIMIZATION: This section involves incorporation of pollution prevention/waste minimization principles into the action to reduce or eliminate liquid, solid, or gaseous waste/materials. Please answer Y (yes), N (no), or N/A (not applicable).

Substitution of less hazardous input materials		Buying materials with recycled contents (e.g., building and office supplies)	
Improving operating practices (e.g., inventory control, volume reduction, best management practices)		Purchasing energy- and water-efficient equipment	
Selection of environmentally friendly (less toxic) or longer-life products		Segregating waste/material types (e.g., hazardous, rad, sanitary)	
Implementing process/technology changes (e.g., equipment modifications)		Recycling materials off-site (e.g., scrap metal, fluorescent light bulbs)	
Implementing in-process recycling (e.g., solvent recovery)		Reusing surplus materials on-site (e.g., chemical exchange)	

REPOSITORY REVIEW CHECKLIST

1. ADMINISTRATIVE INFORMATION:

Inspected by (Print Name and Sign):	Bldg/MS/Phone No:	Date of Inspection:
Repository Name and Location:	Repository Official:	

2. RECORDS: Are the following records being maintained by the repository?

Records on aquisition: **Yes No** (Circle) Comments _____

Catalog and artifact inventory lists: **Yes No** (Circle) Comments _____

Descriptive Information:

Copies of field notes: **Yes No** (Circle) Comments _____

Copies of site forms: **Yes No** (Circle) Comments _____

Copies of reports associated with collections: **Yes No** (Circle) Comments _____

Photographs, negatives, or slides: **Yes No** (Circle) Comments _____

Locational information, including maps: **Yes No** (Circle) Comments _____

Condition of collections (e.g., information on artifact treatment and conservation): **Yes No** (Circle) Comments _____

Use of collections: **Yes No** (Circle) Comments _____

Self inventory and inspection: **Yes No** (Circle) Comments _____

Environmental monitoring: **Yes No** (Circle) Comments _____

Are records stored in an appropriate insulated, fire-resistant, secured cabinets, safe, vault, or area in a location with a fire suppression system? **Yes No** (Circle) Comments _____

3. SPACE UTILIZATION: Does the repository have adequate space for the storage, study, and conservation of the collections?

Storage: **Yes No** (Circle) Comments _____

Study: **Yes No** (Circle) Comments _____

Conservation: **Yes** **No** (Circle) Comments _____

_____

4. PHYSICAL CONDITION OF REPOSITORY: Do the repository facilities provide adequate physical s[illegible] for the collections?

Do the repository facilities meet local electrical, fire, building, and health and safety codes? **Yes** **No** (Circle) Comments _____

_____

Are the collections stored in secured facilities or areas that provide for access control? **Yes** **No** (Circle) Comments

_____

_____

Does the repository have an emergency management plan?**Yes** **No** (Circle) Comments _____

_____

Are fragile or valuable items provided adequate additional security or protection? **Yes** **No** (Circle) Comments __

_____

5. PHYSICAL CONDITION OF COLLECTIONS: Are the collections stored in appropriate containers and are the contents of the collections complete?

Condition of storage containers: **Good** **Fair** **Deteriorated** **Inappropriate** (Circle) Comments _____

_____

Are the storage containers properly labeled? **Yes** **No** (Circle) Comments _____

_____

Do the contents of the storage containers match the catalog and artifact inventory lists? **Yes** **No** (Circle) Com[illegible]

_____

Are the collections complete? **Yes** **No** (Circle) Comments _____

_____

6. CONTRACTS, MEMORANDA, AND AGREEMENTS FOR CURATORIAL SERVICES: Are the terms and conditions of any agreements for curatorial services being met? **Yes** **No** (Circle) Comments _____

_____

_____

CULTURAL RESOURCE PROJECT FORM

1. ADMINISTRATIVE INFORMATION

NHPA STAFF USE ONLY

DATE RECEIVED:	**PROJECT NUMBER:**	**NHPA STATUS:**

COMMENTS:

Project Title:			Estimated Start Work Date:
ADS No:	MJR No:	ESO No:	NHPA Needed By (Date):
Project Engineer/Manager (Print Name and Sign):		Bldg/MS/Phone No:	Date:
Project Location (Plant, Site, Area, Bldg No):		Customer Contact (Name):	Bldg/MS/Phone No:
Project Funding Category: ☐ LI ☐ CE ☐ GPP ☐ EX ☐ GPE		Division/Office:	Charge No:
Project Status: ☐ Ongoing ☐ Proposed ☐ Revised		Regulatory/Start Date: Regulatory Action(s) (circle if applicable): TSCA RCRA CERCLA CWA CAA SDWA NESHAP	

2. PROJECT TYPE: The cultural resource project would involve the preparation of:

	Yes	No
1. Archeological and Historical Review	____	____
2. Architectural/Historical Assessment	____	____
3. Archeological Survey	____	____
4. Memorandum of Agreement	____	____
5. Section 110 Documentation	____	____

3. PURPOSE AND NEED FOR PROJECT: State intention, purpose, and need for the project, and any pertinent background information. Include attachments wher appropriate.

TENNESSEE HISTORICAL AND ARCHITECTURAL RESOURCE FORM

TENNESSEE HISTORIC PRESERVATION

HISTORIC DATA

1. COUNTY (1)

2. SURVEY NUMBER (3)

3. Historic Name (8)

4. Common Name (38)

5. Owner (69)

6. Address (99)

7. Quad Map (134)

8. Other Maps

9. UTM

Zone Easting Northing

10. Longitude (160) Latitude

11. Date of Construction (172)

12. Builder (177)

13. NR Eligible YorN

Comments

14. Comprehensive Planning Themes: Theme 1 (458) Theme 2 (459) Theme 3 (460) Theme 4 (461)

Early Exploration 01	*Early Settlement* 02	*Agriculture* 03	*Commerce and Industry* 04	
Transportation 05	*Religion/Philosophy Movements & Leaders* 06	*Political/Government* 07	*Military Affairs* 08	
Education 09	*Science & Technology* 10	*Art & Architecture* 11	*Society & Customs* 12	*Other* 99

15. Ethnic Affiliation (462)

Anglo-American 1	*Afro-American* 2	*Hispanic* 3	*Asian-American* 4	*Native American* 5
Other 9				

CN-0601

15. Informant [463]

17. Use Original [493] Other _____

18. Use Present [497] Other _____

Single Family Dwelling	Commercial	General Retail Store	Bank	Office	Church
0101	0300	0301	0308	0309	0401

Govt. Building	School	Clubhouse	Railroad Depot	Industrial/Manufacture
0500	0601	0701	0804	1000

Gristmill	Sawmill	Structure abandoned
1001	1002	9800

19. Setting [501] Other _____

Rural Undisturbed	Rural Built-up	Urban	Small Town	Urban Encroachment
1	2	3	4	5

20. Location [502]

21. Date Moved [503]

Original	Moved
1	2

22. Property Endangered [508] Other _____

None/Property Stable	Neglect/Deterioration	Abusive Alterations	Agriculture
1	2	3	4

Private Development	Industry	Urban Encroachment	Govt. Activit
5	6	7	8

PHOTOGRAPHIC INFORMATION

23. Black & White Roll# [509] Frame# [513] - [ ]

Roll# [517] Frame# [521] - [ ]

24. Color Roll# [525] Frame# [529] - [ ]

Roll# [533] Frame# [537] - [ ]

25. Date Taken [541]

26. Location of Negative [549]

27. Recorded By [564]

28. Date Recorded [579]

29. Affiliation [587]

ARCHITECTURAL INFORMATION

30. Style Influence Primary [607] Secondary [609] Other _____

Plain/Traditional	Federal	Greek Revival	Italianate	Queen Anne/Eastlake
01	03	04	05	09

Classical Revival	Bungalow	19th Century Commercial	20th Century Commercial	Other
10	16	21	22	99

31. **Construction** [ ] 611 — *Frame* 1 · *Log* 2 · *Brick* 3 · *Stone* 4 · *Other* 5 _____

32. **Height (Stories)** [ ][ ] 612

33. **Roof Configuration** [ ][ ] 614 **Other** _____ 99 · *Gable* 01 · *Gable with Parapet* 02 · *Clipped Gable* 03 · *Salt Box* 04 · *Hip* 05 · *Pyramid* 06 · *Gambrel* 07 · *Mansard* 08 · *Bellcast* 09 · *Flat* 10

34. **Roof Material** [ ] 616 — *Asphalt Shingles* 1 · *Metal* 2 · *Wooden Shakes* 3 · *Slate* 4 · *Tile* 5 · *Other* 9

35. **Roof Original?** [ ] 617 — **Y** yes **N** no

36. **Window Configuration** [ ] 618 **Other** _____ — *Double-hung* 1 · *Triple hung* 2 · *Stationary* 3 · *Casement* 4 · *Other* 9

37. **Lights/Panes** [ ][ ] 619 · [ ][ ]

38. **Principal Porch Configuration** [ ] 623 **Other** _____ — *Full* 1 · *3/4* 2 · *1 Bay Central* 3 · *1 Bay Other* 4 · *Wrap-around* 5 · *Other* 9

39. **Principal Porch Height (Stories)** [ ] 624

40. **Principal Porch Integrity** [ ] 625 **Other** _____ — *Original* 1 · *Altered* 2 · *Removed/No Replacement* 3 · *Reconstruction* 4 · *New Construction* 5 · *Other* 9

41. **Wall Covering** [ ][ ] 626 — *Log* 01 · *Weatherboard* 02 · *Board&Batten* 03 · *Brick* 04 · *Brick Veneer* 05 · *Stone* 06 · *Stone Veneer* 07 · *Synthetic Siding* 08 · *Stucco* 09 · *Other* 99

42. **Chimney Placement** **A** [ ] 628 **B** [ ] **C** [ ] **D** [ ] **Other** _____ — *Exterior End* 1 · *Interior End* 2 · *Exterior other than End* 3 · *Interior Central* 4 · *Other Interior* 5

43. **Chimney Construction Material** **A** [ ] 632 **B** [ ] **C** [ ] **D** [ ] **Other** _____ — *Brick* 1 · *Stone* 2 · *Brick & Stone* 3 · *Wood (Mud Cat)* 4 · *Other* 9

44. **Foundation Material** [ ] 636 **Other** _____ — *Wood* 1 · *Stone* 2 · *Brick* 3 · *Cast Concrete* 4 · *Concrete Blocks* 5 · *Other* 9

45. **Foundation Configuration** [ ] (637) Other _____ *Continuous* 1 *Piers* 2 *Other* 9

46. **Plan** [ ][ ] (638) **Other** _____ *One Room* 01 *Double-pen* 02 *Dog-trot* 03 *Central Hall* 04

Hall&Parlor 05 *Rectangular* 06 *Square* 07 *Irregular* 08 *Standard Commercial* 09 *T-Shaped* 10 *Other* 99

47. **Wings and Additions** Primary [ ] (640) Secondary [ ] (641) Other _____ *Rear Shed* 1

Rear L 2 *Rear T* 3 *Side* 4 *Prow* 5 *Other Front* 6 *Additional Stories* 7 *Other* 9

48. **Comments:** _____

PART A

TENNESSEE SITE SURVEY FORM
TENNESSEE DIVISION OF ARCHAEOLOGY

DIVISION USE ONLY

STATE SITE NUMBER: 40__|___|
RESURVEY:_____

NATIONAL REGISTER STATUS: [____] DATE NUMBER ASSIGNED: [/ /]

GENERAL SITE INFORMATION

1. NAME/FIELD SITE NUMBER: _____

2. SITE TYPE(S): ____/____/____/____/____/____/____/____/____/____

3. CULTURAL AFFILIATION(S): __/__/__/__/__/__/__/__/__/__/__/__/_

4. HISTORIC DATE RANGE(S): ___/____/____/____/____/____/____/_ ___

5. RADIOCARBON DATES (Y/N): ____ (If (Y) complete PART F)

6. HUMAN REMAINS CODE: _____ 7. OWNERSHIP TYPE CODE: _____

LOCATIONAL AND BOUNDARY INFORMATION

8. COUNTY: _____ 9. PHYSIOGRAPHIC DIVISION: _____

10. QUAD NUMBER: _____ QUAD DATE: ____

11. NORTH LATITUDE: __ __ __ WEST LONGITUDE: __ __ __

12. UTM: Zone: ___ Easting: _____ Northing: _____

13. ELEVATION: _____ (AMSL) 14. DRAINAGE CODE: _____

15. SIZE OF SITE: Long axis _____ Short axis: _____ Area: _____

16. BASIS FOR SIZE ESTIMATE: _____ 17. BOUNDARY ACCURATE (Y/N): ___

18. TAX MAP/PARCEL NUMBER (if available): _____

SURVEY AND REPORTING INFORMATION

19. LAND USE/GROUND COVER: _____ 20. PERCENT SITE DISTURBANCE: _____

21. REPORTED BY: Name _____ Telephone (___) ___-____
Address _____
_____

22. REPORTER TYPE: ____

23. AFFILIATION: _____

24. INVESTIGATION STATUS CODE: _____ 25. DATE OF SURVEY:__/__/____

26. PHOTOGRAPHS: _____ 27. COLLECTIONS: _____ 28. COMPLIANCE: ____

TDOA SITE SURVEY FORM--PART B

PREHISTORIC SITE/COMPONENT

SITE NO.: 40_____
REPORT DATE:___/___/___

1. SITE DESCRIPTION/COMMENTS:

2. OWNERSHIP:
   Name:
   Address:

   Phone:
   Tenant:

3. BIBLIOGRAPHIC REFERENCES:

4. LOCATION OF ADDITIONAL INFORMATION:

REPORTER:

TDOA SITE SURVEY FORM--PART C

HISTORIC SITE/COMPONENT SITE NO.: 40_____

REPORT DATE:___/___/___

1. SITE DESCRIPTION/COMMENTS:

2. OWNERSHIP:
   Name:
   Address:

   Phone:
   Tenant:

3. SITE HISTORY:

4. PERSONS ASSOCIATED:

5. ASSOCIATED BUILDINGS (EXTANT OR PREVIOUSLY EXISTING):

6. BIBLIOGRAPHIC REFERENCES:

7. LOCATION OF ADDITIONAL INFORMATION:

REPORTER:

ARTIFACT INVENTORY

SITE NO.: 40_____
SHEET_____of_____
Date:____/____/_____

REPORTER:_____

COLLECTIONS

SITE NO.: 40_____
REPORT DATE:____/____/_____

ARTIFACT COLLECTIONS

REPOSITORY:_____

ACCESSION NUMBERS:_____

COLLECTION SIZE:_____

COMMENTS:

PHOTOGRAPHS

REPOSITORY:_____

ACCESSION NUMBERS:_____

MEDIA TYPE(S):_____

QUANTITY:_____

COMMENTS:

REPORTER:_____

RADIOCARBON DATE REPORTING SHEET

SITE NO.: 40_____
REPORT DATE:_____/____/____

LABORATORY REFERENCE NUMBER:_____

RADIOCARBON AGE:_____

SAMPLE TYPE:_____

SAMPLE PROVENIENCE/ASSOCIATIONS:_____

_____

_____

PUBLISHED REFERENCE:_____

==========

LABORATORY REFERENCE NUMBER:_____

RADIOCARBON AGE:_____

SAMPLE TYPE:_____

SAMPLE PROVENIENCE/ASSOCIATIONS:_____

_____

_____

PUBLISHED REFERENCE:_____

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LABORATORY REFERENCE NUMBER:_____

RADIOCARBON AGE:_____

SAMPLE TYPE:_____

SAMPLE PROVENIENCE/ASSOCIATIONS:_____

_____

_____

PUBLISHED REFERENCE:_____

REPORTER:_____

GUIDE TO COMPLETING THE

TENNESSEE ARCHAEOLOGICAL SITE FORM

MARCH 1992

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF ARCHAEOLOGY
5103 Edmondson Pike
Nashville, Tn. 37211
(615) 741-1588

TABLE OF CONTENTS

INTRODUCTION 1

USE OF THE SITE FILE 1

TDOA CONTACTS 1

THE SITE FORM 1

THE RULES 2

IS IT A SITE
- Prehistoric sites 2
- Historic sites 3

FILLING OUT THE FORM
- Table 1-- List of Fields 4
  - Part A, Fields 1-2 4
    - Fields 3-6 5
    - Fields 7-15 6
    - Fields 16-21 7
    - Fields 22-28 8
  - Part B 8
  - Parts C, D, E, F 9

APPENDIX I--Site Type List

APPENDIX II--Generalized Physiographic Map

APPENDIX III--Cross Index to Topo Maps

APPENDIX IV--UTM Instructions

APPENDIX V--Tributary River Basins

APPENDIX VI--SHPO Standards and Guidelines for Archaeological Resource Management Studies

APPENDIX VII--Special Requirements for Human Remains

SITE FORM PACKET

INTRODUCTION

The Tennessee Division of Archaeology (TDOA) administers the Statewide Archaeological Site Survey File (Site File). TDOA is the only source for receiving a Smithsonian Trinomial System (SITS) site number in Tennessee. Professional archaeologists, students and private individuals report sites to the TDOA by submitting a site form to the Site File Curator (SFC). The SFC evaluates the site form, assigns a SITS number and enters the site into the Site File.

The Site File is a compilation of information on the known archaeological resources of Tennessee. It is maintained primarily as a cultural resource management tool for purposes designated under the National Historic Preservation Act (NHPA) and state laws. All archaeological resource management studies conducted in conjunction with NHPA compliance are required to use the SITS site numbers in reports submitted to the TDOA Federal Programs Archaeologist.

USE OF THE SITE FILE

The Site File, as a management tool, is accessible for use in archaeological resource management studies and other legitimate research projects. Access to the Site File information must be coordinated with the Site File Curator. Due to space limitations, persons wishing to use the file must make prior arrangements with the curator. Site forms cannot be copied except under conditions.

TDOA CONTACTS

Suzanne Hoyal, Site File Curator
Kevin Smith, Federal Programs Archaeologist
Nick Fielder, State Archaeologist

Tennessee Division of Archaeology
5103 Edmondson Pike
Nashville, Tennessee 37211
Phone (615) 741-1588
Hours 8-4:30 M-F (CST)

THE SITE FORM

The TDOA site form was revised in March 1992 to facilitate computerization of site data. The site form is included in a packet at the end of this document for duplication purposes by persons submitting requests to the TDOA for site numbers. Part A of the site form includes minimal primary management data necessary for preliminary evaluation, i.e. location and basic cultural information.

Requests for site numbers by professional archaeologists conducting archaeological resource management studies for NHPA compliance need only be accompanied by Part A of the site form, a map location, and a cover letter stating the federal agency involved

and project name. Approval of final reports by the Federal Programs Archaeologist is contingent upon completion of all applicable Parts B thru F. If, in consultation with the Federal Programs Archaeologist, it is determined that a reconnaissance level report will be the final report, all applicable Parts B thru F should be submitted at that time. For more information on reporting standards and guidelines for archaeological resource management studies refer to Appendix VI.

Voluntary submittals must include Part A and all other applicable Parts. This document should be used as a guide by all persons submitting requests for site numbers.

THE RULES

1. **Site Form Part A**--legibly handwritten in black ink or typed by those submitting volunteered reports. Professionals/students submitting requests for site numbers on behalf of a consulting firm or government agency may submit site forms on 5 1/4 or 3 1/2 inch MS-DOS compatible diskette, but this is not a requirement. A dBase III+ database file will also be available for direct submittals. The savings in time and paper can be considerable. Contact Kevin Smith for further details concerning computerized submittals.

2. **Site Form Parts B thru F**--typewritten or computer-generated. These will be permanent hard copy files and professional\student archaeologists are expected to submit them as such. Exceptions can be made for amateurs or private individuals submitting volunteered reports.

3. **Maps**--USGS topographic 7.5 minute quadrangle map (copy acceptable) with site location drawn to scale is required with all Part A submittals. Name and number of quad map should be shown <u>on</u> the copy.

4. **NHPA/Section 106 Compliance related submittals**--Originally submitted Part A must be supplemented with updated applicable Parts B thru F and included with final draft compliance reports submitted to the SHPO/TDOA Federal Programs Archaeologist.

IS IT A SITE?

The term <u>site</u> refers to a place where human activity has taken place and that has yielded or may be likely to yield information important in prehistory or history. In the field several overlapping criteria should be considered before recording a locality as a site. The following information should be used by the archaeologist in judging the quantity and quality of information available. Due to the differing nature of prehistoric and historic sites, they will be addressed with a separate set of criteria.

Prehistoric Sites

(A) <u>Number of artifacts</u>--Some arbitrary number of artifacts must be used as partial criteria for calling a locality a site. Although a single flake or isolated diagnostic indicates a possible location where human activity <u>may</u> have taken

place, the multitude of other possible depositional factors must also be considered. In general, a locality should not be considered a site unless at least 10 or more flakes were located within a relatively small bounded area. However, this distinction could be mitigated by the presence of factors (B) or (C).

The number of diagnostic artifacts should not be used as the primary criterion from a casual surface collection. Intensive collection of sites by amateurs has tremendously reduced the number of diagnostic projectile points available in surface collections. Therefore, a fairly extensive site can exist "beneath the soil" without any diagnostics being represented in collections. In most cases only diagnostics could be collected and other artifacts could be observed and recorded.

At a Phase I level of investigation (reconnaissance level survey) the professional archaeologist should use both educated judgement and common sense about the need to record a locality as a site. Later, during an evaluation of significance, a complete accounting of exactly why the site was recorded is required.

(B) Evidence of occupation--midden, petroglyphs, earthworks. With only a minimal number of artifacts, evidence for midden could justify the assignment of a site number, particularly if the level of investigation is minimal, e.g. reconnaissance with poor visibility, limited shovel testing, possibility for alluvial or colluvial deposits.

(C) Amount of site disturbance--Sites that have been dozed or otherwise heavily impacted by modern activities or erosion may have few artifacts, and little evidence for midden. If these types of activities could be demonstrated for a particular area, a sparcity of evidence of cultural activity could still justify a site number.

(D) Degree of investigation--A limited reconnaissance level survey with poor visibility might only yield a single flake or ceramic sherd as evidence of human activity, while the same area plowed might yield large amounts of surface evidence. This type of site can be assigned a site number initially, then the site number can be vacated if further testing does not identify the area as a site.

Historic Sites

(A) Surface Artifacts--The number of artifacts is not as significant as the need to establish that the site is indeed 50 years old or older, which is the cutoff date used for eligibility for listing on the National Register of Historic Places. Establishing the 50 year criteria is often not possible with historic site artifacts, necessitating use of (B).

(B) Records search--in the absence of diagnostic historic artifacts, a review of the appropriate records could help establish a date range for an historic site.

(C) Site Disturbance --as with prehistoric sites, the amount of site disturbance and degree of investigation should be taken into account when determining whether or not to record a locality as a site.

FILLING OUT THE FORM

Procedures for completing the 28 items of Part A (see Table I) and the other Parts B thru F are detailed below.

TABLE I

LIST OF FIELDS FOR SITE FORM-- PART A (March 1992 revision)

1. Name/Field Site Number
2. Site Type
3. Cultural Affiliation
4. Historic Date Range
5. Radiocarbon Dates
6. Human Remains Code
7. Ownership Type Code
8. County
9. Physiographic Division
10. Quad Number/Date
11. Latitude/Longitude
12. UTM
13. Elevation
14. Drainage Code
15. Size of Site
16. Basis For Size Est.
17. Boundary Accurate
18. Tax Map/Parcel #
19. Land Use/Ground Cover
20. % Site Disturbance
21. Reporter Name
22. Reporter Type
23. Affiliation
24. Investigation Code
25. Date of Survey
26. Photographs
27. Collections
28. Compliance

PART A

1. Name/Field Site Number--Enter site name or field number, if any.

2. Site Type(s)--Consult Prehistoric and Historic Type List (Appendix I) and enter 4-digit code for all types that apply.

3. Cultural Affiliations--Consult listing below and enter 4-digit code for all types that apply.

0001	Undetermined Prehistoric
0002	Paleoindian
0003	Transitional Paleo
0004	Archaic
0005	Early Archaic
0006	Middle Archaic
0007	Late Archaic
0008	Gulf Formational
0009	Early Gulf Formational
0010	Middle Gulf Formational
0011	Late Gulf Formational
0012	Woodland
0013	Early Woodland
0014	Middle Woodland
0015	Late Woodland
0016	Mississippian
0017	Early Mississippian
0018	Middle Mississippian
0019	Late Mississippian
0020	Protohistoric
0021	Contact Period Indian
0022	Historic Indian
0023	Historic Non-Indian
0024	Pleistocene Faunal

4. Historic Date Range--Consult list below and enter 2-digit code for all that apply.

01	Undetermined	05	1861-1865
02	Pre-1770	06	1866-1900
03	1770-1819	07	1901-1932
04	1820-1860	08	1933-present

5. Radiocarbon Dates--If a Yes entry is given, fill out the Radiocarbon Date Reporting Sheet-Part F.

6. Human Remains Code--Consult list below, enter code. Refer to Appendix VII, Special Requirements for Human Remains.

00	Unknown	03	Cemetery
01	Scattered Surface Remains	04	Absent
02	Isolated Intact Burial	05	Unknown, but likely

7. Ownership Type Code--Consult list below, enter code.

   01 Unknown
   02 Private (individual,corporate)
   03 Local Government (town, city, county)
   04 State (State of Tennessee)
   05 Federal (TVA, Corps of Engineers, etc.)

8. County--Enter the name of the county(s) in which the site is located. If site boundaries overlap two or more counties, enter first the county where the major portion of the site is located.

9. Physiographic Division--Consult generalized physiographic map of Tennessee (Appendix II), enter 2-digit code.

10. Quad Number/Date--Enter the USGS Geologic Survey 7.5 minute Quadrangle map number and date. Consult the cross index to topographic maps of Tennessee (Appendix III), if your map has no number. A copy of the quad map location must be submitted with the site form, preferably copied on the back of Part B or C.

11. Latitude/Longitude--Geographic Coordinate System measurements for North Latitude/West Longitude is one option for giving the site location. For latitude/longitude, use the readings at the corners of the quad and a 35 or 36 degree overlay to calculate coordinates in degrees, minutes, and seconds at the center of the site. You may calculate the lat/long by measuring from the center of the site to map reference lines. Do not round off to the nearest 5 or 10 seconds.

12. UTM-Universal Transverse Mercator--If site location is given in UTM coordinates three entries are needed: Zone, Easting (6 digits), and Northing (7 digits). Except for parts of Shelby and Tipton counties all of Tennessee is in Zone 16. Calculate coordinates for the center of the site. Consult Appendix IV for further detailed instructions.

13. Elevation above mean sea level (AMSL)--Enter average elevation (in feet) for site location as shown on topographic map contours.

14. Drainage Code--Consult Tributary River Basins in Tennessee (Appendix V) and enter number/letter code for correct basin unit.

15. Size of Site--Enter statement of distance on long axis and short axis, preferably in meters. Linear measurements and area in square meters should correlate with size of site depicted on quad maps and any sketch maps provided.

16. Basis for Size Estimate--Consult list below, enter code.

01 Taped	04 Transit/alidade survey
02 Paced	05 Estimated from map
03 Guessed	

17. Boundary Accurate--If the boundaries are accurately known, enter Yes (Y). If the boundaries are not accurate, enter No (N). If the Boundary Accuracy entry is No, then limitations of determining boundaries, such as access difficulties or lack of subsurface testing should be noted when completing Part B or Part C under site description. Boundaries for reconnaissance level survey should be determined by extent of surface distribution of artifacts and features.

18. Tax Map/Parcel Number--Enter if known, not required.

19. Land Use/Ground Cover--Consult list below, enter code.

01 Grassland/Pasture
02 Cultivation
03 Secondary Growth
04 Unimproved Forest
05 Improved Forest/Orchard
06 Intermittent Flooding
07 Inundated Regularly/Riverbank
08 Urban
09 Roadway
10 Open and Eroded
99 Other (Write in description)

20. Percent Site Disturbance--Consult list below, enter code.

01 Apparently Undisturbed [Excellent]
02 Less Than 25% Disturbed [Very good]
03 26-50% Disturbed [Good]
04 51-75% Disturbed [Fair]
05 76-99% Disturbed [Poor]
06 Destroyed
07 Disturbed, Percent Unknown
08 Inundated

21. Reporter Name--Enter reporter's name, daytime phone # and address. This entry should be a person's name and full mailing address.

22. Reporter Type--Consult list below, enter code.

01 Private Consulting Firm
02 Non-educational Institution or Agency
03 Educational Institution (University/College)
04 Amateur Society Member
05 Landowner (Volunteered report)
06 Private Individual (Volunteered Report)
07 Student (Volunteered Report)
08 Professional (Volunteered Report)

23. Affiliation--Enter the name of your firm or organization, if any.

24. Investigation Status Code-Consult list below, enter code.

01 No Collection
02 Surface Collection (grab bag)
03 Surface Collection(intensive, may include shovel testing)
04 Surface Collection + Test Units (Phase I+)
05 Extensive Testing Program (Phase II)
06 Excavation Program
07 Total Excavation

25. Date of Survey--Enter date the site was visited, not the date the form was completed. Since we are going into the 21st century, use a four digit number to indicate year (e.g. 3/3/1992).

26. Photographs--If yes (Y), complete Part E.

27. Collections--If yes (Y), complete Part E.

28. Compliance--Enter yes, (Y), if the site number is being requested as part of an archaeological survey or resource management study carried out in compliance with the National Historic Preservation Act.

PART B

Prehistoric Site/Component -- Site description should include setting, relationship to water, non diagnostic artifacts (only if no diagnostics were collected), and a sketch map on the back to indicate artifact locations, concentrations or features. All other items should be filled out as completely as possible with the exception of ownership for multiple sites located in surveys of government lands--agency name is sufficient. Enter the date the report was filled out.

PART C

Historic Site/Component -- Complete all appropriate categories. Site description should include setting, water source, a discussion of artifacts observed or collected and sketch map. Describe results of records search indicative of historic date range.

Additional sheets for thematic surveys of Civil War, historic iron industry or other manufacturing sites, or potteries can be obtained from the TDOA.

PART D

Artifact Inventory -- A complete list of diagnostic artifacts must be submitted with final report for National Historic Preservation Act compliance projects and upon initial request for all other submittals. Copy Part E onto the back of Part D if practical.

PART E

Collections -- Repository location of photographs and artifact collections, if any, must be completed when submitting final report for compliance projects, or upon initial request for all other submittals. Copy Part E onto the back of Part D if practical.

PART F

Radiocarbon Date Reporting Sheet -- Part F should be submitted with final report or whenever dates are received.

TENNESSEE - 40

COUNTY SYMBOLS FOR SITE DESIGNATION

ANDERSON - AN
BEDFORD - BD
BENTON - BN
BLEDSOE - BE
BLOUNT - BT
BRADLEY - BY
CAMPBELL - CP
CANNON - CN
CARROLL - CL
CARTER - CR
CHEATHAM - CH
CHESTER - CS
CLAIBORNE - CE
CLAY - CY
COCKE - CK
COFFEE - CF
CROCKETT - CT
CUMBERLAND - CU
DAVIDSON - DV
DECATUR - DR
DEKALB - DK
DICKSON - DS
DYER - DY
FAYETTE - FY
FENTRESS - FN
FRANKLIN - FR
GIBSON - GB
GILES - GL
GRAINGER - GR
GREENE - GN
GRUNDY - GY
HAMBLEN - HB
HAMILTON - HA
HANCOCK - HK
HARDEMAN - HM
HARDIN - HR
HAWKINS - HW
HAYWOOD - HD
HENDERSON - HE
HENRY - HY
HICKMAN - HI
HOUSTON - HO
HUMPHREYS - HS
JACKSON - JK
JEFFERSON - JE
JOHNSON - JN
KNOX - KN
LAKE - LK
LAUDERDALE - LA
LAWRENCE - LR
LEWIS - LS
LINCOLN - LN
LOUDON - LD
MCMINN - MN
MCNAIRY - MY
MACON - MC
MADISON - MD
MARION - MI
MARSHALL - ML
MAURY - MU
MEIGS - MG
MONROE - MR
MONTGOMERY - MT
MOORE - ME
MORGAN - MO
OBION - OB
OVERTON - OV
PERRY - PY
PICKETT - PT
POLK - PK
PUTNAM - PM
RHEA - RH
ROANE - RE
ROBERTSON - RB
RUTHERFORD - RD
SCOTT - ST
SEQUATCHIE - SQ
SEVIER - SV
SHELBY - SY
SMITH - SM
STEWART - SW
SULLIVAN - SL
SUMNER - SU
TIPTON - TP
TROUSDALE - TR
UNICOI - UC
UNION - UN
VAN BUREN - VB
WARREN - WR
WASHINGTON - WG
WAYNE - WY
WEAKLEY - WK
WHITE - WH
WILLIAMSON - WM
WILSON - WI

APPENDIX I

SITE TYPE LIST

PREHISTORIC SITE TYPES

0001	OPEN HABITATION (CAMP, VILLAGE)
0006	CAVE
0007	ROCKSHELTER
0011	MOUND COMPLEX
0012	PLATFORM MOUND
0013	STONE MOUND
0014	EARTH MOUND
0015	MOUND-INDETERMINATE
0021	EARTHWORKS
0022	STONEWORKS
0031	ISOLATED BURIAL/S
0032	PREHISTORIC CEMETERY
0041	QUARRY/LITHIC EXTRACTION
0091	PETROGLYPH
0092	PICTOGRAPH
0098	ISOLATED FIND
0099	UNDETERMINED PREHISTORIC
0100	PLEISTOCENE FAUNAL

HISTORIC SITE TYPES

0101	INDUSTRIAL
0111	POTTERY (INDUSTRIAL)
0121	BRICKMAKING
	MILL
0131	GRIST MILL
0132	FEED MILL
0133	SAW MILL
0134	STAVE MILL
0135	PAPER MILL
0136	WOOLEN MILL
0137	COTTON MILL
0138	POWDER MILL
0149	BUTTON MILL
0150	MILL/TYPE UNKNOWN
	MINE
0151	IRON ORE
0152	COAL
0153	CLAY
0154	GOLD
0155	SALTPETER
0156	STONE QUARRY
0157	SULPHUR
0160	MINE/TYPE UNKNOWN
	IRON MANUFACTURING
0181	FURNACE
0182	FORGE
0183	FOUNDRY
0184	NAILERY
0185	ORE PROCESSING
0186	ROLLING MILL
0201	LUMBERING OPERATION
0231	LIME KILN
0241	INDUSTRIAL HAMLET/COMPANY TOWN
0251	DISTILLERY
0301	HOME INDUSTRY
0302	POTTERY(FAMILY OR ART)
0303	BRICK KILN
0304	BLACKSMITH SHOP
0305	WAGONMAKING SHOP
0306	FURNITUREMAKING SHOP
0307	COBBLING SHOP
0308	SADDLERY SHOP
0309	TANYARD
0310	COTTON GIN
0311	DISTILLERY/MOONSHINE STILL
0312	SORGHUM MILL
0313	GUNMAKER/GUNSMITH

0401	COMMERCIAL
0402	STORE
0403	TAVERN
0404	BOARDING HOUSE
0405	HOTEL/INN
0406	HEALTH SPA
0407	POTTERY (ART)
0408	BANK/WAREHOUSE
0409	OFFICE
0501	PUBLIC
0502	COURTHOUSE
0503	JAIL
0504	COUNTY/CITY OFFICE
0505	FAIRGROUND
0506	POST OFFICE
0507	PUMPHOUSE
0508	RESERVOIR
0509	CCC CAMP
0510	STATE CAPITOL
0601	EDUCATIONAL
0602	SCHOOL
0603	ACADEMY
0604	COLLEGE/UNIVERSITY
0701	RELIGIOUS
0702	CHURCH
0703	MISSION
0704	CAMP MEETING GROUND
0705	RELIGIOUS ACADEMY OR SCHOOL
0706	PARSONAGE
0801	MEDICAL
0802	HOSPITAL/CLINIC
0803	MENTAL HOSPITAL/HOME
0804	DOCTOR'S OFFICE
0805	PHARMACY/PHARMACIST'S OFFICE
0806	DENTIST'S OFFICE
0901	RURAL DOMESTIC
0902	HOUSE
0903	FARMSTEAD
0904	PLANTATION
0905	BARN
0906	SPRINGHOUSE
0907	WELL
0908	CISTERN
0909	UNDIFFERENTIATED STRUCTURE
1001	URBAN DOMESTIC
1002	HOUSE WITHIN EXISTING TOWN
1003	TOWN
1004	ABANDONED TOWN SITE
1101	CEMETERY
1102	PUBLIC
1103	PRIVATE
1104	ISOLATED GRAVE
1201	MILITARY
1202	FRONTIER STATION
1203	BLOCKHOUSE
1204	STOCKADE
1211	FORT
1221	EARTHWORK
1222	ENTRENCHMENT
1223	REDOUBT

1224	REDAN	
1225	LUNETTE	
1226	PRIEST CAP	
1231	RAILROAD GUARD POST	
1241	BATTLEFIELD - SMALL ENGAGEMENT	
1242	BATTLEFIELD - LARGE ENGAGEMENT	
1251	SHORT-TERM ENCAMPMENT (BIVOAC,CANTONMENT)	
1252	LONG-TERM ENCAMPMENT (BIVOAC, CANTONMENT)	
1261	INTERNMENT CENTER	
1271	MILITARY HOSPITAL - SHORT TERM	
1272	MILITARY HOSPITAL - LONG TERM	
1281	HEADQUARTERS	
1291	SIGNAL STATION	
1301	TRANSPORTATION	
	WATER-RELATED	
1312	BOAT LANDING	
1313	LOCK/DAM	
1314	FERRY	
1315	BOAT WRECK	
1316	SHIPYARD	
	RAIL-RELATED	
1331	RAILROAD DEPOT	
1332	RAILROAD SPURS	
1333	RAILROAD BRIDGE	
	ROAD-RELATED	
1352	ROAD(PIKE)	
1353	BRIDGE	
1354	TOLLGATE	
	AIR-RELATED	
	PEDESTRIAN	
1401	OTHER	
1402	DUMP	
1403	EXPLOSIVE MAGAZINE(NON-MILITARY)	
1404	FISH WEIR	
1405	CHECK DAM	
1406	RENDERING VAT	
1407	ROCK SHELTER(HISTORIC USAGE)	
1408	HISTORIC PETROGLYPH	
1409	HISTORIC PICTOGRAPH	
1410	HISTORIC SCATTER - NON-DIAGNOSTIC	
1411	FRATERNAL ORGANIZATION	03/01/1991

APPENDIX II

GENERALIZED PHYSIOGRAPHIC MAP

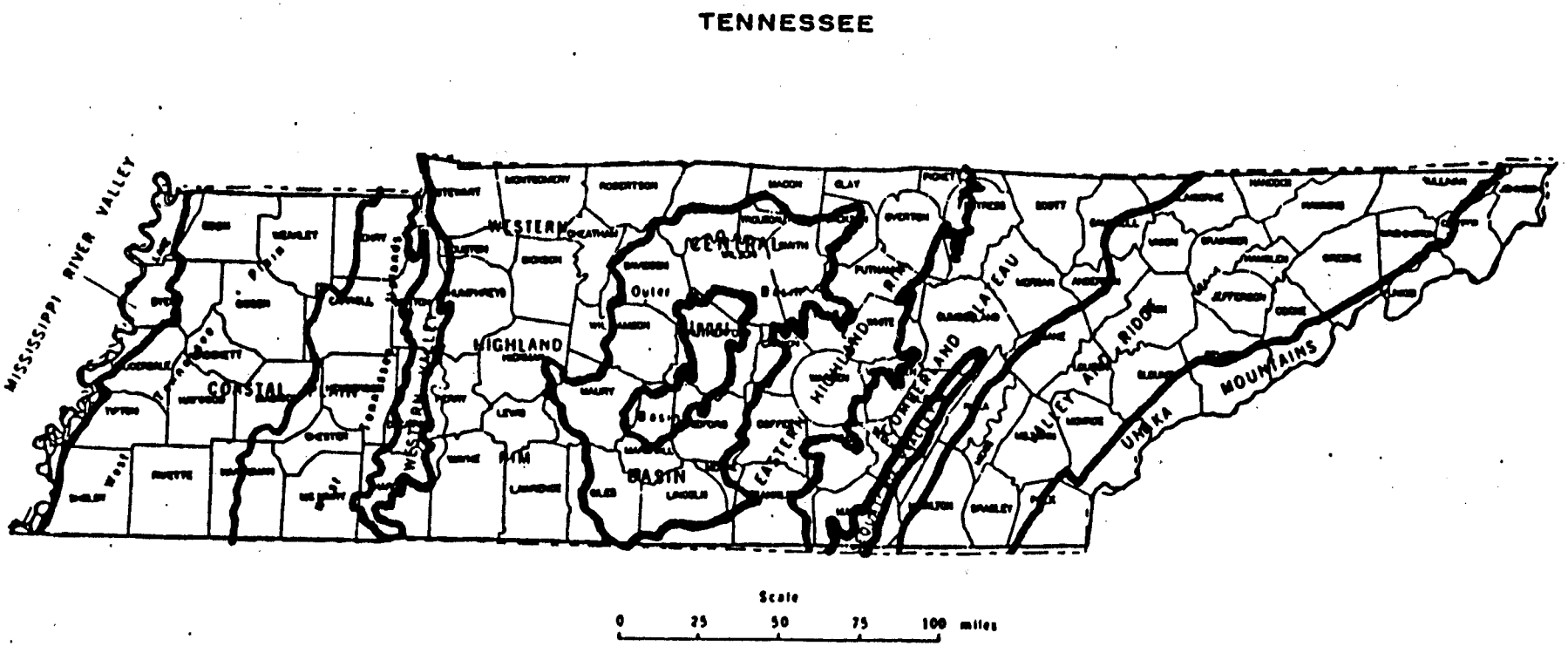

Figure 1. Generalized physiographic map of Tennessee.

01 Unaka Mountains
02 Valley and Ridge
03 Cumberland Plateau
04 Eastern Highland Rim
05 Central Basin
06 Western Highland Rim
07 Western Valley
08 Coastal Plain
09 Mississippi River Valley

APPENDIX III

CROSS INDEX TO TOPO MAPS

CROSS INDEX TO TOPOGRAPHIC MAPS OF TENNESSEE

Adair 438 NW
Adairville 306 NE
Adams 303 SE
Adolphus 312 NE
Alamo 429 SE
Albany 333 NW
Alexandria 318 SE
Allensville 303 NE
Alpine 334 NW
Altamont 99 NW
Alto 93 SW
Antioch 311 SW
Appleton 59 SW
Ardmore 67 NE
Arlington 415 SW
Armorel 406 NE
Ashland City 304 SE
Aspen Hill 59 SE
Athens 125 NE
Atwood 445 NW
Auburntown 319 NE
Ausmus 145 NE
Avondale 162 SW

****

Back Valley 161 SE
Bacon Gap 123 SE
Baileyton 180 SE
Bakersville 208 SW
Bald Creek 200 NW
Bald Knob 332 SW
Bald River Falls 140 SW
Baldwin Gap 220 NW
Barthell SW 336 SW
Bath Springs 23 NE
Baxter 326 NW
Beans Creek 87 SW
Bean Station 162 SE
Bearden 138 NE
Beaverdale 121 NE
Beaverdam Springs 41 NE
Bedford 72 NE
Beech Bluff 446 SW
Beech Grove 85 NW
Belfast 72 NW
Belleville 72 SE
Bellevue 308 SW
Bells 430 NE
Bellwood 317 SW
Belvidere 87 NW
Benton 126 NW
Bethel Valley 130 NE
Bethesda 63 SE
Bethpage 313 NE
Big Junction 140 SE
Big Ridge Park 146 NW
Big Sandy 20 NE
Big Spring 119 NW
Billingsley Gap 110 NW
Binfield 139 NE
Birchwood 119 SW
Block 128 SE
Blockhouse 148 NW
Blountville 197 SE
Bluff City 198 NE
Bodenham 59 NW
Bolivar East 439 SW
Bolivar West 431 SE
Bondurant 418 SE
Bonicord 421 NE
Bonnertown 52 SE
Boone Dam 198 NW
Boonshill 73 NW
Boyds Creek 156 NW
Bradford 436 SE
Brayton 111 NW
Brazil 429 NE
Brick Church 65 SW
Bridgeport 101 NW
Brighton 415 NW
Bristol 206 SW
Brockdell 103 SE
Brownsville 422 SE
Bruceton 20 SW
Brunswick 408 SE
Buchanan 19 NW
Bucksnort 40 NW
Buena Vista 10 NE
Buffalo Valley 322 NE
Bulls Gap 171 SE
Bumpus Mills 28 SE
Burem 180 NW
Burgess Falls 326 SE
Burns 48 SE
Burristown 325 NE
Burrow Cove 93 SE
Burrville 115 SE
Byhalia NW 417 NW
Byrdstown 333 SW

****

Cades Cove 148 SE
Calderwood 148 SW
Calhoun 125 SW
Camden 20 SE
Camelot 171 NE
Campaign 327 SW
Camp Austin 122 SE
Campbell Junction 108 SW
Campbell's Station 65 NW
Campbellsville 58 SW
Cane Hollow 93 NE
Caney Creek 126 SE
Capitol Hill 86 SE
Cardiff 123 NW
Cardwell Mtn. 328 NW
Carter 207 NE
Carters Creek 64 NW
Carthage 321 SW
Caruthersville 412 NW
Caruthersville SE 412 SE
Carvers Gap 208 SE
Cassville 327 NE
Cave Creek 130 SW
Cayce 426 SE
Cedar Grove 445 SE
Celina 324 SE
Center Hill Dam 322 SE
Centertown 92 NW
Centerville 49 SW
Chapel Hill 71 NW
Charleston 119 SE
Charlotte 48 NE
Chattanooga 105 SE
Cheatham Dam 304 SW
Chesterfield 11 NE
Chestnut Bluff 421 SE
Chestnut Grove 32 NE
Chestnut Hill 164 NE
Chestoa 199 SW
Chewalla 4 SW
Chic 413 NW
Chuckey 190 NW
Church Hill 188 SW
Clarkrange 108 NE
Clarksburg 10 SW
Clarksville 301 SE
Claybrook 446 NW
Clayton 427 NW
Clifton 33 NW
Clouds 154 NW
Coble 40 SW
Cohutta 121 NW
Coleman Gap 161 SW
College Grove 70 SW
Collierville 416 SW
Collins 99 NE
Collinwood 43 NW
Columbia 57 SE
Como 443 SE
Concord 138 SW
Cookeville East 331 NW
Cookeville West 326 NE
Cornersville 65 SE
Cottage Grove 8 NW
Cottontown 310 NE
Cottonwood Point 412 SW
Counce 13 SE
Covington 414 SW
Craigfield 56 NW
Crawford 334 SW
Crossville 109 NE
Crutchfield 434 SW
Cuba 442 SW
Cumberland City 38 NW
Cumberland Furnace 302 SE
Curtistown 328 SE
Cypress Inn 34 SE

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Daisy 112 NW
Dale Hollow Dam 329 SW
Dale Hollow Reservoir 329 SE
Dancyville 423 NE
Daniels Landing 31 SW
Daus 104 SW
Davy Crockett Lake 181 SE
Deason 78 SW
Decatur 118 SE
Deerfield 51 SW
Dellrose 66 SE
Demory 136 SE
Denmark 430 SE
De Rossett 332 NE
Dibrell 323 SE
Dickson 48 SW
Dillton 315 SE
Dixon Springs 317 SE
Dodson Branch 325 SE
Doe 214 NW
Doran Cove 95 NE
Dorton 117 NW
Doskie 14 NE
Dot 306 NW
Douglas Dam 156 NE
Dover 29 NE
Doyle 327 SE

Dresden 443 SW
Drummonds 408 NW
Dry Valley 331 SW
Ducktown 133 SW
Duncan Flats 129 NE
Durhamville 422 NW
Dutch Valley 154 SE
Dyer 436 SW
Dyersburg 420 SW

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Eads 416 NW
Eagan 144 SW
Eagle Creek 33 SW
East Chattanooga 112 SW
East Cleveland 120 NE
East Ridge 113 NW
Edmondson SE 400 SE
Elizabethton 207 SW
Elk Mills 214 SW
Elkmont 67 NW
Elk Park 215 NW
Elkton 66 SW
Ellendale 409 NE
Ellis Mills 38 SE
Elverton 130 NW
Englewood 132 NW
Enville 12 NW
Epworth 134 NW
Erin 38 SW
Erwin 199 NW
Estill Fork 88 NW
Ethridge 51 SE
Etowah 125 SE
Eureka 95 NW
Evensville 118 SW
Excell 302 NE

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Fairmount 105 NE
Fairview 56 NE
Farmington 71 SW
Farner 133 NE
Fayetteville 73 NE
Felker 120 SE
Fisk 74 NE
Flag Pond 190 SE
Fletcher Lake 404 SW
Flintville 80 SW
Forest Grove 307 SW
Fork Mtn. 129 NW
Fork Ridge 144 SE
Fort Oglethorpe 106 NE
Fort Pillow 414 NW
Fosterville 78 NW
Fountain City 146 SW
Fountain Head 312 SW
Fountain Run 320 NW
Fowlkes 421 NW
Fox Creek 116 SW
Frankewing 66 NE
Franklin 63 NE
Franklin, KY-TN 309 NE
Fredonia 85 SE
Frenchman's Bayou 403 NW
Friendship 429 NW
Frogue 329 NE

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Gainesboro 325 SW
Galen 320 SW
Gallatin 313 NW
Gallaway 415 SE
Gardner 435 SW
Gassaway 323 NW
Gates 421 SW
Gatlinburg 157 NE
Germantown 409 SE
Gift 414 SE
Gilt Edge 407 SE
Gladeville 314 SW
Glendale 64 SW
Gobey 122 NE
Godwin 57 NE
Golddust 407 NE
Goodfield 119 NE
Goodlettsville 310 SW
Gordonsburg 50 SW
Gordonsville 322 NW
Grand Junction 432 SW
Granville 321 SE
Grasshopper Creek 111 SE
Grassy Cove 117 SW
Graves Spring 41 SW
Graveston 146 NE
Grayson 219 SW
Graysville 111 NE
Greenbrier 307 NE
Greeneville 181 NE
Greenfield 436 NE
Greenfield Bend 50 NE
Greystone 190 SW
Grimsley 115 SW
Guthrie 303 NW
Guys 4 SE

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Halls Creek 30 NE
Hamlin 18 SE
Harmon Creek 30 NW
Harpeth Valley 305 NW
Harriman 123 NE
Harris 435 NW
Hartford 173 SW
Hartsville 317 NW
Hebbertsburg 116 SE
Hebron 440 NW
Hemp Top 127 NE
Henderson 12 A NW
Hendersonville 310 SE
Henrietta 304 NW
Henry 9 NW
Henryville 51 NW
Henson Gap 104 SE
Herbert Domain 109 SW
Hermitage 311 NE
Herndon 300 NE
Hickman 426 SW
Hickory Flat 312 NW
Hickory Valley 432 NW
Hilham 330 NW
Hillsboro 93 NW
Hillsdale 317 NE
Hillville 431 NW
Holladay 21 SW
Holland 316 NE
Hollow Springs 85 NE
Holston Valley 206 SE
Honey Creek 128 A NW
Hooker 106 NW
Hookers Bend 23 SW
Hornbeak 419 SE
Hornsby 440 NE
Horseshoe Lake NE 401 NE
Hot Springs 182 NE
Howard Quarter 162 NW
Hubbard Lake 418 SW
Humboldt 437 SW
Huntdale 199 SE
Hunters Point 313 SE
Huntingdon 9 SW
Huntland 80 SE
Huntsville 128 NW
Hurricane Mills 31 NE
Hustburg 31 NW
Hytop 88 NE

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Indian Mound 300 SW
Indian Springs 197 SW
Iron Mtn. Gap 208 NW
Irving College 328 SW
Isabella 133 SE
Isoline 108 SE
Ivydell 136 NW

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Jacksboro 136 SW
Jacks Creek 12 A NE
Jackson North 438 NE
Jackson South 438 SE
Jamestown 115 NW
Jeannette 22 NE
Jearoldstown 189 SW
Jefferson City 163 SW
Jellico East 338 SE
Jellico West 338 SW
Jericho 403 SW
John Sevier 146 SE
Johnson City 198 SE
Johnson Hollow 28 NE
Johnsonville 30 SW
Jones 430 NW
Jonesboro 198 SW
Jones Cove 164 SE
Jones Knob 116 NW
Joppa 155 NE
Juno 446 NE

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Keenburg 207 NW
Kendrick 14 NW
Kenton 428 NE
Ketchen 337 SE
Ketner Gap 105 NW
Kimmins 41 SE
King Cove 81 NE
Kingsport 188 SE
Kingston Springs 305 SE
Kinzel Springs 148 NE
Knob Creek 413 NE
Knoxville 147 NW
Kyles Ford 170 SE

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Laconia 423 SE
Lafayette 316 SE
La Follette 136 NE
Laguardo 313 SW
Lake City 137 NW

Lake Cormorant 405 NW
Lamar 425 NE
Lambert 423 SW
Lancing 122 SW
Lane 420 NE
Lascassas 315 NE
Latham 443 NW
Laurel Bloomery 213 SE
La Vergne 311 SE
Lawrenceburg 52 NE
Leapwood 12 SW
Leatherwood 33 NE
Lebanon 314 NE
Leesburg 189 SE
Lee Valley 171 NW
Leipers Fork 63 NW
Lemon Gap 182 SW
Lenoir City 130 SE
Lewisburg 65 NE
Lexington 11 NW
Lexington AL-TN 53 NE
Liberty 322 SW
Life 11 SW
Lillamay 305 NE
Lincoln 73 SE
Linden 32 SE
Linton 28 NW
Littlelot 49 SE
Livingston 330 NE
Lobelville 31 SE
Locke 403 SE
Lois 80 NE
Lonewood 332 SE
Long Branch 52 NW
Looneys Gap 179 SW
Loretto 52 SW
Loudon 131 NE
Louisville 138 SE
Lovelace 189 NW
Lovell 138 NW
Lowryville 24 SE
Luftee Knob 174 NW
Luray 446 SE
Luttrell 155 NW
Luxora 406 SW
Lyles 49 NE
Lynchburg East 79 SE
Lynchburg West 79 SW
Lynn Grove 7 SW
Lynnville 58 NE
Lynnville KY-TN 442 SE

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Macon 424 NW
Madisonville 131 SE
Manchester 86 NE
Manleyville 20 NW
Mansfield 9 NE
Martha 314 NW
Martin 435 SE
Martins Mill 34 NW
Maryville 147 SW
Mascot 155 SW
Mason 415 NE
Masseyville 12 A SW
Maury City 429 SW
Maynardville 145 SE
McCloud 180 SW
McConnell 435 NE
McDaniel Bald 141 NE
McDonald 120 SW
McEwen 39 SW
McFarland 133 NW
McKenzie 444 NE
McKinnon 29 SW
McLemoresville 445 NE
McMinnville 92 NE
Meadow 139 NW
Mecca 132 SW
Medina 437 SE
Medon 439 NE
Melvine 110 NE
Mercer 431 NE
Michie 13 SW
Middleburg 432 NE
Middlesboro South 153 SW
Middleton 440 SW
Milan 437 NE
Milky Way 58 SE
Milledgeville 12 SE
Millington 408 SW
Milton 319 NW
Mineral Bluff 134 NE
Miston 420 NW
Mohawk 172 NE
Monteagle 94 NE
Monterey 331 NE
Monterey Lake 331 SE
Moodyville 333 SE
Mooring 411 SE
Morgan Springs 110 SE
Morrison 92 SW
Morristown 163 NE
Moscow 424 SW
Moscow SE 424 SE
Mosheim 181 NW
Mt. Airy 104 NE

Mt. Guyot 165 NE
Mt. Joy 50 SE
Mt. Le Conte 165 NW
Mt. Peter 12 A SE
Mt. Pleasant 57 SW
Mt. Pleasant MS-TN 417 NE
Mt. Vernon 132 NE
Mountain City 214 NE
Mulberry 80 NW
Munford 408 NE
Murfreesboro 315 SW
Murray 7 SE

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Nashville East 311 NW
Nashville West 308 NE
Neddy Mountain 173 NE
Needmore 38 NE
Negro Hollow 42 SW
Newbern 420 SE
New Home 101 NE
New Market 155 SE
New Market AL-TN 81 NW
New Middleton 318 NE
Newport 173 NW
New Providence 301 SW
Niota 124 SE
Noah 85 SW
Nodena 407 SW
Nolensville 70 NW
Norma 128 SW
Normandy 79 NE
Normandy Lake 86 NW
Norris 137 NE
Northeast Memphis 409 NW
Northwest Memphis 404 NE

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Oak Grove 301 NW
Oak Hill 308 SE
Oakland 416 NE
Obey City 108 NW
Obion 427 SW
Okalona 330 SE
Olivehill 23 SE
Oneida North 336 SE
Oneida South 128 A NE
Ooltewah 112 SE
Open Lake 413 SW
Orlinda 309 SW
Orme 94 SE
Osage 8 SW
Osceola 407 NW
Oswald Dome 126 NE
Ovilla 42 SE
Ozone 117 NE

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Paint Rock 182 NW
Pall Mall 335 SW
Palmer 99 SE
Palmersville 443 NE
Palmer Shelter 10 NW
Palmyra 302 NW
Paris 8 SE
Paris Landing 19 NE
Parksville 126 SW
Parrottsville 172 SE
Parsons 22 NW
Pattie Gap 124 NE
Pecan Point 403 NE
Pennine 118 NW
Perryville 22 SE
Petersburg 72 SW
Petroleum 316 NW
Petros 129 SW
Philadelphia 131 NW
Pickwick 24 SW
Pigeon Forge 156 SE
Pikeville 110 SW
Pillowville 444 NW
Pilot Mountain 122 NW
Pine View 32 NW
Pioneer 128 NE
Pitcher Ridge 87 SE
Pittsburg Landing 13 NE
Pleasant Hill 109 NW
Pleasant Shade 321 NW
Pleasant View 304 NE
Pleasantville 41 NW
Plum Grove 179 SE
Pocahontas 440 SE
Point Pleasant 411 NE
Pope 32 SW
Poplar Creek 19 SE
Portland 309 SE
Powder Springs 154 SW
Powell 137 SW
Prices Mill 309 NW
Primm Springs 56 SW
Pulaski 59 NE
Purdy 4 NE
Puryear 8 NE

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Rafter 140 NW
Rally Hill 64 NE
Rankin 172 SW
Ransom Stand 34 SW
Readyville 319 SW
Reagan 11 SE
Red Boiling Springs 320 SE
Riceville 125 NW
Richardson Cove 164 SW
Ridgely 419 SW
Ringgold 113 NE
Ripley North 413 SE
Ripley South 414 NE
Riverside 42 NE
Riverton 334 NE
Rives 427 SE
Roaring Spring 300 NW
Robbins 128 A SE
Rockport 21 NE
Rockvale 70 SE
Rockwood 123 SW
Roddy 117 SE
Rosa 406 SE
Rose Creek 4 NW
Rossville 416 SE
Rover 71 NE
Rugby 128 A SW
Rushing Creek 18 NE
Ruskin 39 NE
Russellville 171 SW
Rutherford 436 NW

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Salem 60 NE
Samburg 419 NE
Sams Gap 191 NE
Sampson 103 NE
Sandy Hook 58 NW
Sango 303 SW
Sardis 12 NE
Saulsbury 432 SE
Savage Point 104 NW
Savannah 24 NW
Scottsboro 308 NW
Scotts Hill 22 SW
Sequatchie 100 SE
Seventeen Creek 21 NW
Sewanee 94 NW
Shady Grove 164 NW
Shady Valley 213 SW
Sharp Place 335 SE
Shelbyville 79 NW
Sherwood 214 SE
Shooks Gap 147 NE
Shop Springs 318 NW
Short Mountain 323 SW
Silers Bald 157 SE
Silerton 439 SE
Silver Point 326 SW
Sinking Cove 94 SW
Slayden 302 SW
Slayden MS-TN 425 NW
Sligo Bridge 327 NW
Smartt Mountain 103 SW
Smithville 323 NE
Smyrna 70 NE
Sneedville 170 SW
Snow Hill 112 NE
Soddy 111 SW
Somerville 424 NE
South Cleveland 120 NW
Southeast Memphis 409 SW
South Pittsburg 100 SW
Southwest Memphis 404 SE
Sparta 332 NW
Spencer 103 NW
Spot 40 NE
Spring City 118 NE
Spring Creek 445 SW
Springfield North 306 SW
Springfield South 307 NW
Spring Hill 63 SW
Springvale 172 NW
St. Joseph 43 SE
Standing Rock 29 NW
Stanley 411 SW
Stantonville 13 NW
Stewart 29 SE
Stockton 115 NE
Stony Point 180 NE
Sugar Tree 21 SE
Sullivan Gardens 189 NE
Summertown 51 NE
Sunnyhill 430 SW
Sunrise 50 NW
Swan Island 162 NE
Sweetwater 131 SW

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Taft 73 SW
Talbott 163 NW
Tallassee 139 SE
Tapoco 149 NW
Tarpley 66 NW
Tatumville 428 SW
Tazewell 154 NE

Teague 439 NW
Telford 190 NE
Tellico Plains 132 SE
Ten Mile 124 NW
Tennemo 412 NE
Tennessee City 39 SE
Tennga 127 NE
Texas Hollow 49 NW
Tharpe 28 SW
Theta 56 SE
Three Churches 34 NE
Thunderhead Mountain 157 SW
Thurman 23 NW
Tibbs 422 NE
Tiptonville 419 NW
Toney 74 NW
Topsy 42 NW
Tracy City 99 SW
Tranquillity 124 SW
Trenton 437 NW
Trenton KY-TN 301 NE
Trezevant East 444 SE
Trezevant West 444 SW
Trimble 428 NW
Tullahoma 86 SW
Turners Station 312 SE
Turnpike 422 SW
Twin Bridges 116 NE

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Unaka 141 NW
Unicoi 199 NE
Union City 427 NE
Union Hill 324 SW
Union Hill AL-TN 60 NW
Unionville 71 SE

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Vale 9 SE
Vandever 109 SE
Vanleer 48 NW
Verona 64 SE
Vine 314 SE
Viola 92 SE
Vonore 139 SW

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Walden Creek 156 SW
Walterhill 315 NW
Wartrace 78 SE
Watauga Dam 207 SE
Watertown 318 SW
Water Valley 434 SE
Waterville 173 SE
Wauhatchie 105 SW
Waverly 30 SE
Waynesboro 33 SE
Wear Cove 157 NW
Webbs Jungle 78 NE
Welchland 328 NE
Well Spring 145 NW
West Memphis 404 NW
Westmoreland 316 SW
Westover 438 SW
Westpoint 43 NE
West Sandy Dike 19 SW
Wheeler 153 SE
White Bluff 305 SW
White City 100 NW
White Hollow 145 SW
White House 310 NW
Whiteoak Flats 140 NE
White Pine 163 SE
White Rocks Mtn. 208 NE
Whites Creek 307 SE
Whiteville 431 SW
Whitfield 40 SE
Whitleyville 325 NW
Whitten 43 SW
Whitwell 100 NE
Wilder 334 SE
Wildwood 147 SE
Willette 321 NE
Williamsport 57 NW
Wilson 402 SE
Winchester 87 NE
Windle 330 SW
Windrock 129 SE
Winfield 337 SW
Wolf Pit Ridge 24 NE
Woodbury 319 SE
Woodlawn 300 SE
Woolworth 39 NW

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Yellow Creek 25 NW
Yorkville 428 SE
Youngville 306 SE
Yuma 10 SE

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Zionville 220 SW

APPENDIX IV

UTM INSTRUCTIONS

APPENDIX IV

Universal Transverse Mercator (UTM)
INSTRUCTIONS FOR DETERMINING UTM REFERENCES

The Universal Transverse Mercator (UTM) Grid System provides a simple and accurate method for recording a geographic location . The UTM Grid System has a number of advantages over the Geographic Coordinate System of latitude and longitude, particularly speed, precision, and the use of linear, metric units of measure. Determining UTM coordinates, in its simplest application, requires only a straightedge, a coordinate grid overlay, and a sharp pencil as working tools. (One source for the coordinate grid overlay, a plastic measuring tool, is Forestry Suppliers Inc. Jackson MS.)

The UTM grid coordinates may be determined from many USGS quadrangles published since 1950, and all maps published since 1959.

In the UTM system, the Earth is divided into 60 zones, running north and south, each 6 degrees wide. Each zone is numbered , beginning at the 180-degree meridian near the International Date Line. [Note: all of Tennessee is in Zone 16 except for parts of Shelby and Tipton Counties] On a USGS map, each zone is flattened and a square grid is marked off in meters. Grid coordinates are given at the map borders but note that the UTM grid is not parallel with the map borders. Any point in the zone may be referenced by citing its zone number, its distance in meters in a easterly direction from a north-south reference line ("easting"), and its distance in meters from the Equator ("northing"). These three figures (coordinates)--the zone number, easting, and northing--make up the complete UTM grid reference for any point and distinguish it from any other point on Earth.

The simplest method of determining a UTM reference is based on drawing part of the UTM grid on the map, and measuring from the grid lines to the point. It requires the following:

* a flat work surface on which the map may be spread out in full
* A straightedge (ordinary rulers may not be accurate enough) long enough to reach completely across the map--generally 28" to 36"
* a very sharp pencil and a worksheet
* A UTM coordinate grid overlay

To measure the <u>center point</u> for a site follow these steps:

1. Draw a line from the top of the map to the bottom (north to south), connecting the UTM border ticks of the same value directly west of the point, that is the ticks with the highest easting value west of the point.

2. Draw a line from the left to the right side of the map (west to east), connecting the grid ticks of the same value directly south of the point, that is the ticks with the highest northing value south of the point. This line will intersect the North-South line somewhere to the southwest of the point.

3. Record the zone number on a worksheet. This number appears in the lower left corner of the map.

4. Record on a worksheet the numbers given by the map ticks through which the lines have been drawn. These are the first three digits of the easting value and the first four digits of the northing value.

5. Locate the scale on the coordinate grid overlay matching that of the map, e.g. 1:24,000. Align the grid overlay precisely on the map so that:

a. the side of the scale that reads from right to left lies along the east-west line.

b. the side of the scale that reads from left to right passes directly through the point.

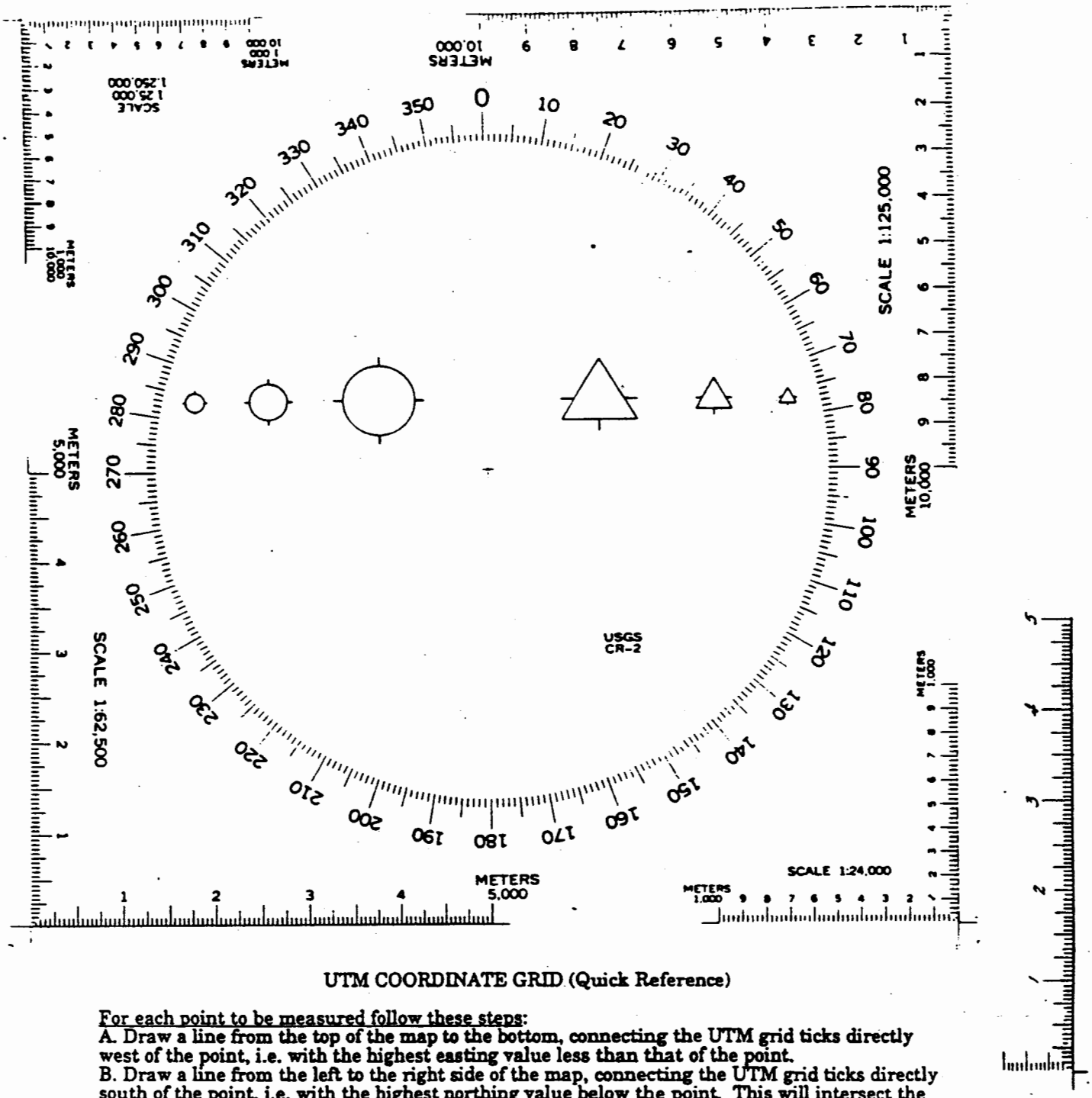
6. Read the coordinate grid overlay scales, right to left for the easting and upward for the northing to get a measured value in three decimal places. In each case, enter the measured value on the worksheet after the number recorded in step 4.

7. Check the readings--are all figures in the correct decimal place? The easting must have six digits and the northing seven.

8. Check the figures for accuracy by remeasuring.

9. Be sure the following order is given: zone number, easting, and northing (Z,E,N).

[The above UTM instructions were adapted from National Register Bulletin 16, DOI-NPS]



UTM COORDINATE GRID (Quick Reference)

For each point to be measured follow these steps:

A. Draw a line from the top of the map to the bottom, connecting the UTM grid ticks directly west of the point, i.e. with the highest easting value less than that of the point.

B. Draw a line from the left to the right side of the map, connecting the UTM grid ticks directly south of the point, i.e. with the highest northing value below the point. This will intersect the previous line somewhere to the southwest of the point.

C. Copy the Zone number onto a worksheet.

D. Copy onto a worksheet the portions of the easting and northing values given with the map ticks through which the lines have been drawn.

E. Locate the scale on the coordinate grid that matches that of the map. Align the scale on the map so that:

1. the side of the map that reads from right to left lies along the east-west line.
2. the side of the scale that reads from left to right passes directly through the point.

F. Read the coordinate grid scales, right to left for the easting and upward for the northing. Enter the measured values onto the form.

G. Check the readings for plausibility--are all figures in the correct decimal place?

H. Check the figures for accuracy by remeasuring.

I. Be sure that the correct order is observed: zone number, easting, northing (Z,E,N).

APPENDIX V

TRIBUTARY RIVER BASINS

TRIBUTARY RIVER BASINS IN TENNESSEE

Delineated as Logical Units for Water Resources Investigation, Appraisal, Development, and Management

Revised by

John M. Kernodle
Geologist, Reports Section
Tennessee Division of Water Resources

1972

In 1963 the State of Tennessee published a map showing delineations of river basins in Tennessee. Since that time, engineering changes such as new dams and channelization plus additional need for local refinements of data and the incorporation of Tennessee basin delineations with national river basin systems have necessitated a map revision. Furthermore, new and very detailed topographic maps have increased the accuracy of the determination of surface drainage areas.

Many fields of science and engineering need accurate data on streamflow which imposes special restrictions on the delineations of these drainage basins. Climate, geology, and physiography exert a strong natural influence on the hydrologic behavior of streams and man with his engineering accomplishments have further regulated streamflow. However, the criteria which governed the first selection of these drainage areas remain unchanged:

> In delineating the basin units the following criteria were considered: (1) A manageable basin size of about 300 to 800 square miles; (2) reasonably homogeneous physiography and geology within a unit; (3) compatability of units with existing water and conservation projects and organizations already active in the State; and (4) water-related problems such as concentrated population centers and urban and industrial growth trends.*

* TRIBUTARY RIVER BASINS IN TENNESSEE by J. S. Cragwall, Jr., 1963

Miscellaneous Publication No. 8

Designations and areas of tributary river basins in Tennessee

No. on map	Basin unit	Drainage area (sq mi)	Geographic area total (sq mi)	Geographic area in Tennessee (sq mi)
	CUMBERLAND RIVER BASIN			
1	Clear Fork and Jellico Creek, Tennessee-Kentucky	501	501	318
2	South Fork Cumberland River, Tennessee-Kentucky	1,382	1,382	978
2-A	New River and Clear Fork	679	679	679
2-B	South Fork Cumberland River Tennessee-Kentucky, head at confluence of New River and Clear Fork to mouth	1,382	703	299
3	Obey River, Tennessee-Kentucky	947	947	782
3-A	East and West Forks Obey River	413	413	413
3-B	Obey River, Tennessee-Kentucky, below East and West Forks	947	534	369
4	Cumberland River minor tributaries between Kentucky-Tennessee line and Caney Fork, Tennessee, but excluding Obey River	-	828	828
5	Caney Fork	2,585	2,585	2,585
5-A	Caney Fork above Great Falls Dam, excluding Collins River	1,677	885	885
5-B	Collins River	791	791	791
5-C	Caney Fork below Great Falls Dam	2,585	909	909
6	Cumberland River minor tributaries between Caney Fork and Stones River	-	1,060	1,060
6-A	South side tributaries	-	442	442
6-B	North side tributaries	-	618	618
7	Stones River	937	937	937
7-A	East and West Forks Stones River	569	569	569
7-B	Stones River below East and West Forks	937	367	367
8	Cumberland River minor tributaries between Stones River and Harpeth River	-	574	574
9	Harpeth River	866	866	866
9-A	Harpeth River above Bellevue, including Little Harpeth River	408	408	408
9-B	Harpeth River below Bellevue	866	458	458
10	Red River, Tennessee-Kentucky	1,456	1,456	767
10-A	Upper Red River and Sulphur Fork	935	935	509
10-B	Lower Red River, below Sulphur Fork	1,456	521	258
11	Cumberland River minor tributaries below Harpeth River, to Tennessee-Kentucky line, Tennessee, but excluding Red River	-	984	984
	GREEN RIVER BASIN, KENTUCKY			
12	Barren River basin, Kentucky-Tennessee	2,262	2,262	412
	TENNESSEE RIVER BASIN			
13	French Broad River in Tennessee, except Nolichucky River	5,124	1,168	1,168
13-A	From State line to Nolichucky River	2,598	398	398
13-B	From Nolichucky River to mouth	5,124	770	770
14	Nolichucky River in Tennessee	1,756	1,130	1,130
14-A	From State line to Nolichucky Dam	1,183	557	557
14-B	From Nolichucky Dam to mouth	1,756	573	573
15	South Fork Holston River, Tennessee-Virginia-North Carolina	2,048	2,048	1,229
15-A	Above South Holston Dam, Tennessee-Virginia	703	703	161
15-B	From South Holston Dam to mouth, excluding Watauga River	2,048	476	402
15-C	Watauga River above Watauga Dam, Tennessee-North Carolina	468	468	265
15-D	Watauga River from Watauga Dam, to mouth	869	401	401
16	Holston River	3,776	999	999
16-A	From confluence of North and South Forks to Cherokee Dam	3,428	651	651
16-B	From Cherokee Dam to mouth	3,776	348	348
17	Tennessee River minor tributaries, head to Ft. Loudoun Dam	-	650	650
18	Little Tennessee River basin in Tennessee	2,627	791	781
18-A	State line (Chatoah Dam) to Ninemile Creek and Tellico River	2,097	261	261
18-B	Tellico River	285	285	275
18-C	From Ninemile Creek to mouth	2,627	245	245

Designations and areas of tributary river basins in Tennessee -- continued

No. on map	Basin unit	Drainage area (sq mi)	Geographic area total (sq mi)	Geographic area in Tennessee (sq mi)
	TENNESSEE RIVER BASIN-continued.			
19	Clinch River basin in Tennessee, excluding Emory River	4,413	1,937	1,747
19-A	Clinch River, State line to Norris Dam, excluding Powell River and minor tributaries (west side), Powell River to Norris Dam	2,912	701	596
19-B	Powell River, State line to mouth, and minor Clinch River tributaries (west side), between Powell River and Norris Dam	1,066	600	515
19-C	Clinch River, Norris Dam to mouth, excluding Emory River	4,413	636	636
20	Emory River basin	865	865	865
20-A	Obed River	520	520	520
20-B	Emory River, excluding Obed River	865	345	345
21	Tennessee River minor tributaries, Ft. Loudoun Dam to Watts Bar Dam, excluding Little Tennessee and Clinch Rivers	-	717	717
21-A	South and east-side tributaries below Clinch River	-	256	256
21-B	West-side tributaries below Clinch River	-	365	365
21-C	North-side tributaries above Clinch River	-	96	96
22	Hiwassee River basin in Tennessee	2,700	1,215	1,215
22-A	From Appalachia Dam to below Ocoee River	2,001	516	516
22-B	From below Ocoee River to mouth	2,700	699	699
23	Tennessee River minor tributaries, Hiwassee River to Sequatchie River	-	1,500	846
23-A	North side tributaries to below North Chickamauga Creek	-	380	380
23-B	South side tributaries to below South Chickamauga Creek	-	634	252
23-C	Tributaries, both sides, from below South Chickamauga Creek to Sequatchie River	-	486	214
24	Sequatchie River	605	605	605
25	Tennessee River minor tributaries, northside, Sequatchie River to below Crow Creek, Tennessee-Alabama	-	535	326
26	Tennessee River minor tributaries, north side, from below Crow Creek to above Elk River, Tennessee-Alabama	-	2,164	212
27	Elk River basin, Tennessee-Alabama	2,249	2,249	1,999
27-A	Head to above Beans Creek	569	569	569
27-B	From above Beans Creek to above Richland Creek	1,295	726	726
27-C	Richland Creek	488	488	488
27-D	From below Richland Creek to mouth	2,249	466	216
28	Tennessee River minor tributaries, north side, Elk River to below Shoal Creek, Tennessee-Alabama	-	776	504
29	Tennessee River minor tributaries, east side, Pickwick Landing Dam to below Horse Creek	-	241	241
30	Tennessee River minor tributaries, west side Pickwick Landing Dam to above Beech River, Tennessee-Alabama	-	650	612
31	Tennessee River minor tributaries, east side, from below Horse Creek to below Cypress Creek	-	534	534
32	Beech River	302	302	302
33	Tennessee River minor tributaries, from below Beech River to below Birdsong Creek	-	482	482
33-A	West side tributaries	-	303	303
33-B	East side tributaries	-	179	179
34	Duck River basin, excluding Buffalo River	3,500	2,736	2,736
34-A	Head to below Flat Creek, 2 miles west of Shelbyville	481	481	481
34-B	From below Flat Creek to Columbia	1,208	727	727
34-C	From Columbia to Centerville	2,048	840	840
34-D	From Centerville to mouth, excluding Buffalo River	3,500	688	688
35	Buffalo River	764	764	764
36	Tennessee River minor tributaries, from below Birdsong Creek to above Big Sandy River on west side and to Kentucky line on east side	-	646	646
36-A	West side tributaries	-	176	176
36-B	East side tributaries	-	470	470
37	Big Sandy River	629	629	629
45	Tennessee River minor tributaries, west side, from Big Sandy River to Kentucky line in Tennessee	-	56	56

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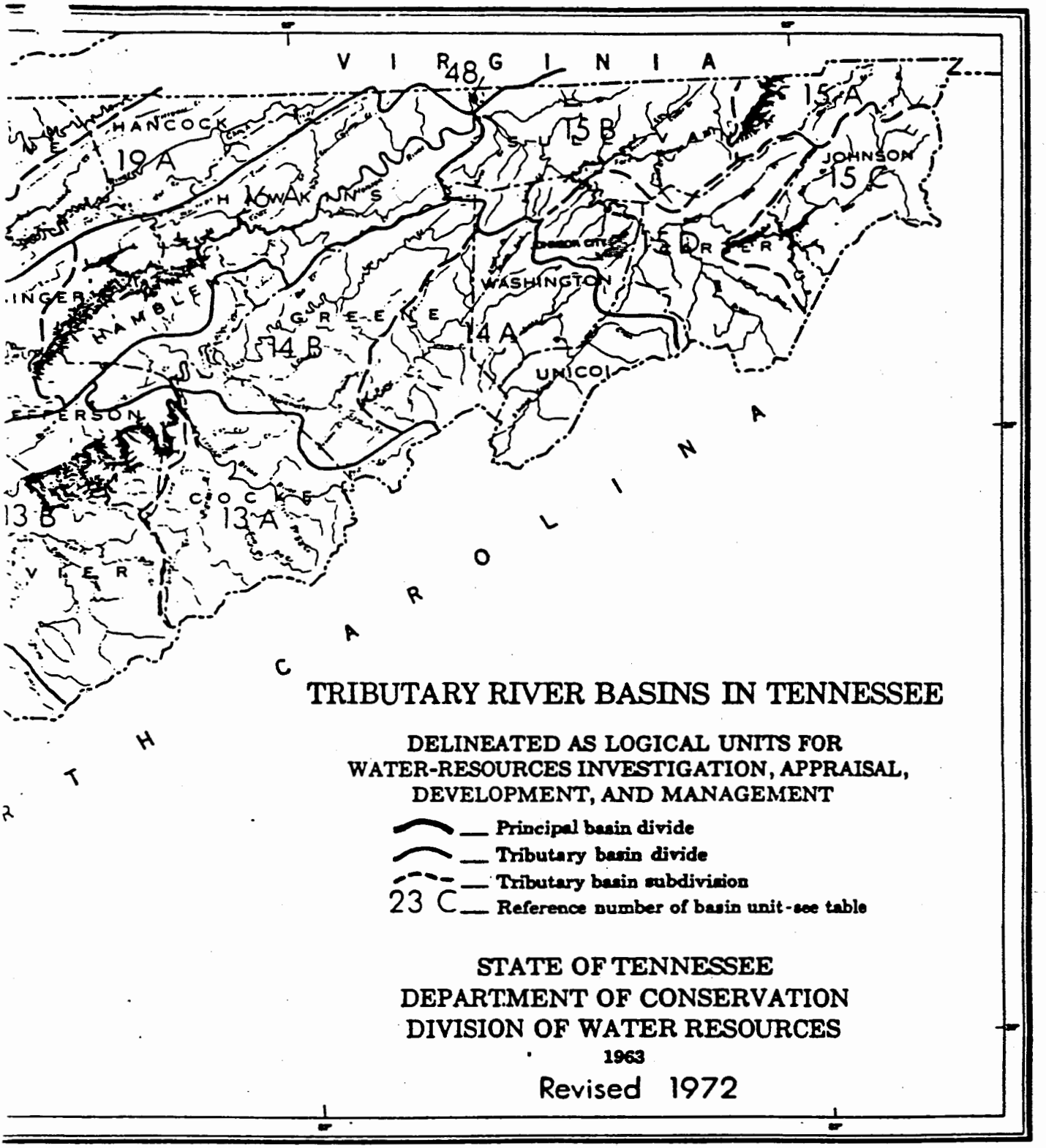

by Cragwell, Jr.,
l Survey, 1962

Basin delineations revised by J. M. Kernodle,
Tenn. Div. of Water Resources, 1972

Basin areas revised by George H. Wood,
U. S. Geological Survey, 1972

APPENDIX VI

SHPO STANDARDS AND GUIDELINES FOR ARCHAEOLOGICAL RESOURCE MANAGEMENT STUDIES

TENNESSEE STATE HISTORIC PRESERVATION OFFICE

STANDARDS AND GUIDELINES
ARCHAEOLOGICAL RESOURCE MANAGEMENT STUDIES

Introduction

Since 1969, environmental assessments and impact studies have generated a large number of archaeological survey reports. One notable characteristic of these reports is their variation in content, description of work conducted, and a lack of appropriate recommendations in keeping with legal compliance by federal agencies. Consequently there is a critical need for a clear and concise statement of what kinds of information should be presented in a cultural resource identification study so that the reports can be used effectively for federal decision making and comparative research.

In each state the State Historic Preservation Office is charged with the responsibility of coordinating state and federal cultural resource surveys as well as review responsibilities for surveys done in conjunction with National Historic Preservation Act and National Environmental Policy Act compliance. It is in this view that the following reporting standards and guidelines will be required for archaeological reports resulting from projects involving federal aid, licenses, or permits.

Legal considerations

In recent years, federal agencies have become more attentive to their legal compliance with the National Historic Preservation Act (PL 89-665), the Archaeological and Historic Preservation Act (PL 93-291), and the National Environmental Policy Act (PL 91-190).

Consequently, it has become even more important that cultural resource consultants fully understand the technical legalities of preservation law so that they can provide the best service to their clients and can help protect cultural resources using the letter of the law as well as the spirit.

Attached to these survey requirements is a current list of federal preservation laws, rules, and regulations. We strongly recommend that every consultant and agency become familiar with these documents and that they fully understand their responsibilities in the compliance process.

Role of the State Historic Preservation Officer

Under current preservation legislation, the SHPO does not approve nor disapprove of any federal undertaking; the role is one of providing information and opinions on the significance of properties and on appropriate plans to avoid, minimize, or mitigate adverse impact. In a sense, the SHPO is the state arm of the National Advisory Council on Historic Preservation, and Office of Archaeology and Historic Preservation. Specific legal responsibilities of the SHPO are given at 36 CFR 61.2 and 36 CFR 800.4 and 800.5.

CONSULTANT QUALIFICATIONS

The general rationale of specifying minimum qualifications is that the recognition and evaluation of significance of archaeological properties requires professional training and experience. The following standards meet the published requirements of the Department of Interior (36 CFR 66[42 FR 5371-5383, Jan. 28, 1977]), and represent the minimum qualifications acceptable for principal investigators on compliance projects in the State of Tennessee. Sections of the qualifications have been adapted from guidelines issued by the Society for Professional Archaeologists.

General requirements (all compliance research)

(1) Graduate degree in archaeology, anthropology, or closely related field; or equivalent training accepted for accreditation purposes by the Society of Professional Archaeologists (see specific requirements below).
(2) Demonstrated ability to carry research to completion, usually evidenced by timely completion of theses, research reports, or similar documents.
(3) Experience in archaeological research in the region where the project will be undertaken is usually desirable.

Phase I (reconnaissance level) survey projects

Reconnaissance level surveys cannot normally be used to demonstrate compliance with the National Historic Preservation Act. The intent of 36 CFR 800.4 is to provide for a determination of the presence or absence of National Register eligible properties. The purpose of a reconnaissance level survey is usually to determine if an intensive survey or testing is warranted. As such, it can be used at the discretion of the federal agency where appropriate to its planning needs. Consultants should explicitly inform clients of the phased nature of archaeological research to avoid potential misunderstandings concerning the scope of services.

(1) 24 weeks (6 months) of field experience under the supervision of a professional archaeologist, of which no more than 12 weeks (3 months) can be survey.
(2) 20 additional weeks (5 months) of field experience in a supervisory capacity.
(3) 8 weeks (2 months) of laboratory experience under the supervision of a professional archaeologist.

Phase II (intensive survey/testing) and phase III (data recovery) projects

In most cases, Phase II and III reports will be used by agencies to request formal determinations of eligibility to the National Register. If so used, it must contain sufficient levels of information to allow the SHPO and the federal agency to apply National Register criteria to all properties that may possess any historical, architectural, or cultural value (see 36 CFR 63 and associated guidelines).

Historical Archaeology: At least one year of field and laboratory experience, including 24 weeks of field work and 8 weeks of laboratory work under the supervision of a professional historical archaeologist on sites and artifacts of an historical period, and 20 weeks in a supervisory capacity.

Prehistoric Archaeology: At least one year of field and laboratory experience, including 24 weeks of field work and 8 weeks of laboratory work under the supervision of a professional prehistoric archaeologist on sites and artifacts of a prehistoric period, and 20 weeks in a supervisory capacity.

Archival Research: At least one year of experience in documentary research, under the supervision of a professional researcher.

For the purposes of this office's review of survey reports, each report must be prepared under the direction of a professional meeting the above qualifications as author or co-author. The qualified professional assumes responsibility for the quality and accuracy of results even though the field work may have been done by another person.

REPORTING STANDARDS AND GUIDELINES

These requirements should in no way be interpreted to restrict the inclusion of any data or comments the consultant or agency deems important, but the format should reasonably reflect that provided in the following guideline to insure comparability of research and the adequate documentation to comply with the Standards and Guidelines issued by the Secretary of the Interior. Sections of these standards and guidelines have been adapted from "Standards and Guidelines for Quality Control in Archaeological Resource Management in the Southeastern United States" published by J.A. Bense, H.A. Davis, L. Heartfield, and K. Deagan in Southeastern Archaeology 5(1):52-62.

(1) Title Page. This page should include (a) title of the report, including name and location of project (ex. "Archaeological Survey of the Proposed Jones Wastewater Treatment Facility Tract, Nashville, Davidson County"); (b) author(s)/principal investigator(s), institutional affiliation, address, and phone number; (c) name, address, and phone number of the client for whom the report was prepared; (d) lead state/federal agency and contract/permit number(s); (e) date of report.

(2) Management Summary. This should not exceed one page and should contain the following information: (a) type of project and purpose of investigation; (b) summary of report contents including research orientation, methodology, and conclusions; and (c) brief statement of significance and National Register eligibility in the opinion of the principal investigator(s), nature and degree of potential impact to site(s), and recommendations for mitigation of potential impacts. This summary will be used frequently by non-archaeologists and should be written accordingly.

(3) Table of Contents.

(4) Introduction. This section should include (a) project sponsor, contract/permit numbers, and other agency specific information; (b) project description including geographic limits of project area and potential project impacts; (c) purpose of report and discussion of scope of work; (d) dates of investigation and staff composition; and (e) disposition

(temporary and final) of field notes, photographs, artifacts, and other materials.

(5) Environment. This section should describe the present environment of the project area and how the prehistoric or historic environment may have differed from the contemporary environment.

(6) Literature Review. This section should summarize the archaeological and historical information obtained from literature searches. Its purpose is to provide a framework for prehistoric culture periods and the course of historical development in the project area. Repositories consulted should be given (i.e. personal library, Tennessee Division of Archaeology Library, agency library, etcetera).

(7) Summary of Field Methods. This section should contain a detailed summation and evaluation of field techniques used during the survey, including sampling and recording techniques. If the complete range of artifact types was not collected, a rationale should be given for differential recovery methods. Note all constraints on investigation, including limitations of access, poor visibility, adverse weather conditions, etcetera. Include maps showing the location of survey transects and locations of subsurface tests.

(8) Summary of Laboratory and Analytical Methods. Describe the classificatory/typological schemes used; means of chronological determination; and indicate where artifacts and records are to be curated. Include the accession numbers assigned to the materials obtained from each site.

(9) Results. Negative finding reports should include a discussion of why resources may not have been located (previous disturbance, poor visibility, possibility for deeply buried sites, etcetera). Positive finding reports should describe the nature of each site in short narrative form using permanent State Site Numbers at all times. Enumerate and describe artifacts in tabular format, including illustrations of relevant diagnostic artifacts. Surveys using any form of subsurface investigation should include, at a minimum, a representative soil profile or profiles.

(10) Eligibility Determinations. Significance must be stated in relation to the potential of the property to contribute information. The reason(s) for concluding the site does or does not have this potential must be provided for each site. Specific research questions that can be addressed through further work on the site should be constructed, including references to previous scholarly investigations. The known and potential impacts to each specific site by the undertaking should be described in as much detail as possible.

(11) Recommendations. Explain fully any recommendations for future research on any site, referring to specific research questions that may be answered by further research. If the work performed is a Phase I survey, further work may include testing certain sites for eligibility--justifications must be specific concerning both further testing and avoiding further testing. If the work performed is a Phase II survey or testing project, recommendations for further work might include the mitigation of adverse effects on specific sites through data recovery or modifications to the proposed undertaking.

PROCEDURAL REQUIREMENTS

(A) Consultation of Site Files. Consultation of official site file repositories to identify previously recorded sites within the study area (repositories include the Tennessee Division of Archaeology, University of Tennessee Knoxville, and Memphis State University). Note: The central and most up-to-date repository is that maintained by the Tennessee Division of Archaeology, Nashville Office.

(B) Completion of Tennessee Site Survey Forms. Official site survey forms should be obtained from the Site File Curator and submitted for assignment of state site numbers before submittal of draft or final reports. Reports containing field numbers or other designations will not be accepted. Appropriate supplemental sheets should be submitted with the final draft report.

(C) Application for State Archaeological Permit. All archaeological work conducted on state-owned lands must be cleared by the State Programs Archaeologist. Clearance requires submittal of a State Archaeological Permit Application, and issuance of said permit by the State Programs Archaeologist.

(D) Submission of Draft Reports. One copy of draft reports should be submitted for review. For tracking purposes, reports should be submitted directly to Herbert L. Harper, Deputy SHPO, Tennessee Historical Commission, 701 Broadway, Nashville TN 37219.

(E) Report distribution. A minimum of four copies of final survey reports should be submitted to the State Historic Preservation Officer for distribution to four designated repositories: (a) Tennessee Historical Commission; (b) Tennessee Division of Archaeology Library; (c) University of Tennessee Knoxville site file repository; (d) Memphis State University site file repository. Whether the report is sent directly by the consultant, or by the client or agency is at the latter's discretion.

SHPO Contacts for Archaeological Matters

In the state of Tennessee, review and compliance responsibilities concerning archaeological matters are carried out by the Nashville Office of the Tennessee Division of Archaeology, Department of Environment and Conservation.

Questions regarding archaeological matters should be directed to the following individuals:

Kevin E. Smith	Federal Programs Archaeologist
Suzanne Hoyal	Site File Curator
George (Nick) Fielder	State Archaeologist and Director

Telephone: (615) 741-1588 Address: Tennessee Division of Archaeology
5103 Edmondson Pike
Nashville, TN 37211

BASIC LEGISLATION AND CODIFIED RULES AND REGULATIONS

National Historic Preservation Act as amended Public Law 89-664 (16 U.S.C. 470)

National Environmental Policy Act as amended Public Law 91-190 (42 U.S.C. et seq.)

NEPA Regulation 40 CFR 1500-1508 (43 FR 55978-56007; November 29, 1978).

Native American Graves Protection and Repatriation Act, Public Law 101-601 (104 Stat. 3048; 25 USC 3001-13; November 16, 1990).

Advisory Council Procedures for the Protection of Historic and Cultural Properties. 36 CFR 800 (revised 51 FR 31115, September 2, 1986).

National Register of Historic Places. 36 CFR 60.

Criteria for Comprehensive Statewide Historic Surveys and Plans. 36 CFR 61 (42 FR 47658-47661).

Determinations of Eligibility for Inclusion in the National Register of Historic Places. 36 CFR 63 (42 FR 47661-47669).

Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment."

Archaeological and Historic Preservation Act, Public Law 93-291 (16 U.S.C. 469(a)).

Recovery of Scientific, Prehistoric, Historic, and Archaeological Data: Methods, Standards, and Reporting Requirements. 36 CFR 66 (42 FR 5371-5383; January 28, 1977).

Specific Agency Procedures

Various federal agencies have issued internal procedures for their compliance with NHPA and NEPA. These agencies, including Housing and Urban Development, Department of Transportation, Farmers Home Administration, Soil Conservation Service, US Army Corps of Engineers, and numerous others, are in the process of revising and writing their counterpart regulations. Consultants should check with a specific agency to determine their most current internal procedures.

Additional Source Materials

Handbook on the Treatment of Archaeological Properties. Advisory Council on Historic Preservation, Washington D.C. 1980.

Manual of Mitigation Measures. Advisory Council on Historic Preservation, Washington D.C.

STAFF INVOLVED WITH REVIEW AND COMPLIANCE

Department of Environment and Conservation

J.W. Luna	State Historic Preservation Officer	Commissioner

Tennessee Historical Commission

Herbert L. Harper	Deputy SHPO	Executive Director.
Richard G. Tune	Assistant Director, Federal Programs	Historic Preservation Supervisor
Steve Rogers	Survey and National Register	Historic Preservation Specialist
Joseph Garrison	Review and Compliance	Review and Compliance Coordinator
Claudette Stager	National Register	Historic Preservation Specialist
Elizabeth Straw	National Register	Historic Preservation Specialist
Louis Jackson	Tax Act Certification	Historic Preservation Specialist
Linda Wynn	Assistant Director, State Programs	
James Jones	Survey and Planning	Historic Preservation Specialist

Tennessee Division of Archaeology

George Fielder	Review and Compliance	State Archaeologist and Director
Kevin Smith	Review and Compliance	Federal Programs Archaeologist
Mike Moore	State Review and Permits	State Programs Archaeologist
Suzanne Hoyal	Review and Compliance	Site File Curator

APPENDIX VII

SPECIAL REQUIREMENTS FOR HUMAN REMAINS

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF ARCHAEOLOGY
5103 Edmondson Pike
Nashville, Tn. 37211
(615) 741-1588

Memorandum

To: Interested Parties

From: Nick Fielder, State Archaeologist

Subject: Portions of Archaeological Statutes pertaining to burials and human remains

Date March 19, 1992

The following portions of Tennessee Code Annotated archaeology laws pertain to burials and human remains. Please note the legal requirements on notification and discovery of human remains and the exemption for surface collecting activities. All practicing archaeologists should be thoroughly familiar with T.C.A. Title 11 Chapter 6.

Archaeological Statutes (Tennessee Code Annotated) with additions made by 1990 General Assembly and signed into law on April 10, 1990. The provisions are in effect as of April 10, 1990.

New additions are shown in **BOLD**

11-6-102. Definitions. - For the purposes of this chapter, unless a different meaning clearly appears in the context:

(1) "Artifacts" means all relics, specimens or objects of a historical, prehistorical, archaeological, or anthropological nature which may be found above or below the surface of the earth, and which have scientific or historic value as objects of antiquity, as aboriginal relics, or as archaeological specimens;

(2) "Field archaeology" means the study of the traces of human culture at any land or water site by means of photographing, mapping, surveying, digging, sampling, excavating, and removing artifacts or other archaeological material, or going on a site with that intent; and

(3) "Site" means any location of historic or prehistoric human activity such as, but not restricted to, mounds, forts, earthworks, burial grounds, structures, villages, mines, caves, and all locations which are or may be sources of paleontological remains.

( ) " Burial object" means any cultural material, including but not limited to, whole or broken ceramic, metal or glass vessels, chipped stone tools, groundstone tools,

worked bone and shell objects, clothing, medals, buttons, rings, jewelry, firearms, edged weapons, and the casket and parts thereof, that were demonstratively buried with an individual or the burial pit or mound associated with an individual or the structure created to house the body.

( ) "Burial grounds" means a place used for or to be used for human burials. The term " burial grounds" shall not include an individual urn or other container for human ashes which have been lawfully cremated. The fact that any tract of land has been set apart for burial purposes, or that a part or all of the grounds have been used for burial purposes shall be evidence that such grounds were set aside for burial purposes. The fact that graves are not visible on any part of the grounds shall not be construed as evidence that such grounds were not set aside and used for burial purposes.

( )"Excavation" means digging below the surface of the earth by hand or with mechanical equipment with the purpose of recovering artifacts, archaeological data, human remains or burial objects.

( )"Human remains" means the bodies of deceased persons, in whatever stage of decomposition, including but not limited to, skeletal remains, mummies, or body parts. Human remains do not include the ashes of a person who has been lawfully cremated.

Human remains do not include body parts or tissue which is removed for transplantation or other medical procedures or research.

( )"Surface collection" means walking fields, stream banks, or other locations to look for and collect artifacts lying on the surface of the ground, or which have been disturbed by plowing or natural processes of erosion.

11-6-107. Discovery of sites or artifacts - Notice to division and contractors.

(d)(1) Any person who encounters or accidentally disturbs or disinters human remains on either publicly or privately owned land except during excavations authorized under this chapter shall:

(A) Immediately cease disturbing the ground in the area of the human remains;

(B) Notify either the Coroner or the Medical Examiner and a local law enforcement agency;

(C) Either the Coroner or the Medical Examiner shall, within five (5) working days, determine whether

the site merits further investigation within the scope of such official's duties;

(D) If the Coroner or Medical Examiner, and law enforcement personnel have no forensic or criminal concerns with regard to the site, then the Coroner or the Medical Examiner shall notify the department;

(E) Human remains and burial objects reported to the Division of Archaeology shall be treated as provided in Sections 11-6-104 and 11-6-119, and/or Title 46, Chapter 4, if applicable;

(F) A person who violates subdivisions (1)(A) or (1)(B) of this subsection commits a Class A misdemeanor;

(2) The provisions of this section shall not apply to:

(A) Normal farming activity, including but not limited to, plowing, disking, harvesting, and grazing, provided, however, that if human remains are discovered or disturbed a report should be made to the officials specified in Section 11-6-107(d)(1)(B); or

(B) Surface collecting.

11-6-116. (a) When a burial ground or other area containing human remains of Native Americans is excavated, representatives of Native American Indians shall have a right to be present on the site at all times excavation or treatment of such remains is taking place.

(b) The department shall promulgate regulations governing application procedures for and the number of representatives to be present on sites.

[Note: These regulations were promulgated November 25, 1991. Copy included in this appendix]

Section 11-6-117 There shall be no public exhibition or display of Native American Indian human remains, except as evidence in a judicial proceeding.

Section 11-6-118.

(a) The import into Tennessee or the export from Tennessee of human remains is prohibited except in the following instances:

(1) Import or exports by hospitals or medical schools for education or research purposes;

(2) Import for burial or reburial in Tennessee or export for burial or reburial in another state or country;

(3) Import or export for preparation for burial or reburial; or

(4) Import or export for use as evidence in any judicial proceeding.

(b) Violation of this subsection is a Class E felony.

(c) Any remains so imported or exported shall be confiscated and subject to disposition as provided in Sections 11-6-104 and 11-6-119.

Section 11-6-119. Any human remains discovered in the course of an excavation or accidentally, and any such remains confiscated under the provisions of Section 11-6-118, shall be properly reburied following scientific analysis within six (6) months of such discovery or confiscation in accordance with procedures formulated by the advisory council which are appropriate to Native American traditions. Upon request for scientific or medical research, the director of the division may grant an extension of not more than six (6) months before reburial is required.

[Note: Reburial regulations were promulgated November 25, 1991. Copy included in this appendix]

DEPT OF ENVIRONMENT & CONSERVATION
RECEIVED
OCT 10 1991
OFFICE OF GENERAL COUNSEL

RULEMAKING HEARING RULES
OF
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF ARCHAEOLOGY

CHAPTER 0400-9-1

NATIVE AMERICAN INDIAN CEMETERY REMOVAL
AND REBURIAL

NEW RULES

TABLE OF CONTENTS

0400-9-1-.01 Manner of Reburial
0400-9-1-.02. Reburial Areas
0400-9-1-.03. Marking of Boundaries
0400-9-1-.04. Notification
0400-9-1-.05. Observation of Disinterment by Native American Observers

0400-9-1-.01. MANNER OF REBURIAL.

The reinterment of prehistoric and historic period Native American Indian skeletal remains shall be done in a manner consistent with original and/or traditional customs.

(1) When archaeological, tribal, or other documentation exists that specifies the original manner of burial, reburial of those remains shall be carried out in the same manner.

(2) When documentation on the original manner of burial is not extant, reburial of individual remains shall be done in subsurface grave pits at such a depth to prevent future disturbance. Remains shall be placed directly into the soil.

(3) Any religious or ceremonial activities carried out in conjunction with reburial shall not be the responsibility of the state.

0400-9-1-.02. REBURIAL AREAS

All reburial areas should be as close to the original burial area as practicable and must be designated as a

cemetery and registered with the county tax assessor's office as same.

0400-9-1-.03. MARKING OF BOUNDARIES

The boundary of any reburial area must be suitably marked and a permanent record of the location of reinterments kept by the landowner.

0400-9-1-.04. NOTIFICATION.

Anyone carrying out work which involves the removal of Native American Indian human remains must notify the Native American members of the Archaeological Advisory Council, the Chairman of the Tennessee Commission on Indian Affairs, and the State Archaeologist. Notification of the intent to remove such remains must be in writing. Such notification shall be given at the time a petition is filed under T.C.A. §46-4-101 et seq., "Termination of Use of Land as Cemetery", or at the time an application for a permit is filed under T.C.A. § 68-3-508.

0400-9-1-.05. OBSERVATION OF DISINTERMENT BY NATIVE AMERICAN OBSERVERS.

At least one (1) Native American observer is entitled to be present during removal, excavation or disinterment of Native American human remains. This person shall be a Native American Indian member of the Archaeological Advisory Council or person designated by such member. Additional observers may be present as field conditions warrant with the permission of the project director. Observers must make prior arrangements with the person in charge of excavation or burial removal. In some cases, such as on-going construction activities, observers may be required to follow special safety procedures.

Authority: T.C.A. §§11-6-116(b) and 11-6-119.

Signature of the agency officer or officers directly responsible for proposing and/or drafting these rules:

WILLIAM D. PENNY
General Counsel

DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DIVISION OF ARCHAEOLOGY
5103 Edmondson Pike
Nashville, Tn. 37211
(615) 741-1588

Memorandum

To: Interested parties

From: Nick Fielder, State Archaeologist

Subject: Termination of Use of Cemeteries

Date March 19, 1992

Since 1985 all cemeteries regardless of age, ethnic affiliation or condition are afforded equal treatment under the laws of Tennessee. **State law does not apply to cemeteries located on federal property.** The law provides a process by which cemeteries can be moved. This process is called "Termination of Use of Land as Cemetery" [T.C.A. 46-4-101 et seq] and applies to prehistoric Native American burials as well as marked and unmarked historic cemeteries.

The procedure involves demonstrating to the satisfaction of the local county chancery court that one of three conditions exist -- 1) the cemetery has been abandoned or 2) it is in a neglected or abandoned condition, or 3) conditions or activities in or about the cemetery are inconsistent with proper reverence or respect for the dead.

The judge must also be shown that provisions for reinterment of the remains have been made prior to disinterment.

Typically, the property owner's legal counsel files a petition to the court requesting an order be issued permitting the removal and reinterment. The specific techniques, who will do the removal, and other matters are determined on a case by case basis but must be approved by the court. All other interested parties, as defined by statute, are made defendants in the case and may argue their side of the issue to the court. The judge may appoint a special lawyer to represent any unknown defendants.

The amount of time required to go through the process depends on the complexity of the case, time period of the cemetery, whether it is contested, and the case load of the chancery court docket. It can range from three days to several months. Any archaeological project which anticipates encountering human remains should plan accordingly.

The Termination of Use process requires reinterment in a suitable repository but osteological analysis can be performed if approved by the court. However under TCA 11-6-119 reburial has to be accomplished within a 12 month period after removal.

This memo is intended to give a brief overview of the process and does not replace the need for consulting legal counsel.

Tennessee Division of Archaeology
Department of Environment and Conservation
5103 Edmondson Pike
Nashville, Tennessee 37211

(615) 741-1588

MEMORANDUM February 28, 1992

TO: Archaeological Consultants
FROM: Nick Fielder, State Archaeologist
RE: Eligibility of Cemeteries to the National Register

In recent reviews of the National Register Criteria for Evaluation, the Criteria Working Group of the National Park Service noted that the eligibility of graves and cemeteries to the National Register of Historic Places (NR) was not fully addressed under the 1980 Amendments to the National Historic Preservation Act.

In September 1991, the Department of the Interior released a draft of NR Bulletin 41 entitled "How to Evaluate and Nominate Cemeteries and Burial Places." Based on this report and a recognition that all cemeteries, regardless of ethnic origin or affiliation, have the potential to yield important archaeological and osteological information, any cemetery older than 50 years should be identified and evaluated for NR significance in Section 106 compliance related surveys.

On Phase I surveys, the presence of historic cemeteries should be noted (including those indicated on topographic maps but not evidenced in the field). Historic cemeteries lacking state site numbers should be recorded with the Division of Archaeology. Where possible, efforts should be made to attach small isolated cemeteries to their parent entities (i.e. farmsteads, plantations, etc).

On Phase II testing programs, all cemeteries (both prehistoric & historic) within the project area should be investigated, and appropriate documentation (including archival research) provided to allow eligibility determinations by the SHPO.

According to the draft report (pg. 8): "Burial places may be eligible for their potential to yield information about prehistoric peoples and historic cultural and ethnic groups. Under Criterion D, the common requirements are that the property have information to contribute and the information is considered important. The importance of the information to be yielded is determined by considering a research design or a set of questions that could be resolved by controlled investigation of the site." (emphasis mine).

The mere existence of a 50-year-old cemetery does not automatically make it eligible for the National Register. Just as we do for prehistoric & historic sites, the demonstrated potential of a burial population to answer pertinent research questions will determine eligibility. Factors to be considered are the identities of the deceased, ethnicity, time period, and any special conditions. Small cemeteries, like those encountered on most surveys, do not usually occur as entities separate from other historical sites. Therefore, if the cemetery is associated with a farm or plantation site, it should be considered a feature within the larger site (and thus not receive a separate site number).

Please contact Kevin Smith, Suzanne Hoyal, or me if you have any questions.

TENNESSEE DEPARTMENT OF CONSERVATION
DIVISION OF ARCHAEOLOGY

Memorandum

To: Concerned parties

From: Nick Fielder, State Archaeologist

Subject: New cemetery laws

Date: March 27, 1990

The 1989 legislature changed the entire criminal code to reduce redundancy and to make sentences more uniform. **The changes went into effect on November 1, 1989. All of the previous laws were repealed.**

All of the previous sections of the criminal code which dealt with cemeteries and grave robbing were condensed into two sections--TCA 39-17-311 and 39-17-312. 311 is a condensation of the cemetery vandalism laws and 312 rewrites the grave robbing and dead bodies laws. The full text is given below.

The section of the code which permits cemetery relocation-- Termination of use of land as cemetery [TCA 46-4-101-104] is not part of the criminal code and was not changed.

39-17-311. Desecration of a Venerated Object

(a) A person commits an offense who intentionally desecrates:
(1) A place of worship or burial; or
(2) A state or national flag.
(b) A violation of this section is a Class A misdemeanor.[Acts 1989, ch 591,1].

[Class A misdemeanor is imprisonment for not more than 11mo-29days and/or a fine not to exceed $2,500] [Acts 1989, ch 591,6]

39-17-312. Abuse of corpse

(a) A person commits an offense who, without legal privilege, knowingly:
(1) Physically mistreats a corpse in a manner offensive to the sensibilities of an ordinary person;
(2) Disinters a corpse that has been buried or otherwise interred; or
(3) Disposes of a corpse in a manner known to be in violation of law.

(b) A violation of this section is a Class E felony. [Acts 1989, ch. 591,1]

[Class E felony is imprisonment of not less than 1 year nor more than 6 years. In addition the jury may assess a fine not to exceed $3,000. A corporation may be fined up to $50,000 for a Class E felony]

APPENDIX E

STANDARDIZED OUTLINES

ARCHITECTURAL/HISTORICAL ASSESSMENTS E-3

ARCHEOLOGICAL SURVEYS E-5

ARCHEOLOGICAL AND HISTORICAL REVIEWS E-7

MEMORANDUMS OF AGREEMENT E-9

SECTION 110(b) DOCUMENTATION E-15

ARCHITECTURAL/HISTORICAL ASSESSMENTS

TITLE: The title of an architectural/historical assessment should reflect the resources that are evaluated in the assessment, as is illustrated in the following title of the ORNL assessment report:

Architectural/Historical Assessment of the Oak Ridge National Laboratory, Oak Ridge Reservation, Anderson and Roane Counties, Tennessee

Architectural/historical assessments should contain seven primary sections: Executive Summary, Introduction, Historical Context, Surveyed Properties, Conclusions, References, and Appendices. In addition, architectural/historical assessments should contain a table of contents, list of figures, and plates and tables, as warranted. Information contained in each of the sections is described below.

EXECUTIVE SUMMARY: The executive summary should provide a brief synopsis of the purpose of the assessment and the significant results or findings of the assessment.

INTRODUCTION: The introduction should provide information such as (1) a detailed discussion of the purpose of the assessment; (2) a discussion of the regulatory drivers for the assessment; (3) a description of the study area, including maps showing the location of properties evaluated during the assessment; (4) a discussion of previous survey or National Register of Historic Places work that has been conducted in the area; (5) a brief description of the organization of the assessment report; and (6) a discussion of the assessment results.

HISTORICAL CONTEXT: The historical context should provide a detailed discussion of the history associated with the surveyed properties and provide the basis from which determinations of National Register of Historic Places eligibility determinations are made.

SURVEYED PROPERTIES: This section should provide detailed descriptions of the properties evaluated during the assessment and include photographic documentation, maps showing the location of the properties, and tables summarizing data collected as a part of the assessment.

CONCLUSIONS: The conclusions should contain a discussion of the significant findings of the assessment and recommendations for the disposition of the cultural resources identified and evaluated as a result of the assessment.

REFERENCES: The references should alphabetically list all citations made in the text of the assessment.

APPENDICES: Appendices should be provided for assessments that result in the collection of large quantities of data that cannot, for practical purposes, be presented in the body of the assessment report.

ARCHEOLOGICAL SURVEYS

TITLE: The title of archeological survey reports should reflect both the type of the survey and the purpose for which the survey was conducted. An example title for an archeological reconnaissance survey would be as follows:

AN ARCHEOLOGICAL AND HISTORICAL RECONNAISSANCE OF THE PROPOSED CENTER FOR BIOLOGICAL SCIENCES AND OTHER PLANNED FACILITIES, OAK RIDGE RESERVATION, ANDERSON AND ROANE COUNTIES, TENNESSEE

Archeological survey reports should contain nine primary sections: Executive Summary, Introduction, Project Description, Methodology, Coordination with State Agencies, Survey Results, Conclusions, References, and Appendices. In addition, archeological survey reports should contain a table of contents, list of figures, and plates and tables, as warranted. Information contained in each of the sections is described below.

EXECUTIVE SUMMARY: The executive summary should provide a brief synopsis of the purpose and the significant results or findings of the survey. If the survey was conducted for the purpose of identifying cultural resources that may be affected by a proposed action, the executive summary should contain a brief discussion of the determination of effect the proposed action would have on any cultural resources identified within the project area.

INTRODUCTION: The introduction should provide (1) a detailed discussion of the purpose of the survey, (2) information pertinent to regulatory drivers for the survey, (3) a brief description of the organization of the survey report, and (4) a discussion of the survey results.

PROJECT DESCRIPTION: The project description should provide (1) a description of the location of the survey area, including maps, and (2) a detailed description of the proposed action for which the survey was conducted—or the purpose for the survey if the survey was conducted for reasons other than to assess the effects a proposed action would have on cultural resources.

METHODOLOGY: This section should provide a description of the methods used to identify and evaluate cultural resources within the project area. This section should also contain a description of the methods used to catalog and analyze artifacts found during the survey and to prepare the artifacts for curation.

COORDINATION WITH STATE AGENCIES: Coordination with state agencies regarding the effects proposed actions would have on cultural resources must be handled by DOE ORO personnel and not by a subcontractor. However, some coordination with state agencies regarding the location of known cultural resources/sites within a project area may be conducted by a subcontractor. Therefore, this section should provide information obtained during activities such as (1) reviews of the site files at the Tennessee Division of Archaeology and the Tennessee Historical Commission and (2) a search of the National Register of Historic Places.

SURVEY RESULTS: *This section should provide a detailed discussion of the results of the survey. Supporting information and data—such as photographic documentation, site drawings, and lists of recovered artifacts—should also be presented in this section.*

CONCLUSIONS: The conclusions should contain a discussion of the significant findings of the survey and recommendations for the disposition of any cultural resources identified and evaluated as a result of the survey.

REFERENCES: The references should alphabetically list all citations made in the text of the survey report.

APPENDICES: Appendices should be provided for survey reports resulting in the collection of large quantities of data that cannot, for practical purposes, be presented in the body of the survey report. Examples of information or data that should be provided in appendices include (1) listings of artifacts recovered during surveys, (2) detailed site drawings made during surveys/excavations, and (3) photographic documentation.

ARCHEOLOGICAL AND HISTORICAL REVIEWS

TITLE: The title of all Archeological and Historical Reviews (AHRs) should use the following format:

PROJECT SUMMARY
SECTION 106 ARCHEOLOGICAL AND HISTORICAL REVIEW (AHR) FOR
{PROJECT TITLE}

The body of AHR documents should contain five primary sections: Proposed Action, Location, Discussion, Determination, and References. Information contained in each of these sections is described below.

PROPOSED ACTION: This section should contain a brief description of the proposed action and should begin with the statement, "The U.S. Department of Energy Oak Ridge Operations Office (DOE ORO proposes to . . . ." The preferred format is to divide the proposed action into its basic components/ activities and to describe them in an enumerated fashion.

LOCATION: The section should contain a description of the location at which the proposed action would take place and should begin with the statement, "The proposed action would take place on the ORR in ? County, Tennessee." The following text should provide more specific details regarding the location of the proposed action and a map showing the actual location.

DISCUSSION: This section should provide information such as (1) a discussion of the cultural resources that may be affected by the proposed action and (2) methods that would be used or actions that would be taken to avoid or minimize effects to cultural resources.

DETERMINATION: This section should provide a determination of effect that the proposed action would have on cultural resources and should begin with the statement, "DOE ORO has determined that the proposed action would . . . ."

REFERENCES: This section should contain an alphabetical listing of references cited in the document. If no references are cited, this section should be omitted.

MEMORANDUMS OF AGREEMENT

TITLE: The title of a Memorandum of Agreement (MOA) should follow the following format:

MEMORANDUM OF AGREEMENT BETWEEN THE U.S. DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE AND THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER SUBMITTED TO THE ADVISORY COUNCIL ON HISTORIC PRESERVATION PURSUANT TO 36 CFR 800.5(e)(4) REGARDING {*PROJECT TITLE*}

The body of an MOA should contain (1) all pertinent "WHEREAS" statements followed by a "NOW, THEREFORE" statement; (2) stipulations such as those for the completion of Section 110(b) documentation and for resolving objections; (3) administrative stipulations that include the definition of parties to the MOAs, alterations to project documentation, amendments to the MOA, and termination of the MOA; and (4) signature blocks for representative of the parties to the MOA. Because MOAs will vary with project type, it is not possible to provide a standardized MOA outline that would work for all MOAs. However, an example of a recently executed MOA for a DOE ORO undertaking is provided in the following pages and should be used as a model for the development of future MOAs.

MEMORANDUM OF AGREEMENT
BETWEEN THE U.S. DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE
AND THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER
SUBMITTED TO THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
PURSUANT TO 36 CFR 800.5(e)(4)
REGARDING WASTE AREA GROUPING 1
SURFACE IMPOUNDMENTS OPERABLE UNIT REMEDIATION,
OAK RIDGE NATIONAL LABORATORY,
OAK RIDGE RESERVATION, ROANE COUNTY, TENNESSEE

WHEREAS the U.S. Department of Energy Oak Ridge Operations Office (DOE ORO) proposes to remediate the Oak Ridge National Laboratory (ORNL) Waste Area Grouping (WAG) 1 Surface Impoundments Operable Unit (SIOU) under the Comprehensive Environmental Response, Compensation, and Liability Act. The SIOU is located at ORNL on the Oak Ridge Reservation (ORR) in Roane County, Tennessee, and consists of Impoundment 3513 (Settling Basin, also known as the Waste Holding Basin), Impoundment 3524 (Process Waste Systems Basin, also known as the Equalization Basin), and Impoundments 3539 and 3540 (Process Waste Ponds);

WHEREAS the remediation of the SIOU, the subject of this Memorandum of Agreement (MOA), under all alternatives presently being considered, except for the no action alternative, would involve removal of the impoundments from existence;

WHEREAS DOE ORO has established the area of potential effect of the undertaking, as defined at 36 CFR 800.2(c), to be the SIOU and the streetscapes in the immediate vicinity of these structures, which include facilities within and adjacent to the ORNL Historic District;

WHEREAS DOE ORO has determined that the remediation of the SIOU would have an effect on these properties and might have effects on the streetscapes in the immediate vicinity of the undertakings;

WHEREAS DOE ORO, pursuant to 36 CFR 800.4(c) and in consultation with the State Historic Preservation Officer (SHPO), has determined that Impoundments 3513 and 3524 are eligible for inclusion in the National Register of Historic Places (National Register);

WHEREAS DOE ORO has consulted with the SHPO in accordance with Section 106 of the National Historic Preservation Act (NHPA), 16 U.S.C. § 470f, and its implementing regulations (36 CFR Part 800) to resolve any adverse effect of the undertakings;

WHEREAS DOE ORO intends to use the provisions of this MOA to address applicable requirements of Section 110(b) of the NHPA, 16 U.S.C. § 470h-2(b); and

WHEREAS DOE ORO has determined that it is not practicable to implement alternatives to the remediation of the SIOU, such as adaptive use, in accordance with Section 111(a), 16 U.S.C. § 470h-3(a), because the structures are surplus and pose a considerable hazard to personnel and the environment due to the presence of radioactive contamination;

NOW, THEREFORE, DOE ORO and the SHPO agree that upon acceptance of this MOA by the Advisory Council on Historic Preservation (Council), and upon the DOE ORO decision to proceed with the remediation of the SIOU, DOE ORO shall ensure that the following stipulations are implemented to take into account the effects of the undertaking on historic properties.

Stipulations

DOE ORO shall ensure that the following stipulations are implemented:

1. **Section 110(b) Documentation.**

   a. Documentation, prepared pursuant to Section 110(b) of the NHPA, 16 U.S.C. § 470h-2(b), to be provided to the SHPO, shall include a brief description of the alternatives now being considered for the proposed undertaking, a discussion of the location at which the undertaking shall take place, and an account of the history and use of the facilities within the SIOU that have been determined to be eligible for inclusion in the National Register. This documentation shall also include (1) a map showing the location of the facilities within the SIOU and the ORNL Historic District; (2) a full set of appropriately labeled photographs documenting the current condition and surrounding streetscapes around the SIOU; and (3) copies of representative structural, civil, architectural, and/or utility design drawings documenting the current and past features of the SIOU. All photographs shall be black and white images taken with a 35 mm camera (or equivalent) and printed in a 3" x 5" format.

   b. Copies of all documentation provided to the SHPO shall be retained in the DOE ORO Environmental Protection Division files and provided for review to any persons demonstrating a research interest in such structures.

   c. Any new construction proposed for the sites of the SIOU shall be provided to the SHPO for review and comment.

2. **Resolving Objections**

   a. Once the remediation/demolition phase of the undertaking has begun, should the SHPO or the Council object to activities related to the undertaking and pursuant to this MOA, the DOE ORO shall consult with the objecting party to resolve the objection. All actions under this MOA that are not the subject of the objection shall remain unchanged.

   b. If DOE ORO determines that the objection cannot be resolved, DOE ORO shall forward all documentation relevant to the dispute to the Council. Within 30 days of receipt of this documentation, the Council will either

      i. Provide DOE ORO with recommendations which DOE ORO will take into account when reaching a final decision regarding the dispute or

      ii. Notify DOE ORO that it will comment pursuant to 36 CFR 800.6(b) and proceed to comment. Any such comment will be taken into account by DOE ORO in accordance with 36 CFR 800.6(c)(2) when reaching a final decision regarding the dispute.

   c. Should the Council not exercise one of the above options within 30 days after receipt of all pertinent documentation, DOE ORO may assume the Council's concurrence in its proposed response to the objection.

3. Administrative Stipulations

a. **Definition of Parties.** For the purposes of this MOA, the term *parties to this MOA* means DOE ORO, the SHPO, and the Council, each of which has authority under 36 CFR 800.5(e)(6) to terminate the consultation process.

b. **Alterations to Project Documents.** DOE ORO shall not alter any plan, scope of services, or other document that has been reviewed and commented on pursuant to this MOA (except to finalize documents commented on in the draft) without first affording the SHPO and Council an opportunity to review the proposed change and determine whether it shall require that this MOA be amended. If one or more of the above parties determines that an amendment is needed, the parties to this MOA shall consult in accordance with 36 CFR 800.5(e) to consider such an amendment.

c. **Amendments.** Any party to this MOA may propose to DOE ORO that the MOA be amended, whereupon DOE ORO shall consult with the other parties to this MOA to consider such an amendment. 36 CFR 800.5(e) shall govern the execution of any such amendment.

d. **Termination.**

i. If DOE ORO determines that it cannot implement the terms of this MOA, or if the SHPO or Council determines that the MOA is not being properly implemented, DOE ORO, the SHPO, or the Council may propose to the other parties to this MOA that it be terminated.

ii. The party proposing to terminate this MOA shall so notify all parties to this MOA explaining the reasons for termination and affording them at least 30 days to consult and seek alternatives to termination.

iii. Should such consultation fail and the MOA be terminated, DOE ORO shall either consult in accordance with 36 CFR 800.5(e) to develop a new MOA or request the comments of the Council pursuant to 36 CFR 800.5(e)(6).

Execution of this MOA by DOE ORO and the SHPO, its subsequent acceptance by the Council, and implementation of its terms serve as evidence that DOE ORO has afforded the Council an opportunity to comment on the Waste Area Grouping 1 Surface Impoundments Operable Unit Remediation undertaking and that DOE ORO has taken into account the effects of the proposed undertaking on the 3513 Settling Basin, 3524 Process Waste Systems Basin, and the ORNL Historic District, which are eligible for inclusion in the National Register.

DEPARTMENT OF ENERGY, OAK RIDGE OPERATIONS OFFICE

By: _____ Date: 2-28-95

Peter J. Gross, Director, Environmental Protection Division

TENNESSEE HISTORICAL COMMISSION

By: _____ Date: 3/7/95

Herbert L. Harper, Executive Director and
Deputy State Historic Preservation Officer

ACCEPTED for the Advisory Council on Historic Preservation

By: _____ Date: 4/20/95

SECTION 110(b) DOCUMENTATION

TITLE: The title of documentation prepared pursuant to Section 110(b) of the National Historic Preservation Act should follow the following format:

National Historic Preservation Act Section 110(b) Documentation for {*Project Title*}

Section 110(b) documentation should contain at least four primary sections: Proposed Action, Location of Action, Site and Facilities Description, and References. Information contained in each of these sections is described below.

PROPOSED ACTION: Because Section 110(b) documentation will be initiated almost invariably as a result of a proposed action that would have an adverse effect on properties that are included or eligible for inclusion in the National Register of Historic Places, each Section 110(b) document should begin with a description of the proposed action. The description should begin with the statement, "The U.S. Department of Energy Oak Ridge Operations Office (DOE ORO) proposes to . . . ." The preferred format is to divide the proposed action into its basic components/activities and to describe them in an enumerated fashion.

LOCATION OF ACTION: This section should contain a description of the location of the proposed action and/or the location of the properties for which the Section 110(b) documentation is being prepared and should include maps showing the location of the proposed action and/or properties.

SITE AND FACILITIES DESCRIPTION: This section should contain a detailed discussion of the history of the properties for which the documentation is being prepared. Wherever possible and appropriate, this discussion should incorporate photographic documentation (present and historical photographs) and detailed engineering drawings of the facilities, including equipment schematics (present and historical drawings and schematics).

REFERENCES: This section should contain an alphabetical listing of any references that are cited in the documentation.

APPENDIX G

PROGRAMMATIC AGREEMENT AND CORRESPONDENCE WITH NATIVE AMERICAN TRIBES

PROGRAMMATIC AGREEMENT G-3

CORRESPONDENCE WITH NATIVE AMERICAN TRIBES

July 29, 1994, letter to the Cherokee Nation of Oklahoma
from Ray T. Moore, DOE ORO G-15

July 29, 1994, letter to the Eastern Band of Cherokee Indians
from Ray T. Moore, DOE ORO G-17

Advisory Council On Historic Preservation

The Old Post Office Building
1100 Pennsylvania Avenue, NW, #809
Washington, DC 20004

MAY 9 1994

Mr. Peter J. Gross
Director,
Environmental Protection Division
Department of Energy
Oak Ridge National Laboratory
P.O. Box 2001
Oak Ridge, TN 37831-8739

REF: Programmatic Agreement for management of historic and cultural properties at Oak Ridge

Dear Mr. Gross:

Enclosed is your copy of the fully executed Programmatic Agreement for the referenced program. By carrying out the terms of the Agreement, you will have fulfilled your responsibilities under Sections 106 and 110 of the National Historic Preservation Act and the Council's regulations. A copy of the Agreement has also been sent to the Tennessee State Historic Preservation Officer.

We appreciate your cooperation, and that of your staff, in reaching this Agreement.

Sincerely,

John L. Klima
Director
Eastern Office of Review

Enclosure

PROGRAMMATIC AGREEMENT
AMONG
THE DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE
THE TENNESSEE STATE HISTORIC PRESERVATION OFFICER
AND
THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
CONCERNING MANAGEMENT OF HISTORICAL AND CULTURAL PROPERTIES AT THE OAK RIDGE RESERVATION

WHEREAS, the United States Department of Energy Oak Ridge Operations Office (DOE/ORO) proposes the continued operation, maintenance, research, development, waste management, decontamination/decommissioning, and restoration activities (herein referred to as "Activities") at the Oak Ridge Reservation (ORR) including all properties as set forth on the map attached as Figure 1 and have determined these Activities will have an effect upon historic resources included in and eligible for inclusion in the National Register of Historic Places (National Register), and

WHEREAS, DOE/ORO has consulted with the Advisory Council on Historic Preservation (Council) and the Tennessee State Historic Preservation Officer (SHPO) pursuant to Section 800.13 of the regulations (36 CFR Part 800) implementing Sections 106 and 110 of the National Historic Preservation Act (16 U.S.C. §§ 470f and 470h-2), and

WHEREAS, the origins of the ORR lie with the World War II Manhattan Project for the development of the atomic bomb and subsequently many other significant atomic energy research, development, and production activities have taken place at the ORR and several of the scientific and highly technological facilities associated with these activities are still in existence;

NOW, THEREFORE, the DOE/ORO, the Council, and the SHPO agree that the Activities at the ORR shall be administered in accordance with the following Programmatic Agreement ("Agreement") to satisfy the DOE/ORO's responsibilities for compliance with Section 106 and Section 110 of the National Historic Preservation Act (NHPA) for all individual undertakings.

STIPULATIONS

The DOE/ORO shall ensure that the following measures are carried out.

I. DEVELOPMENT OF A MANAGEMENT PLAN FOR HISTORICAL AND CULTURAL RESOURCES (CULTURAL RESOURCES MANAGEMENT PLAN) FOR THE OAK RIDGE RESERVATION

A. To ensure that historic and cultural resources receive full consideration during the Activities at the ORR, the DOE/ORO shall develop and implement a Cultural Resources Management Plan (CRMP) for the ORR. The goal of the CRMP is to formally establish and document the means by which consideration of historic and cultural resources are integrated into the decision-making process for the Activities at the ORR. The CRMP will provide for the development and implementation of procedures, methods, and responsibilities for the identification of historic and cultural resources and determine appropriate treatments

that strike a balance between their historic and cultural significance and the necessary DOE/ORO Activities that may impact them.

B. The CRMP shall be developed in consultation with the SHPO and the Council. The CRMP will be prepared in accordance with the DOE's Environmental Guidelines for Development of Cultural Resources Management Plans, the Secretary of the Interior's Standards and Guidelines for Preservation Planning (48 FR 44716-20), the Section 110 Guidelines (52 FR 4727-46), the recommendations and conclusions contained in the Council's recent report to Congress, Balancing Historic Preservation Needs with the Operation of Highly Technical or Scientific Facilities, and will be consistent with the draft Council guidance document entitled Historic Resource Management Plans and other standards or guidelines prepared by the SHPO for Preservation planning.

C. Within 24 months after the date of ratification of this Agreement, the DOE/ORO will provide copies of the draft CRMP to the SHPO and the Council for 30 days' review and comment. Copies of the CRMP will also be provided to appropriate town/county authorities and local preservation organizations for review and comment. Disagreements or questions about the draft CRMP will be resolved by the DOE/ORO through consultation among the parties to this Agreement in accordance with Stipulation V. below.

D. The CRMP shall incorporate systematic intensive surveys, inventories, and reviews (herein referred to as "Survey") of the ORR when and as they are completed. The Survey (described below in II.) shall provide the initial foundation for determinations made to ensure compliance with Sections 106 and 110 of the NHPA.

II. CULTURAL RESOURCES SURVEY AND INVENTORY

A. DOE/ORO will conduct, or cause to be conducted, a Survey to identify significant historical properties located within the ORR. This Survey and other elements associated with the Survey listed below will be incorporated into the CRMP. The Survey will be conducted in a manner consistent with Section 110(a)(2) of the NHPA, the Department of Interior's Guidelines for Archeology and Historic Preservation (48 FR 44716, September 29, 1983), and applicable DOE standards.

B. The Survey shall be initiated as soon as possible after the ratification of this Agreement and will be conducted in a phased approach. Existing information such as previous survey data, photographs, maps, drawings, building plans, descriptions, sketches, etc. shall be used where possible and where appropriate (photographs, drawings, and building plans may not be available in some situations due to security classification priorities) along with new data and material developed by investigators.

1. Properties to be identified and evaluated shall include but not be limited to (a) archeological materials (artifacts) and sites

dating to the prehistoric and historic periods; (b) standing structures that are 50 years of age and/or are important because they represent a major historical theme; (c) cultural and natural places that have importance for American folklife traditions (e.g., remains of old homesteads and/or farms that predated the establishment of ORR or that are of traditional cultural importance for Native Americans), and (d) Manhattan Project and Cold War scientific facilities.

2. Properties which have been previously identified and those identified through this Survey which are included or eligible for inclusion in the National Register will be recorded and maintained in an active database as specified in the CRMP that will be developed and is discussed in I. above.

3. This Survey shall be conducted and performed by qualified professionals with appropriate background, education, and experience which at a minimum will include the Secretary of the Interior's Professional Qualifications Standards (48 Federal Register 44738-9) or other standards which are deemed to be otherwise qualified by the SHPO and shall be in conformance with the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation. The contractor will be chosen from a list that has been approved by the SHPO to perform the Survey. The results of the Survey will be presented to the SHPO for concurrence.

4. In the interim before the Survey is completed, any project that is determined to be an undertaking will be submitted to the SHPO for review before project initiation. Undertakings that involve new construction or physical modifications which could affect a property included or eligible for inclusion in the National Register shall be conducted in compliance with the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings.

C. Archeological surveys will be ongoing as dictated by proposed construction/disturbance activities in previously undisturbed areas and will be conducted in a manner to allow for consultation and coordination with the SHPO.

D. Properties identified as historically significant through the Survey shall be evaluated in accordance with 36 CFR Part 800 and in consultation with the SHPO. If this evaluation determines that there are properties eligible for inclusion in the National Register, DOE/ORO, in consultation with the SHPO, shall nominate individual properties or historical districts to the Keeper of the National Register.

E. If the DOE/ORO and the SHPO do not agree on National Register eligibility, or if the Council or the National Park Service so request, the DOE/ORO shall request a formal determination of

eligibility from the Keeper of the National Register, National Park Service, whose determination shall be final.

F. Undertakings proposed for those areas/districts and properties that have been surveyed but are not included and were not identified (and concurred by the SHPO) as eligible for inclusion or nomination in the National Register may proceed with no further investigation and no additional coordination with or notification to the SHPO.

III. INTERIM PROGRAMMATIC EXCLUSIONS FROM SECTION 106 REVIEW

A. Until such time as the CRMP is finalized and implemented, the following criteria will be used to determine the extent of DOE/ORO's Section 106 Review responsibilities:

1. If the activity <u>will not</u> impact primary scientific facilities or equipment that were originally constructed <u>prior to</u> January 1, 1960, (or is addressed under item C of this section below) <u>and</u> will not result in ground disturbance (or is addressed under item D of this section below), then the activity is excluded from further Section 106 review.

2. If the activity <u>will</u> impact primary scientific facilities or equipment that were originally constructed <u>prior to</u> January 1, 1960, (or is addressed under item C of this section below) or <u>will</u> result in ground disturbance (or is addressed under item D of this section below), <u>and</u>

   a. <u>is</u> a programmatic exclusion listed in Section IV below, then DOE/ORO shall apply the Council's Criteria of Adverse Effect (36 CFR Part 800.9(b)) to the activity.

      (1) If DOE/ORO finds that the activity will not have an adverse effect to historic properties at or adjacent/appurtenant to the area of the activity, it can be initiated and completed with no review by either the SHPO or the Council.

      (2) If the activity will have an adverse effect, DOE/ORO shall contact the SHPO and initiate the review procedures set forth in the Council's regulations beginning at 36 CFR Part 800.5(e)-800.6.

   b. <u>is not</u> a programmatic exclusion listed in Section IV below, then DOE/ORO shall contact the SHPO and initiate the review procedures set forth in the Council's regulations beginning at 36 CFR Part 800.5.

B. Pursuant to Part III.A.2.a.(2) and b. above, if the SHPO and DOE/ORO agree on measures to be implemented by DOE/ORO that will result in no adverse effect to the historic property (as determined by applying the exceptions to the Criteria of Adverse Effect, 36 CFR Part 800.9(c)),

such activities need not be reviewed by the Council. However, DOE/ORO shall retain all project documentation for possible review by the Council. Appropriate measures that may be implemented by DOE/ORO to avoid, reduce, or mitigate project effects include, but are not limited to:

1. resiting the proposed activity, where feasible;

2. rehabilitation in accordance with "The Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings;"

3. additions to historic buildings and structures that takes into account the significant architectural characteristics of the original building or structure;

4. salvage of architectural or scientific/engineering elements where feasible;

5. recordation as a last resort when other mitigation measures are determined, in consultation with the SHPO, to be infeasible. Recordation shall include photographs, floorplans, and drawings (when not precluded because of security classification priorities) to the standards of the Historic American Buildings Survey or the Historic American Engineering Record (HABS/HAER: National Park Service, Washington DC). No undertaking shall be initiated until this documentation is accepted by the SHPO.

C. When an activity is proposed for an area in which DOE/ORO has completed its historic properties survey (and the survey has been accepted by the SHPO), DOE/ORO shall consult the survey to determine if the activity has the potential to affect properties eligible or included in the National Register instead of using the 1960 cutoff date set forth above. If this potential exists, the DOE/ORO shall initiate the procedures set forth above at III.B.

D. Archeology:

1. When a ground disturbance activity is proposed in a previously undisturbed area and an archeological survey (that has been reviewed and accepted by the SHPO) has determined that no National Register included or eligible archeological properties will be affected by the proposed activity, DOE/ORO may proceed with the project with no further review by either the SHPO or the Council.

2. When a ground disturbance activity is proposed in a previously undisturbed area where there has been no archeological survey reviewed and accepted by the SHPO, DOE/ORO shall contact the SHPO to determine whether an archeological survey is warranted prior to initiation of the activity.

3. When a ground disturbance activity is proposed in an area where previous ground disturbance activities have occurred, DOE/ORO may proceed with the activity without consulting the SHPO or the Council regarding the need for an archeological survey so long as the depth and the extent of new disturbance does not exceed the depth and extent of previous disturbances.

4. If archeological properties are located by a survey, the DOE/ORO shall consult with the SHPO to determine the property's National Register eligibility; if found to be eligible, DOE/ORO shall further consult with the SHPO to determine appropriate measures that might avoid, reduce, or mitigate the activity's effects to the site.

5. If the SHPO and DOE/ORO agree to measures that will result in no adverse effect to the archeological property (as determined by applying the Criteria of Effect and Adverse Effect, 36 CFR Part 800.9 [a-c]), such activities need <u>not</u> be reviewed by the Council. However, DOE/ORO shall retain all project documentation for possible review by the Council.

IV. PROGRAMMATIC EXCLUSIONS

A. <u>General Equipment</u>:

Direct replacement or removal of equipment or facility components.

B. <u>Process and Lab Equipment</u>:

Installation, maintenance, repair, storage, relocation, removal or replacement of process or lab equipment and associated systems such as: presses, rolling mills, foundry equipment, cranes, glove boxes and hoods, fans and tanks, ultrasonic cleaners, machine shop equipment, heat exchangers, ovens and furnaces, salt baths, centrifuges, bag houses and scrubbers, conveyors, motors, piping, valves, autoclaves, compressors, pumps, hydroforms, recovery equipment, metal forming equipment, inspection equipment, motor control centers, and cyclone separators.

C. <u>Water Systems</u>:

Siting, installation, maintenance, repair, removal, and operation of plant water systems including, but not limited to: water wells, cooling water systems, potable water systems, storm sewers, waste water treatment systems, plant drainage, and plumbing.

D. <u>Electrical Systems</u>:

Installation, maintenance, repair, removal, or replacement of plant and building electrical systems including, but not limited to: switchyards, building conduit, wiring and lighting, emergency

lighting, circuits and wiring, meters, transformers, utility poles, crossarms, and insulators and downed transmission lines.

E. Communications and Computer Systems:

Siting, installation, maintenance, repair, removal, or replacement of communications and computer systems, including: public address systems, facsimile systems, microwave/radio systems, fiber optic cables, phone systems, and computers and peripheral systems including transmitters.

F. Routine Plant Service Activities:

Mowing and trimming of grass, shrubs, or trees; moving and assembling of furniture and equipment; snow removal; routine vegetation and erosion control activities; janitorial and housekeeping services; small scale use of pesticides; small scale road, sidewalk, and parking lot repair; maintenance and repair of plant vehicles and heavy equipment; maintenance of plant safe/vaults and locks; busing and plant transportation; minor relocation of access roads; maintenance or repair of industrial machinery; maintenance, repair, or installation of fencing; maintenance, repair, or installation of indoor or outdoor signs; construction of scaffolding, calibration, testing, repair, and maintenance of laboratory and/or electronic equipment; corrective and preventative actions to maintain and preserve buildings, structures, and equipment in a suitable condition; and routine decontamination of tools, surfaces, and equipment.

G. Waste Treatment, Storage and Disposal Activities:

Operation and maintenance of waste treatment, storage, and disposal facilities; maintenance of landfills; spill cleanup activities; maintenance, repair or replacement of liquid retention tanks, dikes, and piping; and maintenance, or repair of lagoons and small basins.

H. Repair and Maintenance of Buildings:

Maintenance, repair, modification, or direct in kind replacement (when available) associated with structures or buildings including, but not limited to: painting, siding, roofing, mounting and hanging wall items; door, ceiling, wall, window, floor, and floor covering repair/replacement; cabinet and shelf fabrication and installation; and elevator repair.

I. Occupational Safety and Health Act Regulations and Permit Compliance:

Installation, maintenance, repair, or replacement of equipment used in current operations designed to maintain compliance with permits and Occupational Safety and Health Act regulations and Americans With Disabilities Act regulations.

J. Hazard Prevention:

Installation and maintenance required for hazard prevention including: fabrication, removal, installation, and repair of safety railings, machine guards, hand rails, guard rails, ladders, frames, and fences; installation of nonskid surfaces and anchoring floor mats; and grounding of structures and equipment.

K. Security Systems:

Installation, maintenance, removal, and repair of security systems, including: computer security, detection, monitoring, surveillance, and alarm systems.

L. Heating and Air Conditioning Systems:

Installation, maintenance, removal, repair, or replacement of heating, ventilating, air conditioning systems, and high efficiency particulate air filters.

M. Steam Condensate/Chemical Treatment Systems:

Modification to steam/condensate systems including, but not limited to: repair or replacement of associated piping, pumps, and condensers to maintain system integrity (excluding above ground steam lines); extension of systems to accommodate new construction or building modification; and repair of any associated chemical treatment systems.

N. Removal of Asbestos:

Asbestos removal and renovation activities including cleanup, encapsulation, and removal and/or disposal of asbestos-containing materials from existing buildings and structures.

O. Removal of Polychlorinated Biphenyl Contaminated Items:

Removal of Polychlorinated Biphenyl contaminated items such as electrical transformers and capacitors possibly requiring temporary removal of walls, ceilings, fences, power lines, or other obstacles which would prevent forklift or crane access to the item targeted for removal. Some transformers may have contaminated pads and/or soil around the base. The surrounding substrate will be sampled and, if determined to be contaminated, will be excavated and removed.

P. Fire Protection System:

Routine upgrades and modifications to fire protection systems including fire alarm systems, smoke detectors, and sprinkler systems.

Q. Personnel Safety:

Installation or modification of personnel safety systems and devices including, but not limited to: safety showers, eye washes, emergency exit lighting systems, emergency ingress/egress routes; protective additions to electrical equipment; personnel accountability/assembly systems and stations; improvements to walking and working surfaces or areas; fabrication and installation of platforms, rails, shields and guards; and stairway modifications and installations.

R. Environmental Monitoring:

Installation, operation, maintenance, repair, replacement, or abandonment of environmental devices/stations, including, but not limited to: monitoring wells and well-monitoring devices, monitoring weirs, flow meters, rain gauges, sampling devices, meteorological towers, instrumentation/equipment buggies, geochemical/geophysical monitoring and survey devices; and actions necessary for conducting site monitoring and characterization activities including, but not limited to: sampling water, soil, rock, flora, and fauna.

S. Routine Activities:

Routine administrative, contractual, security, preventative maintenance, financial, or personnel activities.

T. Training, Planning, and Tests:

Training exercises; emergency preparedness planning; various tests and demonstrations including, but not limited to: transport packaging tests for radioactive/hazardous material, tank car tests, research and development demonstrations, and small scale pilot demonstrations.

U. Habitat Protection:

Actions in researching, protecting, restoring, or improving fish and wildlife habitat.

V. Energy Conservation:

Actions to conserve energy.

W. Emergency Situations:

Activities required by emergency situations, (i.e., health and safety-related emergencies) as determined on a case-by-case basis including those emergency activities in compliance with Federal, State, or local regulatory requirements including, but not limited to: State/ Environmental Protection Agency, Federal Facility Agreements; Comprehensive Environmental Response, Compensation, and Liability Act; Resource Conservation and Recovery Act; Superfund Amendments and Reauthorization Act; Occupational Safety and Health Act, etc.

Emergency activities that will have an effect to historic properties shall be handled in accordance with 36 CFR Part 800.12.

V. AGREEMENT REVIEW

A. Any party to this Agreement may request a review of the terms of this Agreement in the event the need arises. If revisions are needed, the parties will consult to make such revisions in a manner consistent with 36 CFR Part 800.13.

B. The Council and the SHPO may monitor activities carried out pursuant to this Agreement, and the Council will review such activities if so requested. DOE/ORO will cooperate with the Council and the SHPO in carrying out their monitoring and review responsibilities.

C. Any party to this Agreement may terminate it by providing 60 days notice to the other parties providing that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, DOE/ORO will comply with 36 CFR Parts 800.4 through 800.6 with regard to all individual undertakings for activities at the ORR.

VI. DISPUTE RESOLUTION

The DOE/ORO and the SHPO shall jointly attempt to resolve any disagreement arising from implementation of this Agreement. If the DOE/ORO determines that the disagreement cannot be resolved, the DOE/ORO shall request the further comments of the Council in accordance with 36 CFR Part 800.6(b). Any Council comment provided in response will be considered by the DOE/ORO in accordance with 36 CFR Part 800.6(c)(2), with reference only to the subject of the dispute. The DOE/ORO's responsibility to carry out all other actions under this Agreement are not the subject of dispute and will remain unchanged.

Execution and implementation of this Agreement evidences that DOE/ORO has satisfied its Section 106 and 110 responsibilities for all individual undertakings related to the Activities of the ORR.

DEPARTMENT OF ENERGY OAK RIDGE OPERATIONS OFFICE

By: _____ Date: 12-20-93

TENNESSEE HISTORIC PRESERVATION OFFICER

By: _____ Date: 1/17/94

ADVISORY COUNCIL ON HISTORIC PRESERVATION

By: _____ Date: 5-6-94

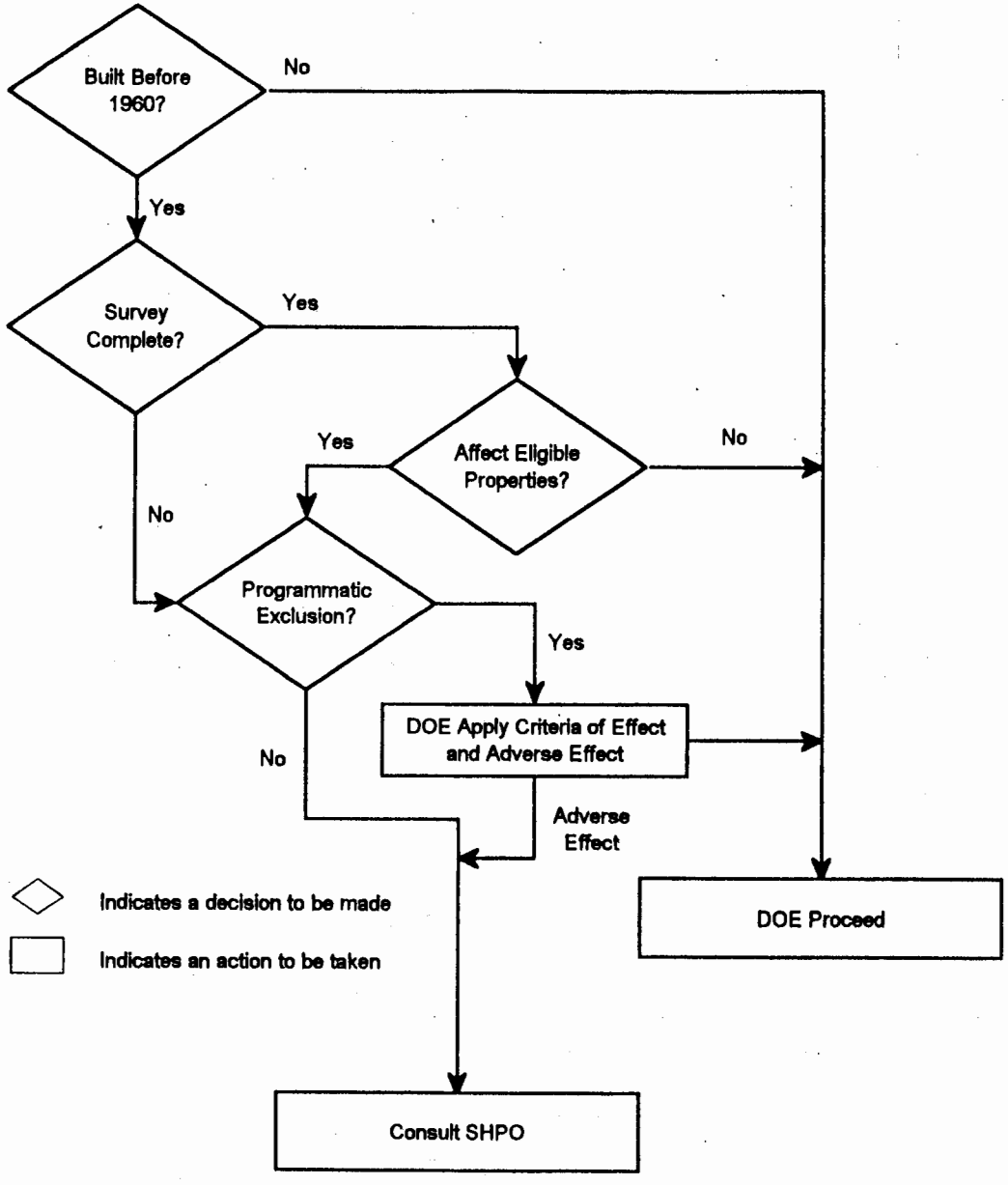

Fig. G.1. Review process using the PA for determining Section 106 documentation and consultation requirements for actions impacting extant structures.

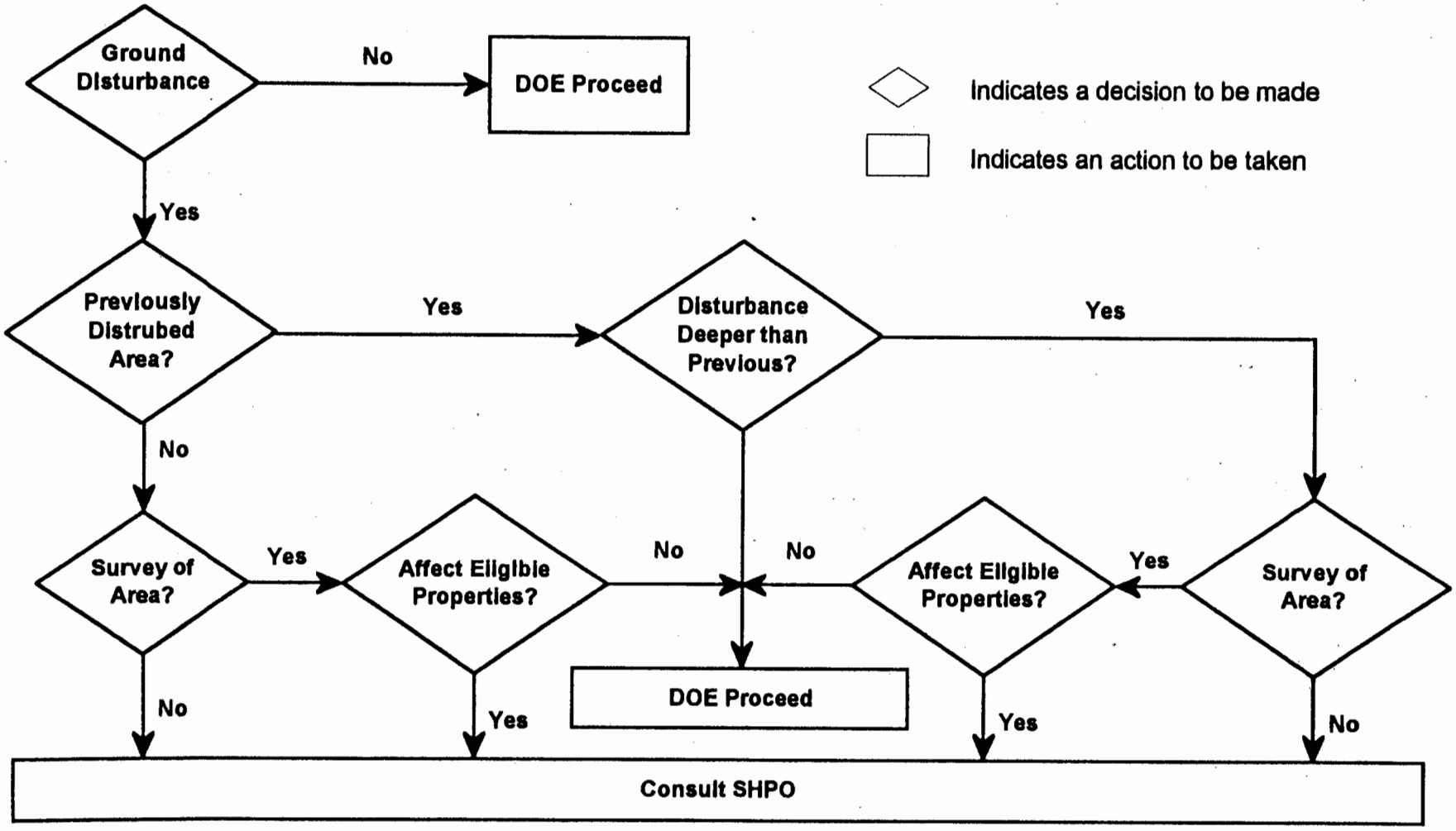

Fig. G.2. Review process for determining Section 106 documentation and consultation requirements for action involving ground-disturbing activities.

Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831— 8739

July 29, 1994

MS 6282
Bldg. 130 MT

Cherokee Nation of Oklahoma
Post Office Box 948
Tahlequah, Oklahoma 74465

Cherokee Nation of Oklahoma:

The U.S. Department of Energy Oak Ridge Operations (DOE ORO) is currently preparing a Cultural Resource Management Plan (CRMP) for the Oak Ridge Reservation (ORR), Anderson and Roane Counties, Tennessee. As a part of the preparation of the CRMP, we are requesting comments from interested parties concerning matters related to archaeological resources. DOE ORO is requesting any comments you may have as a Native American representative concerning matters related to Native American burials that might be encountered during future archaeological surveys or construction activities on the ORR.

Specifically we are requesting your comments concerning notification, any special treatment, and disposition of the human remains that might be discovered on the ORR. Presently DOE ORO does not have any proposed plans to conduct any major archaeological investigations on the ORR in the near future.

Your input and comments would be appreciated as a part of the process for the preparation of the ORR CRMP. Thank you in advance for your comments. If you have any questions you may call me at 615-576-9574.

Sincerely,

Ray T. Moore

Ray T. Moore
DOE ORO Cultural Resource
Management Coordinator

Department of Energy

Oak Ridge Operations
P.O. Box 2001
Oak Ridge, Tennessee 37831— 8739

July 29, 1994

MS 6282
Bldg. 130 MT

Eastern Band of Cherokee Indians
Post Office Box 455
Cherokee, NC 28719

Eastern Band of Cherokee Indians:

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Sincerely,

Ray T. Moore

Ray T. Moore
DOE ORO Cultural Resource
Management Coordinator

APPENDIX H

ARTIFACTS CURATED AT UTK

Table H-3

Table H.1. Artifacts curated at UTK

Site No.	Type 1	Type 2	Type 3	Type 4	Type 5	Ceramics
40AN25	62	2				
40AN26	22	1				
40AN27	174	6			6	
40AN29	206	15			6	
40AN30	20					
40AN31	3		2			
40RE27	3	2	1		1	3
40RE86						
40RE89	146	18			4	328
40RE90	27	5	2		1	
40RE101	425	17	3	2	4	
40RE103	122	6		1	1	
40RE104	1	1				
40RE106	56	6		2	3	1
40RE109A	391	26	8	10	32	3
40RE109B	216	24	5	4	13	
40RE110				1	1	1
4ORE111	143	9	2		10	
40RE125	3		1			
40RE126	118	29	12	8	73	
40RE127	2			1		
40RE131	6	1		1	1	
4ORE132	174	16	5	1	7	
40RE133	17	2				
40RE134	46	4	1	1	2	
40RE135					1	

Explanation for Table H.1:

Artifact Type 1—Primary Lithic
Hammerstone
Crude subconical core
Discoidal core
Amorphous core
Core trimming flake
Flat flake
Bifacial thinning flake
Utilized flake
Miscellaneous retouched flake

Artifact Type 2—Unifacial Implements
End scraper on flake
Side scraper on flake
Transverse side scraper
Notched flake
Spokeshave
Denticulate flake
Perforator
Graver
End and side scraper
End scraper/graver
Miscellaneous unifacial implements

Artifact Type 3— Bifacial Implements
Thick bifacial: blank, roughout
Knife, including asymmetrical knife
Preform: knife
Core scraper
End scraper
Chisel
Side scraper
Perforator

Artifact Type 4—Ground Stone Implements
Pecked cobble
Pecked pebble
Pitted cobble, Type B
Pitted cobble, Type D
Pitted cobble, Type F
Ground and battered cobble, Type A
Ground and faceted hematite
Celt, green slate (greenstone)
Green slate fragment
Worked igneous rock fragment
Worked steatite

Artifact Type 5—Projectile Points/Knives
Small triangular, thin narrow excurvate blade
Small triangular, thin narrow incurvate blade
Small triangular, thick narrow straight blade
Medium-large triangular, straight-excurvate blade
Unidentifiable broken triangular
Narrow thick lanceolate expanded stemmed
Medium-large wide shallow side notched blade
Small shallow side notched
Small corner notched, thin blade
Medium corner notched, elongate blade
Small triangular, thick narrow, incurvate blade
Small triangular, thin narrow straight blade
Pentagonal
Medium-large triangular, recurvate elongate blade
Narrow thick lanceolate stemmed
Narrow thick lanceolate side notched
Medium-large shallow side notched, narrow
Undifferentiated side notched
Small-medium corner notched
Small-medium expanded stemmed

Artifact Type 5—Projectile Points/Knives (continued)

Small-medium short straight stemmed

Medium undifferentiated expanded stemmed

Medium contracting stemmed, narrow blade, weak shouldered

Medium short rounded stemmed, strong shouldered

Medium short stemmed, unfinished blade

Medium-large straight stemmed, weak shouldered

Medium straight stemmed, narrow blade strong shouldered

Large crude straight stemmed

Small-medium corner removed

Medium-large short rounded base, wide blade

Medium-large corner notched, straight base

Medium corner notched, straight base

Small-medium short expanded stemmed, bifurcate base, narrow blade

Medium short expanded stemmed, bifurcate base, wide blade, barbed

End scraper, reworked on projectile point/ knife

Small-medium narrow expanded stemmed, slight barb, narrow blade

Large wide contracting stemmed

Medium short straight-rounded stemmed, weak shouldered

Medium round stemmed, narrow blade

Medium straight stemmed, narrow blade

Medium short straight stemmed, narrow blade

Asymmetrical stemmed knife

Medium-large corner removed, wide blade

Medium-large basal notched, wide blade

Large corner notched, straight base

Medium-large corner notched, excurvate base

Medium short expanded stemmed, serrated blade

Small-medium expanded stemmed, bifurcate base, narrow blade, weak shouldered

Unidentifiable broken distal ends

Ceramics

Grit-tempered plain
Grit-tempered cord-marked
Limestone-tempered cord-marked plain
Shell-tempered cord-marked
Shell-tempered filleted rims
Shell-tempered incised (Dallas)
Shell-tempered plain
Shell-tempered salt pan