10-Year Site Plan

FY 2009 to FY 2018

ORNL/TM-2007/15

ORNL 2007/G00230/aas

Managed by
UT-Battelle for the
U.S. Department of Energy

OAK RIDGE
National Laboratory

ORNL/TM-2007/15

Oak Ridge National Laboratory
Ten-Year Site Plan

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July 2007

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The information in the *Oak Ridge National Laboratory Ten-Year Site Plan* was obtained with the cooperation of the professional staff of the Oak Ridge National Laboratory. For additional information, contact

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ORNL Creative Media Division.

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Acronyms and Abbreviations

ACI	Asset Condition Index
ADS	Activity Data Sheet
AFP	Approved Financial Plan
AMSE	American Museum of Science and Energy
ASCR	Office of Advanced Scientific Computing Research (DOE)
ATDD	Atmospheric Turbulence Diffusion Division
AUI	Asset Utilization Index
BER	Biological and Environmental Research
BES	Basic Energy Sciences
BJC	Bechtel Jacobs Company
BWXT	BWX Technologies
CAIS	Condition Assessment Information System
CAMP	Capital Asset Management Prioritization
CCCP	Central Campus Closure Project
CD-0	Critical Decision-0
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFD	computational fluid dynamics
CH	contact handled
CLO	Central Laboratory and Office
CNMS	Center for Nanophase Materials Sciences
CNS	Center for Neutron Scattering
CO_2	carbon dioxide
CROET	Commercial Reuse Organization of East Tennessee
D&D	decontamination and decommissioning
DDC	direct digital control
DHS	U.S. Department of Homeland Security
DHHS	Department of Health and Human Services
DM	Deferred Maintenance
DMR	Deferred Maintenance Reduction
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE-ASCR	U.S. Department of Energy Office of Advanced Scientific Computing Research
DOE-BER	U.S. Department of Energy Biological and Environmental Research Program
DOE-BES	U.S. Department of Energy Office of Basic Energy Sciences
DOE-EERE	U.S. Department of Energy Office of Energy Efficiency and Renewable Energy
DOE-EM	U.S. Department of Energy Environmental Management
DOE-FES	U.S. Department of Energy Fusion Energy Sciences Program
DOE-NE	U.S. Department of Energy Nuclear Energy
DOE-NP	U.S. Department of Energy Nuclear Physics Program
DOE-OE	U.S. Department of Energy Office of Electricity Delivery and Energy Reliability
DOE-ORO	U.S. Department of Energy Oak Ridge Office
DOE-SC	U.S. Department of Energy Office of Science
EFDP	Excess Facilities Disposition Program
EM	Environmental Management Program (DOE)

EPACT	Energy Policy Act
ES&H	environment, safety, and health
ESD	Environmental Sciences Division
ETTP	East Tennessee Technology Park
FACE	Free Air CO_2 Enrichment
FCI	Facility Condition Index
FEMP	Federal Energy Management Program
FES	Fusion Energy Sciences Program (DOE)
FIMS	Facility Information Management System
FRP	Facility Revitalization Program
FY	fiscal year
GPE	general-purpose equipment
GPP	general plant project
gsf	gross square feet
GTL	Genomes to Life
HFIR	High Flux Isotope Reactor
HRIBF	Holifield Radioactive Ion Beam Facility
HTML	High Temperature Materials Laboratory
HVAC	heating, ventilation, air conditioning
Hz	hertz
IBM	International Business Machines
IFC	Integrated Field Challenge
IFDP	Integrated Facility Disposition Project
IFI	Integrated Facilities and Infrastructure
IGPE	institutional general-purpose equipment
IGPP	institutional general plant project
ITER	International Thermonuclear Experimental Reactor
JIBS	Joint Institute for Biological Sciences
JICS	Joint Institute for Computational Sciences
JINS	Joint Institute for Neutron Sciences
LCF	Leadership Computing Facility
LCFG	Laboratory for Comparative and Functional Genomics
LEED®	Leadership in Energy and Environmental Design
LI	Line Item
LLLW	liquid low-level (radioactive) waste
LLW	low-level (radioactive) waste
LTS	long-term stewardship
LWTS	Long-Wavelength Target Station
M&O	management and operating
MARS™	Maintenance and Repair System (Whitestone Research Corporation)
MII	Maintenance Investment Index
MOU	Memorandum of Understanding
MRF	Multiprogram Research Facility
MV	Melton Valley

NASA	National Aeronautics and Space Administration
NE	Office of Nuclear Energy (DOE)
NEON	National Ecological Observatory Network
NIH	National Institutes of Health
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NP	Nuclear Physics Program (DOE)
NRC	Nuclear Regulatory Commission
nsf	net square feet
NSF	National Science Foundation
NTRC	National Transportation Research Center
NTTRC	National Transmission Technology Research Center
NUSF	net usable square feet
ORCAS	Oak Ridge Center for Advanced Studies
ORISE	Oak Ridge Institute for Science and Education
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Office (DOE)
ORR	Oak Ridge Reservation
OSF	Other Structures and Facilities
OSHA	Occupational Safety and Health Administration
PCAT	Powerline Conductor Accelerated Testing
R&D	research and development
REDC	Radiochemical Engineering Development Center
RH	remotely handled
RIC	Rehabilitation and Improvement Cost
RPM	Risk Prioritization Model
RPV	Replacement Plant Value
RSC	Research Support Center
S&M	surveillance and maintenance
S&T	Science and Technology
SANS	Small-Angle Neutron Scattering
SC	Office of Science (DOE)
sf	square feet
SHaRE	Shared Research Equipment Program
SLI	Science Laboratories Infrastructure
SLI-EFDP	Excess Facilities Disposition Program funded by SLI
SNS	Spallation Neutron Source
TEAM	Transformational Energy Action Management (DOE Secretarial initiative)
TRIC	Total Rehabilitation and Improvement Cost
TRU	transuranic
TSCI	Total Summary Condition Index
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
TYSP	Ten-Year Site Plan

UT	University of Tennessee
UTK	University of Tennessee–Knoxville
VFD	variable-frequency drive
WBW	Walker Branch Watershed

1. Executive Summary

Oak Ridge National Laboratory (ORNL) is the Department of Energy's (DOE's) largest science and energy laboratory. Managed since April 2000 by a partnership of the University of Tennessee (UT) and Battelle, ORNL was established in 1943 as part of the secret Manhattan Project to pioneer a method for producing and separating plutonium. During the 1950s and 1960s, and with the creation of DOE in the 1970s, ORNL became an international center for the study of nuclear energy and related research in the physical and life sciences. By the turn of the century, the Laboratory supported the nation with a peacetime science and technology mission that was just as important as, but very different from, the days of the Manhattan Project.

Today, under the DOE Office of Science (DOE-SC), ORNL has the primary mission focus of conducting research in neutron science, energy, high-performance computing, systems biology, materials science at the nanoscale, and national security that will lead to innovative solutions to complex problems. As an international leader in a range of scientific areas supporting DOE's basic research, energy, national security, and environmental missions, ORNL is actively engaged in a broad range of national and international partnerships with industry and educational institutions. As a DOE steward of critical national research infrastructure, the Laboratory provides access to university, industry, and government researchers on a competitive basis. ORNL is the home of the world's largest facility for materials research with the recently completed Spallation Neutron Source (SNS) and the upgraded High Flux Isotope Reactor (HFIR), as well as 16 other designated national user facilities.

ORNL is located in the southwest corner of DOE's Oak Ridge Reservation (ORR), a reserve of approximately 34,000 acres of federally owned lands within Anderson and Roane counties in Tennessee. Twenty thousand acres of the ORR, the Oak Ridge National Environmental Research Park, is an outdoor laboratory and a national user facility. Parts of the ORR are undergoing cleanup from past research and production activities, and, accordingly, some ORNL sites require cleanup activities beyond those currently funded to protect the environment and allow for future use. The main ORNL site is comprised of approximately 4470 acres of land. It includes facilities in two valleys (Bethel and Melton) and on a major ridge (Chestnut). On site are 4,256,064 sf of operating facilities (330 buildings and 77 trailers). The ORNL site has many functions and requirements of a small city and is supported by a dedicated fire department, medical center, and security force. It has extensive utilities with both centralized (e.g., steam and sewage treatment plants) and distributed systems.

ORNL receives over one billion dollars of research funding (nonconstruction) annually. The Laboratory has a staff of some 4200. About 12,000 extended-stay guest researchers and 17,000 short-term visitors annually request on-site access. The number of visiting researchers and students is expected to grow rapidly over the next 10 years with the full operations of the SNS, the Center for Nanophase Materials Sciences (CNMS), and HFIR and the planned second SNS target building. The 10-year American Competitiveness Initiative to double government science program funding could result in ORNL becoming a $1.7 billion to $2.0 billion laboratory. If successful, ORNL staff headcount could increase by several hundred. In addition, the developing on-site ORNL Science and Technology Park could add 600 or more people to the site population.

In year 2000, DOE and UT-Battelle initiated the Facility Revitalization Project. By 2006, the project exceeded its goals by vacating 1,800,000 sf of aged, expensive-to-maintain buildings, renovating and constructing new 600,000 sf (excluding SNS), relocating 600 staff on-site, and reducing the average age of buildings by 10 years. Today, the majority of staff and visitors are now housed in new or

renovated work spaces. All have access to new on-site amenities, and users have large, state-of-the-art tools at their disposal. Efforts to address "legacy issues" have demolished vacant facilities, disposed of legacy materials, consolidated the hot cell footprint, and downgraded nonreactor nuclear facilities. Yet several revitalization and legacy challenges remain. Many DOE-owned mission-critical facilities simply do not meet the needs of modern research. These include ORNL's largest chemistry and material sciences complex (Buildings 4500N and 4500S). Such facilities not only tax researchers' ability to perform work, but they make attracting and retaining highly sought staff difficult. Most site utility and waste-handling systems are incorrectly sized for future missions and are in poor condition. Site electrical and chilled water capacities have not kept pace with growing computational capacity. The sewage treatment plant is approaching its design life, and long runs of poorly insulated steam lines add to energy losses. Disposal of all excess facilities and materials from 60 years of research and production work has yet to occur, redirecting resources that could be used for modernization and sustainment to manage risks associated with these legacies.

Completing the remaining campus revitalization and legacy cleanup is the greatest challenge during this planning period. ORNL recapitalization and modernization priorities are

- Renovation and partial replacement of the Materials and Chemistry Building Complex (4500N/S), ORNL's largest laboratory building complex
- Disposition of legacy facilities and materials and right-sizing of waste management systems
- Recapitalization and capacity enhancement of electrical, cooling, and other utilities to support more powerful research equipment and growing site population
- Renovation and renewal of existing buildings and construction of new buildings in the West and Melton Valley Campuses to collocate synergistic research capabilities, reduce the nonreactor nuclear footprint, and vacate the Central Campus ahead of site cleanup
- Enhancement of security, safety, health and environmental protection systems and relocation of first responders to better protect people, information, and physical assets, and
- Additions of new site amenities to support a growing visiting scientist population and to provide site staff with a healthy, productive work environment.

The *ORNL Ten-Year Site Plan* (TYSP) supports achieving DOE corporate performance targets. Energy conservation efforts are on track with successes such as obtaining Leadership in Energy and Environmental Design (LEED®) gold certification for the recently completed Multiprogram Research Facility. Although the DOE target performance is less understood, operation costs have benchmarked well against other national research and nonresearch firms. ORNL's asset utilization indexes (AUI) for laboratory, office, and warehouse facilities are at long-term performance target levels. Plans to vacate an additional 550,000 sf of aged, expensive-to-maintain facilities ahead of site cleanup will temporarily lower the AUI. Disposition of the majority of these facilities is proposed in the DOE Oak Ridge Office (DOE-ORO) Integrated Facility Disposition Project (IFDP), which received Critical Decision-0 (CD-0) in June of 2007. Once IFDP facility disposition is under way, performance will then return to target levels. Disposition of excess facilities not included in the IFDP will be funded by replacement Science Laboratory Infrastructure (SLI) line item projects or ORNL's $1.5M annual overhead-funded disposition program. A successful IFDP and overhead-funded facility disposition program will bank enough space to offset the planned construction of general purpose replacement buildings and new user facilities such as the second SNS target building. At present, ORNL's Asset Condition Indexes (ACIs) do not meet DOE corporate performance targets. Annual maintenance investments at 2 to 4% of plant replacement value (the industry standard) have not affected our deferred maintenance backlog.

UT-Battelle is committed to, and has implemented, an outstanding ORNL revitalization strategy that focuses on improving scientific research capabilities, including providing facilities commensurate with world-class research. This strategy not only enables science but also focuses on removing high-maintenance facilities from operation, thus allowing critical maintenance funds to be invested only in mission-critical facilities and infrastructure. This strategy has reduced deferred maintenance by $70M by vacating 1,800,000 sf of excess facilities. In the future, deferred maintenance will be similarly reduced. The SLI Modernization Initiative, a $150M Institutional General Plant Project (IGPP) program, and $50M of deferred maintenance reduction funding, coupled with validation of existing reported deferred maintenance, will bring the ACI to target performance levels while retaining the focus on revitalization.

ORNL has historically pursued a mission of world-class science. Now, the Laboratory must look ahead, preserving past traditions and sustaining current successes, but also making substantial investments in a future that will provide state-of-the-art facilities and infrastructure to ensure DOE programs are conducted in modern, more cost-efficient surroundings located on sites free of legacy burdens (Fig. 1.1). Innovative research in a safe, secure, and environmentally sound setting is the Laboratory's goal. This TYSP describes the process by which this will be accomplished.

As required by 2007 TYSP guidance (DOE 2007a), Appendices A through F contain current and future inventory and financial data for ORNL as well as pertinent maps of the Laboratory and the surrounding area.

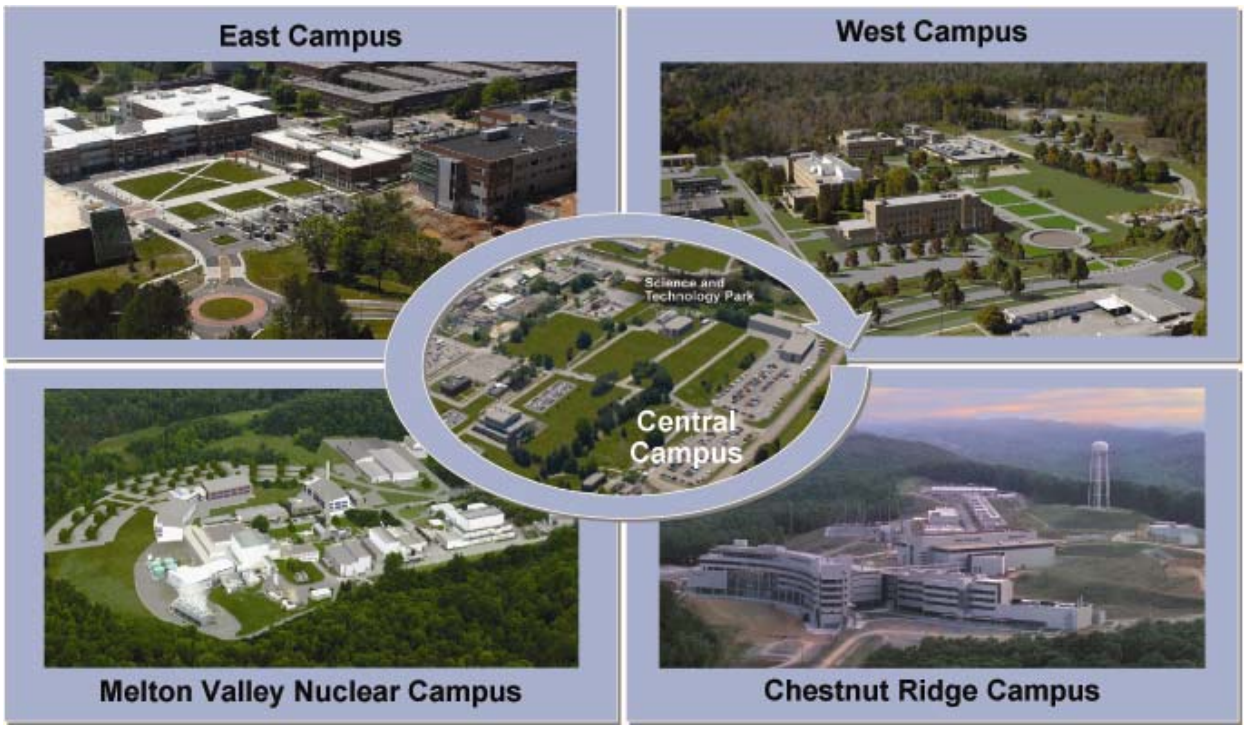

Fig. 1.1. State-of-the-art facilities and infrastructure will enable world-class research in modern, cost-efficient settings.

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2. Overview of Site Facilities and Infrastructure

Oak Ridge National Laboratory (ORNL) is the Department of Energy's (DOE's) largest science and energy laboratory. Managed since April 2000 by a partnership of the University of Tennessee (UT) and Battelle, ORNL was established in 1943 as a part of the secret Manhattan Project to pioneer a method for producing and separating plutonium. During the 1950s and 1960s, and with the creation of DOE in the 1970s, ORNL became an international center for the study of nuclear energy and related research in the physical and life sciences. By the turn of the century the Laboratory supported the nation with a peacetime science and technology mission that was just as important as, but very different from, the days of the Manhattan Project. ORNL is an international leader in a range of scientific areas that support DOE's mission. The Laboratory's six major mission roles include neutron science, energy, high-performance computing, bioenergy, materials sciences at the nanoscale, and national security. ORNL is the home of the world's largest facility for materials research with the recently completed Spallation Neutron Source (SNS) and the upgraded High Flux Isotope Reactor (HFIR), as well as 16 other designated national user facilities. These facilities are available to national and international laboratory, industrial, and academic users.

ORNL funding exceeds $1 billion. The Laboratory has a staff of about 4200. Annually, about 12,000 extended-stay guest researchers and 17,000 short-term visitors request on-site access. With the completion of the SNS and the Center for Nanophase Materials Sciences (CNMS) and the upgrade to HFIR, the total number of annual visitors is expected to expand to 35,000 by 2010.

ORNL sits in the southwest corner of DOE's Oak Ridge Reservation (ORR), a reserve of approximately 34,000 acres of federally owned lands within Anderson and Roane counties in Tennessee (Fig. 2.1). ORNL shares the ORR with the commercial industrial East Tennessee Technology Park (ETTP), the National Nuclear Security Administration (NNSA) Y-12 National Security Complex, the Oak Ridge Institute for Science and Education (ORISE), and the developing Oak Ridge Science and Technology

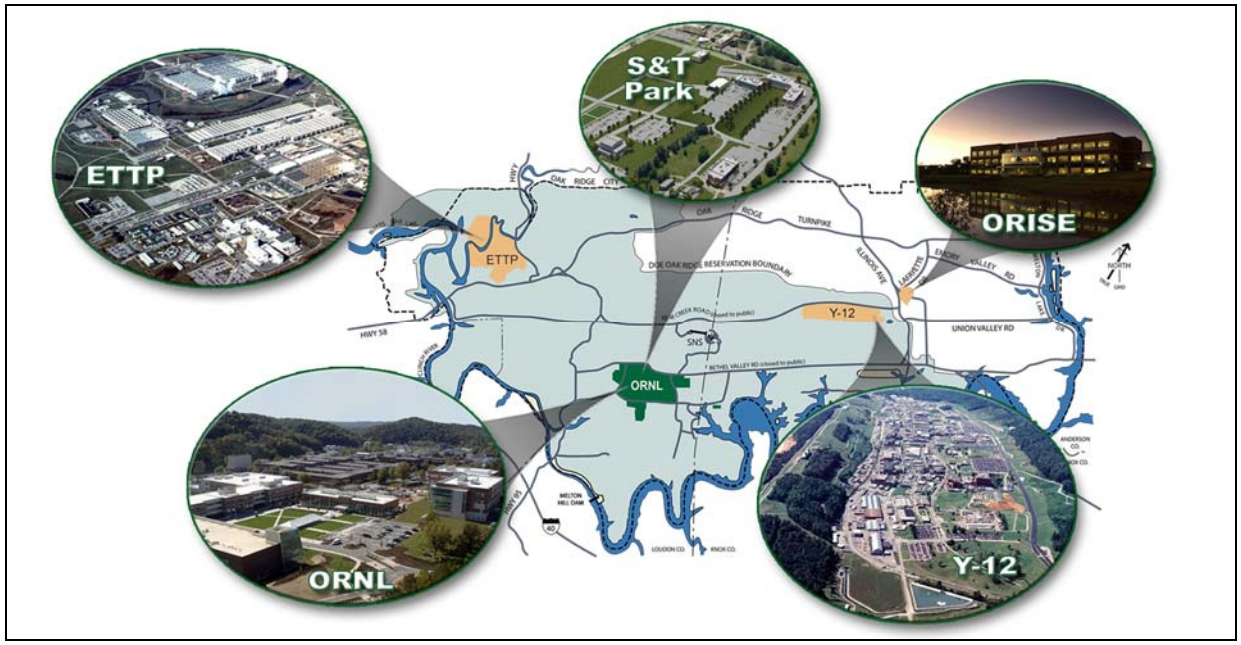


Fig. 2.1. Location of ORNL within the ORR and its relationship to other local DOE facilities.

Park. Twenty thousand acres of the ORR, the Oak Ridge National Environmental Research Park, is an outdoor laboratory and a national user facility. It supports DOE-sponsored research in carbon cycling, ecosystem dynamics, global climate change, and remediation studies as well as the research of numerous colleges, universities, and other state and federal agencies.

Part of the ORR is undergoing cleanup from past research and production activities. The ORNL site requires additional cleanup beyond that currently funded to protect the environment and to allow for future use.

The main ORNL site is comprised of approximately 4470 acres of land. It includes facilities in two valleys (Bethel and Melton) and on a major ridge (Chestnut). The ORNL site has many functions and requirements of a small city. It is supported by a dedicated fire department, medical center, and security force. It has extensive utilities with both centralized (e.g., steam and sewage treatment plants) and distributed systems. Thirty-seven miles of paved roads, 180 miles of unpaved roads, and 115 acres of maintained grounds provide access to the site.

The ORNL site Facility Information Management System (FIMS) data lists 346 buildings and 79 trailers, a total of 5,017,126 sf of operating facilities. On the ORNL campus there are 330 buildings and 77 trailers. DOE Environmental Management (DOE-EM) on-site facilities (74 buildings, 46 trailers) are managed by several contractors. On-site UT-Battelle manages 250 DOE-owned buildings, 5 DOE-leased buildings, 27 DOE-owned trailers, and 4 DOE-leased trailers for the DOE Office of Science (SC) and 1 DOE-owned building for DOE Nuclear Energy (NE). UT-Battelle also manages 15 DOE-SC facilities and 1 DOE-NE facility that are located off-site of the main campus. Seven buildings and one trailer are located at Y-12, none of which house ongoing research. Three buildings and one trailer, which house the American Museum of Science and Energy (AMSE), are located in the city of Oak Ridge. UT-Battelle leases six buildings, five near Oak Ridge and one in Washington, D.C. Table 2.1 shows the distribution of space in square footage.

By the end of 2010, the state of Tennessee will have constructed approximately 120,000 sf of research space on the ORNL site. The Joint Institute for Computational Sciences (JICS) (51,464 sf) was completed in 2003. The Joint Institute for Biological Sciences (JIBS) (35,557 sf) is under construction and is scheduled for completion in November 2007. The Joint Institute for Neutron Sciences (JINS) (35,000 sf) is in design; construction is scheduled to be completed in 2009.

Table 2.1. ORNL space distribution (operating facilities) FY 2007

Location	Buildings		Trailers		Total space, sf
	Number	Space, sf	Number	Space, sf	
ORNL main site					
UT-Battelle (DOE-SC)	250	3,414,259	27	31,218	3,445,477
UT-Battelle (DOE-NE)	1	24,660	–	–	24,660
Other site contractors (DOE-EM)	74	270,601	46	46,310	316,911
Leased on-site*	5	457,015	4	12,001	469,016
Subtotal, ORNL main site	**330**	**4,166,535**	**77**	**89,529**	**4,256,064**
ORNL off-site					–
Museum (AMSE)	3	57,223	1	552	57,775
ORNL at Y-12 (1 DOE-NE)	7	561,118	1	680	561,798
Leased off-site*	6	141,489	–	–	141,489
Total	**346**	**4,926,365**	**79**	**90,761**	**5,017,126**

*Amount is leased net square feet (nsf) rather than gross square feet (gsf)

The three joint institutes, along with the Joint Institute for Heavy Ion Research, are part of the unique partnership between UT and Battelle. Joint institutes are visitor- and user-oriented entities built around major ORNL capabilities. The partnership has enabled UT to expand and enrich the university's research program while providing ORNL facilities that can be used to compete for large federally funded research programs. Although expanded to include the UT-Battelle core universities, they are of particular benefit to UT faculty because of their proximity, which affords the opportunity for working closely with ORNL staff and visitors.

Construction has also been completed on over 1 million sf of DOE and private-sector facilities. The majority of the new facilities are located on Chestnut Ridge and in the east portion of the Bethel Valley campus. As of the third quarter of FY 2007, ORNL has vacated 1.9 million sf of aged, poor-condition buildings. The new construction and consolidation of operations have reduced ORNL's average facility age from 42 to 31 years. ORNL's Asset Utilization Index (AUI) is 0.94 (Adequate).

Outside the Chestnut Ridge and East Campus locations, the condition and age of DOE-owned facilities are similar to other DOE-SC laboratories; the majority of the buildings are more than 40 years old and their condition is Fair to Fail (see Figs. 2.2 and 2.3). Where possible, this footprint is being further reduced by consolidating operations into a smaller set of mission-critical and mission-dependant facilities.

The site Asset Condition Index (ACI) remains at 0.88 (Fair). The ACI for buildings is 0.86 (Fair) and for utilities it is 0.94 (Adequate) (see Table 2.2). The ACI for mission-critical buildings is 0.87 (Fair) and for mission-dependant buildings is 0.75 (Fair).

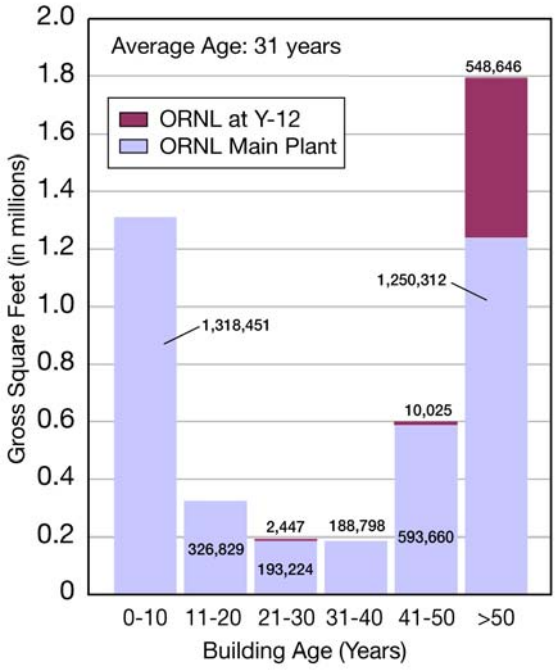


Fig. 2.2. Age of ORNL operating buildings.

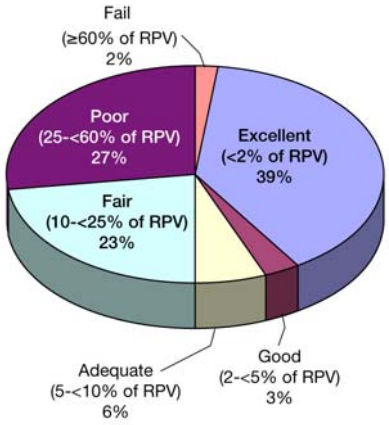


Fig. 2.3. Condition of space at ORNL DOE-owned and leased on-site buildings.

Table 2.2. Summary condition

Description	RPV[a]	DM[b]	RIC[c]	TRIC[d]	FCI[e]	TSCI[f]	ACI[g]
Site	$1,601,418,173	$187,270,532	$180,653,012	$367,923,544	0.12	0.23	(Fair) 0.88
Facilities	$1,118,105,489	$160,199,689	$165,741,010	$325,940,699	0.14	0.29	(Fair) 0.86
Utilities	$ 483,312,684	$ 27,070,842	$ 14,912,002	$ 41,982,844	0.06	0.09	(Adequate) 0.94

[a]Replacement Plant Value (RPV): Current Total [*]
[b]Deferred Maintenance (DM)
[c]Rehabilitation and Improvement Cost (RIC)
[d]Total Summary Condition (DM+RIC) [*] (TRIC)
[e]Facility Condition Index (FCI): (Based on DM)
[f]TSCI = Sum of DM and RIC as a percentage of the RPV
[g]ACI (Asset Condition Index) (1-FCI)
[*]Includes DOE-SC–owned operating buildings, on-site leased buildings, and nonprogrammatic other structures and facilities (OSF) (Utility Systems only).

The composition of facilities and infrastructure ranges from basic utilities to special hazardous waste handling systems, from standard offices, storage, and facility operations buildings to radiological and nanomaterial laboratories and a vivarium. Figure 2.4 shows laboratory space distribution by FIMS use codes. The total replacement value for all ORNL DOE-owned facilities and infrastructure is about $3.9 billion (see Table 2.3).

Table 2.3. Estimated RPV for ORNL main site (DOE-SC only)

Facility type	Replacement cost ($M)
Utilities, transportation, and communications systems	626
Buildings and trailers	1,123
Programmatic science facilities	2,089
All other	42
Total	3,880

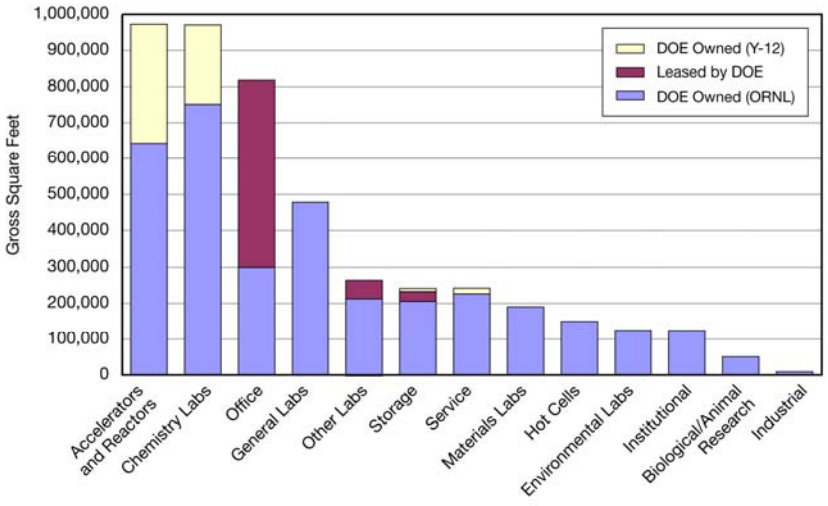


Fig. 2.4. Laboratory space distribution by FIMS use codes (DOE-SC only). Includes on-site and off-site leased buildings.

3. Current and Future Missions for the Site

The information contained in this section is an abridgement of the *Department of Energy, Office of Science, Laboratory Plans, FY 2008–FY 2012* (DOE 2007b).

Today, under DOE-SC, ORNL has the primary mission focus of conducting research in neutron science, energy, high-performance computing, systems biology, materials science, and national security that will lead to innovative solutions to complex problems. As an international leader in a range of scientific areas supporting DOE's basic research, energy, national security, and environmental missions, ORNL is actively engaged in a broad range of national and international partnerships with industry and educational institutions. As a DOE steward of critical national research infrastructure, the Laboratory provides access to university, industry, and government researchers on a competitive basis.

3.1 Laboratory Focus and Vision

The Laboratory has six core competencies that fall under the programmatic themes in the DOE *Strategic Plan* (DOE 2006):

- Scientific Discovery and Innovation
  - Neutron science, including structure and dynamics of materials in extreme conditions, and on nanometer length scales in soft and hard materials
  - Leadership computing and simulation science
  - Comprehensive design, synthesis, and characterization of advanced materials and interfacial chemical processes
  - Biological and environmental systems

Lab-at-a-Glance

Location: Oak Ridge, Tennessee

Type: Multiprogram lab

Contract Operator: UT-Battelle

Responsible Field Office: Oak Ridge Office

Web site: http://www.ornl.gov/

Physical Assets (DOE-SC owned only):

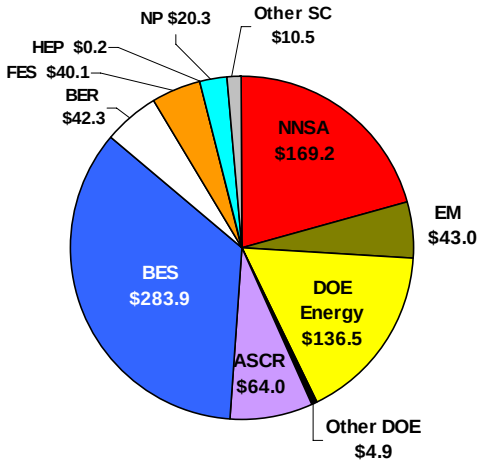
- 4470 acres and 250 buildings
- 3.4M gsf in Active Operational Buildings
- 243K gsf in Nonoperational Buildings
- Replacement Plant Value: $1,087B
- Deferred Maintenance: $160M
- Asset Condition Index:
  - Mission Critical 0.87 (Fair)
  - Mission Dependent 0.75 (Fair)
- Asset Utilization Index: 0.94 (Adequate)

Human Capital:

- 4187 employees
- 2456 Undergraduate and Graduate Students
- 2478 Facility Users and Visiting Scientists

FY 2006 Total DOE Funding: $814.9M

FY 2006 DOE Funding by Source
PALS data (BA in Millions):



FY 2006 Non-DOE Funding: $186.9M
FY 2006 Dept. of Homeland Security: $72.4M

- Energy Security
  - Engineering sciences, including electric power systems, combustion and thermal engineering, plasma physics, and radiochemical technology
- Nuclear Security
  - Counterterrorism and nonproliferation detection systems

DOE-SC believes that these six competencies will enable ORNL to deliver its mission and customer focus, to perform a complementary role in the DOE laboratory system, and to pursue its vision for scientific excellence and preeminence in the following areas:

- Delivering and sustaining the world's foremost center for neutron scattering
- Dramatically accelerating scientific discovery through computation by delivering unparalleled capability in computational and data solutions applied to major problems in energy, environment, and national security
- Understanding and controlling nanoscale physical and chemical phenomena for the discovery of materials and interfacial processes with tailored properties through sustained leadership in synthesis, characterization, and theory
- Providing leadership in microbial and plant systems biology and environmental science, producing sustainable solutions to challenges in bioenergy, climatic change, and remediation
- Developing next-generation fusion and fission energy systems and energy-efficient technologies for transportation, buildings, and the electric power grid
- Delivering innovative technologies to limit or prevent the spread of materials, technologies, and weapons of mass destruction expertise, including developing new knowledge discovery tools, algorithms, materials, and open architecture detector systems to increase situational awareness

3.2 Business Lines

The following capabilities, aligned by business lines, distinguish ORNL and provide a basis for effective teaming and partnering with other DOE laboratories, universities, and private-sector partners in pursuit of the Laboratory mission. These business lines and the distinguishing capabilities outlined in Table 3.1 provide an additional window into the mission focus and unique contributions and strengths of ORNL and its role within the DOE-SC laboratory complex. Items in italics within the Distinguishing Capabilities column identify research facilities that convey particular strategic strengths and capabilities to the Laboratory. Descriptions of these facilities can be found at the web site (www.ornl.gov) noted in the Lab-at-a-Glance information on the first page of this section.

Typical of DOE-SC multiprogram laboratories, ORNL supports work for several large customers. DOE-SC is the primary sponsor for work in the business lines of Neutron Scattering; Computational Science and Engineering; Materials Synthesis, Design, Characterization and Processing; Molecular Biology and Ecology; and Fusion Science and Technology. In support of these areas, ORNL is one of the world's broadest and most capable materials science and technology laboratories, achieving significant integration between basic and applied technology research. For the business line of Arms Control and Nonproliferation, DOE's NNSA and the Department of Homeland Security (DHS) are primary customers, and the Defense Threat Reduction Agency is a secondary customer. In particular, the NNSA contributes significant resources to ORNL to provide technical leadership to prevent the spread of nuclear materials and technology. ORNL is the single largest provider of support for materials protection and control programs. In the Energy Technology business line, primary customers include the DOE's Offices of Energy Efficiency and Renewable Energy (DOE-EERE), Nuclear Energy (DOE-NE), and Electricity Delivery and Energy Reliability (DOE-OE). ORNL has, perhaps, one of the world's largest and broadest public energy research and development (R&D) portfolios. It includes expertise in buildings, transportation, and industrial end-use efficiency; electric transmission and distribution with strengths in superconducting transmission; and nuclear energy and space nuclear power.

Table 3.1. Business lines and distinguishing ORNL capabilities

Business lines and alignment with DOE Strategic Plan[a]	Distinguishing capabilities[b]	Distinguishing performance	Mission relevance
Neutron Scattering (Scientific Discovery and Innovation)	• Neutron beams pulsed at the Spallation Neutron Source (SNS) and steady-state at the High Flux Isotope Reactor (HFIR), for research and industrial development • Next-generation instrumentation • Applications for science and engineering • *16 instruments by 2012 at SNS* • *11 instruments by 2012 at HFIR*	By 2008, SNS and instrumentation will provide capability at 10 to 100 times the current state of the art; computer benchmarking of instrument performance has been confirmed by the commissioning studies. HFIR will provide unsurpassed capabilities for steady-state, cold brightness of 10^{13} neutrons/cm^2/s/ steradian/angstrom, equal to the Institut Laue-Langevin High Flux Reactor	Advance core disciplines of basic energy sciences Lead nanoscale science revolution Master control of energy-relevant complex systems
Computational Science & Engineering (Scientific Discovery and Innovation)	• Methods and tools for advanced-architecture supercomputers • Early research in new technologies and architectures • Advanced science and engineering models • Scientific Discovery through Advanced Computing • *Leadership Computing Facility*	The Leadership Computing Facility (LCF) is expected to become one of the world's leading centers for capability computing. The LCF success will be measured against the metrics specified by the Advanced Scientific Computing Advisory Committee sub-panel (chaired by Gordon Bell and Jim Hack) that examined the issues of science-based performance metrics for the present and proposed computational facilities for the Office of Science, and as evidenced by the unprecedented, demonstrated, sustained performance on key DOE scientific applications (materials, 36%; geosciences, 11-16%; computational fluid dynamics [CFD], 13%; biology, 15%; etc.)	Advance discovery through computer science and math Advance scientific simulation through new computational models Deliver leadership computing resources in support of science and energy mission

Table 3.1 (continued)

Business lines and alignment with DOE Strategic Plan[a]	Distinguishing capabilities[b]	Distinguishing performance	Mission relevance
Materials Synthesis, Design, Characterization and Processing (Scientific Discovery and Innovation)	• Tailored design, synthesis, and characterization of nanoscale materials • Synthesis, characterization, and processing of alloys, ceramics, carbon-based materials, and polymers • Advanced tools for characterizing nanoscale materials and chemical processes • Understanding and controlling interfacial molecular processes • Chemistry and materials theory • *High Temperature Materials Laboratory* • *Shared Research Equipment Program (SHaRE)* • *Center for Nanophase Materials Sciences*	Nation's largest DOE Office of Basic Energy Sciences and DOE-EERE materials research program covering materials science and engineering, condensed matter physics, and materials chemistry. World record resolution of 0.6 angstroms in electron microscopy	Advance core disciplines of basic energy sciences Lead scientific research and user environment for nanoscale science Apply fundamental advances in materials and molecular processes to high-impact energy applications
Energy Technology (Energy Security)	• Energy-efficient transportation, industrial, and building technologies • Fusion energy concepts, plasma theory, and heating and fueling technologies • Fission reactor separations, fuels, and materials technologies • Electric transmission and grid technologies • *Radiochemical Engineering Development Center* • *Irradiated Fuels Examination Laboratory* • *Buildings Technology Center* • *National Transportation Research Center* • *U.S. ITER project office*	A series of technological breakthroughs that has reduced energy usage by > 70% in air conditioners and refrigerators and has replaced CFCs refrigerants.[c] In partnership with industry, developed the world's first commercial application for superconducting cables.	Develop technologies that foster a diverse supply of reliable, affordable, and environmentally sound energy and that improve our mix of energy options and our energy efficiency Manages the U.S. commitment to the ITER Project Understand fusion plasma behavior and determine the most promising confinement configurations Develop new materials and technologies to enable advanced nuclear reactors and fusion energy power systems Develop nuclear fuel reprocessing technologies for closing the fuel cycle

Table 3.1 (continued)

Business Lines and Alignment with DOE Strategic Plan[a]	Distinguishing Capabilities[b]	Distinguishing Performance	Mission Relevance
Biological and Environmental Sciences (Scientific Discovery and Innovation)	• Physical and computational methods for biological and environmental science • Genomics and proteomics of microbes and plants • Terrestrial ecology and carbon cycle science • Microbial ecology focusing on environmental impact • Subsurface science focusing on the biogeochemistry of fate and transport • *Center for Structural Molecular Biology*	Led the international Poplar genome consortium. Leadership for Laboratory Science Program within the Joint Genome Institute. Journal of Proteome Research paper (2006) on proteome of Rhodopseudomonas palustris is on the American Chemical Society's list of most cited papers. Proceedings of the National Academy of Sciences paper (2005) on forest productivity in a CO_2 enriched environment (result of FACE facility) provides benchmark to evaluate predictions of ecosystem global models Science (2006) review article on "the path forward for biofuels and biomaterials" co-authored by Davison, Mielenz, Tschaplinski (2006)	Tap power of genomics for our nation's energy and environment Unravel the mysteries of Earth's changing climate and protect our living planet Develop science for remediation of contaminated sites Understand the environmental impacts of microbes
Arms Control & Non-proliferation (Nuclear Security)	• Safeguarding materials • Detecting illicit production of nuclear materials • Radiological dispersal devices (for DHS)	National Laboratory that is the nation's largest National Nuclear Security Administration provider of support for materials protection, control, and accounting program. Recognition by sponsor of outstanding results in meeting commitments under the 2005 Bratislava Nuclear Security Initiative.	Provide technical leadership to limit or prevent spread of materials, technology, and weapons of mass destruction expertise
Nuclear Physics (Scientific Discovery and Innovation)	• Nuclear structure and astrophysics with radioactive beams • Neutron physics • Accelerator R&D in high power targets • *Holifield Radioactive Ion Beam Facility*	Nation's only facility for producing both proton- and neutron-rich post-accelerated beams SNS is the world's most powerful source of pulsed neutrons and low-energy neutrinos for particle physics	Understand the structure of the nucleon and nucleonic matter Investigate nuclear astrophysics, including understanding largest supernovae and synthesis of heavy elements in the universe Measure fundamental properties of the neutron Investigate nature of neutrino

[a] DOE (Department of Energy). 2006. U.S. Department of Energy Strategic Plan, Office of Program Analysis and Evaluation, U.S. Department of Energy (www.energy.gov)

[b] Italicized items in the "Distinguishing Capabilities" column identify research facilities that convey particular strategic strengths and capabilities to ORNL.

[c] NAS 2001. *Energy Research at DOE, Was it Worth It?* p. 96, National Academies Press, 2001.

3.3 Major Activities

The following is a set of major activities that ORNL is pursuing to support aspects of the DOE mission and to build on core strengths and capabilities of the Laboratory. These activities are either currently supported or appear in the FY 2008 budget submission to Congress. The activities are supportive of the DOE Strategic Themes of Scientific Discovery and Innovation and Energy Security.

The major activities are as follows:

0. Neutron Scattering: Defining the State of the Art
1. Theory, Modeling, and Simulation
2. Materials to Energy
3. Systems Biology
4. Advanced Energy Technologies

3.3.1 Neutron Scattering: Defining the State of the Art

- Summary: Sustain world leadership in the science and technology of neutron scattering and the facilities and instruments that support such research
- Expectations: Sustain U.S. leadership in neutron scattering and materials research and development; generate innovative new materials for energy and national security applications; and develop foundational biology data to support bioengineering for energy and health care
- Benefit Perspective: Potentially *transformational* benefits
- Risk Perspectives:
  - Technical: *Low risk*—as expectations are that SNS will meet design goals and that the HFIR cold source will function as expected
  - Market/Competition: *Moderate risk*—since a competitive Asian or European neutron scattering center will be developed over time, necessitating ongoing enhancements to maintain lead.
  - Management/Financial: *Moderate risk*—due to funding uncertainties associated with the second target station and to management, regulatory, security, and infrastructure issues with HFIR that could impact reliability and cost

The Instruments focus of the neutron scattering activity is to deliver the world's most capable neutron scattering center, which includes the SNS and the HFIR cold source; it includes extending our leadership with new instruments, the SNS power upgrade, and the SNS Long-Wavelength Target Station (LWTS); and building the world's foremost neutron scattering research program.

The corresponding programs and capabilities will enable fundamental discoveries in materials research in the areas of superconductivity, magnetism, phase transitions, and structure and dynamics, as well as enable fundamental advances in biology (membranes, protein structure, and dynamics). They will also facilitate optimization of engineering materials through in situ studies and nondestructive measurements.

3.3.2 Theory, Modeling, and Simulation

- Summary: Sustaining world leadership in theory, modeling, and simulation through application of the most powerful computing capability that is possible
- Expectations: Sustain U.S. leadership in computational science and engineering; reduce risk and increase scientific productivity from major DOE-SC user facilities; and provide new energy technologies in such areas as engines, fuel cells, or fusion power reactors
- Benefit Perspective: Potentially *transformational* benefits
- Risk Perspectives:
  - Technical: *Moderate risk*—due to uncertainties with regard to present and future architectures and their ability to meet expectations
  - Market/Competition: *High risk*—international competition for fastest supercomputer is intense

The core of this activity is to build and operate a premier leading-edge computational facility for

the research community, develop multiscale methods for modeling of complex systems, and develop modeling and simulation tools that enable scientific and technological breakthroughs in key application areas. Key elements include the Leadership Computing Facility (LCF) hardware and operations; possibly components of advanced architecture R&D; simulation science; and methods, algorithms, and tool development. This activity builds on current capabilities at ORNL.

Investment in this activity will transform discoveries in materials science, biology, climate science, plasma physics, astrophysics, energy technologies, and other areas and will enable the investigation of experimentally inaccessible natural and engineered systems, from supernovae to the dynamics of the electric grid.

3.3.3 Materials to Energy

- Summary: Sustain leadership in understanding and designing materials properties and interfacial processes at the nanoscale through synthesis, characterization, and theory and make key capabilities available to the use community through the CNMS
- Expectations: Provide the fundamental breakthroughs needed to realize revolutionary new materials and interfacial chemical processes for future energy requirements
- Benefit Perspective: Potentially *transformational* benefits in fundamental knowledge relevant to energy applications
- Risk Perspectives:
  - Technical: *Low risk*—as expectations are that fundamental breakthroughs in novel tailored materials relevant to energy will be realized
  - Market/Competition: *Moderate risk*—due to risks of success in response to solicitations in solar, hydrogen, advanced nuclear, and other energy-inspired fundamental materials and chemical science areas
  - Management/Financial: *Low risk*—due to increasing capabilities and number of users at the CNMS, continuing fundamental advances in materials and molecular processes and ongoing developments in advanced characterization tools

This activity will focus on nanoscale-level tailoring of materials and interfacial processes to achieve desired properties and functions, based on a basic understanding of how materials respond in the nanoscale. This activity will exploit leading capabilities in neutron scattering, atomic and chemical imaging, computing, and nanoscale synthesis to provide insight into the structure and properties of nanophase materials and associated interfacial processes. Further, coupled with the CNMS, this activity will provide world-leading capabilities to users. The materials-to-energy activity will allow ORNL to build a strong bridge between fundamental and applied energy research; support the enhancement of the CNMS; and extend the Laboratory's capabilities in synthesis and characterization of novel materials and interfacial chemistry that will lead to revolutionary new technologies of high relevance to energy production, storage, and utilization.

3.3.4 Systems Biology

- Summary: Apply and further develop the entire suite of cutting-edge genomics and proteomics tools together with molecular and chemical imaging, and computational models to develop a systems-level understanding of microbes and microbial communities and plants and their interaction with the environment
- Expectations: Provide fundamental breakthroughs enabling sustainable production of biofuels; provide the basis for determining the response of ecosystems to climate change
- Benefit Perspective: Potentially *transformational* benefits: displacement of fossil transportation fuels, sustainable biomass supply, stabilization of atmospheric CO_2, and environmental management
- Risk Perspectives:
  - Technical: *Low risk*—as novel analytical tools and advancement in computational

power provide unprecedented insights into the functioning of biological systems from the molecular to the organism and community levels
  - Market/Competition: *Moderate risk*—due to risks of success in response to solicitations for proposals; e.g., Genomics: Genomes to Life (GTL) program
  - Management/Financial: *Low risk*—due to increasing capabilities in the biophysical and biochemical sciences; strategic new hires in microbiology, plant science, and molecular biophysics; recent successes in securing research funds and equipment; and the development of partnerships and research infrastructure; e.g., the UT/ORNL Joint Institute for Biological Sciences, funded by the state of Tennessee

This activity will integrate unique capabilities and facilities in the physical and computational sciences at ORNL with leading expertise in biology and environmental sciences to significantly advance our understanding of biological systems from the molecular to the ecosystem level, thereby enabling sustainable and effective solutions to energy security and climate change challenges.

3.3.5 Advanced Energy Technology

- Summary: Create breakthroughs in energy supply, efficiency, and transmission technologies by applying nanoscience, neutron science, systems biology, and leadership-class computing in combination with leading-edge engineering research capabilities
- Expectations: Accelerated innovation in current and new technologies that will increase the efficiency and reduce emissions of transportation vehicles; increase capacity, security, and reliability of the electric grid; establish an economical, and proliferation-resistant nuclear power system for the future; demonstrate the technological viability of fusion power systems; and improve the efficiency of buildings technology and industrial processes
- Benefit Perspective: Potentially *sustaining/substantial* benefits
- Risk Perspectives:
  - Technical: *Low risk*—associated with price targets for fuels, engines, or materials
  - Market/Competition: *Low risk*—recognizing that international leadership in energy technology is "up for grabs" in transportation and other areas
  - Management/Financial: *Moderate risk*—due to lack of new investment in energy technology

This activity will apply leadership-class computing and the experimental capabilities of the Radiochemical Engineering Development Center (REDC) and the Irradiated Fuels Examination Laboratory to develop new scientific insights into the performance of advanced burner reactors and fuel-reprocessing plants for closing the nuclear fuel cycle. Materials science in combination with applied power electronics research will continue to advance high-temperature superconducting power systems and plasma heating and control systems for fusion. Nanotechnology for catalysis, advances in materials synthesis, systems biology for biofuels, and combustion engineering science will lead to development of advanced internal combustion engines and vehicular systems and alternative transportation fuels. Advanced computing science will assist in generating a new fundamental understanding of magnetically confined plasmas, the dynamics of the electric power grid, and the performance of irradiated materials and fuels in extreme conditions. This activity will also draw upon ORNL's core engineering science and instrument science capabilities and strengths in materials technology, nuclear engineering research, and energy systems analysis.

With successful deployment of this activity, there will be innovation in next-generation nuclear and fusion energy technologies; high-efficiency, low-emissions transportation vehicles and engines; low-cost, low-net-carbon liquid fuels; high-efficiency building technologies,

real-time control of the electric grid; and higher temperature, more efficient industrial processes.

3.4 Funding Outlook and Its Effect

Detailed information regarding the financial outlook for ORNL is subject to (1) competition and merit review, (2) the availability of appropriated funds, and (3) programmatic decisions. The first two factors cannot be predicted or estimated in advance. Programmatic decisions (the third factor) are developed in accordance with the planning targets reflected in the DOE programmatic 5-year plans, a companion document to these strategic laboratory business plans. In addition, because of the DOE-SC commitment to competition and merit review, there is often a time lag between programmatic decisions and the determination of which research provider can best deliver the greatest value in conducting the research. Thus, it is not always apparent how programmatic decisions unfold for particular laboratories. Nevertheless, some decisions, such as the plans for large scientific user facilities, show clear paths to individual laboratories and therefore inform their business plans.

Support for non-DOE-funded work is a vital role of our national laboratories, contributing to national security, energy security, environment stewardship, scientific discovery, and more fundamentally, the competitiveness of the U.S. economy. For ORNL, this is no exception. DOE-SC is supportive of this work, and although it is not addressed in any detail within DOE-SC 5-year plans, DOE-SC believes it is sufficiently important and appropriate to address within the strategic laboratory business plan. A brief perspective and financial outlook are therefore provided.

The major ORNL non-DOE funded activities are primarily supported by the U.S. Department of Defense (DoD), Nuclear Regulatory Commission (NRC), Department of Homeland Security (DHS), National Aeronautics and Space Administration (NASA), and the Department of Health and Human Services/National Institutes of Health (DHHS/NIH). The work for DoD is focused on national defense in such areas as chemical/biological detection, adaptive planning systems, sensor technology, materials, and nonproliferation activities. The NRC activities revolve around reactor pressure vessel integrity, aging and environmental effects on containment, high-burn-up fuel issues for storage and transport of spent fuel, advanced reactor physics, and instrumentation and controls technology. DHS supports research in biological, chemical, and radiological/nuclear countermeasures and threat, vulnerability, and test assessment, while NASA supports activities related to fission power systems for space exploration with an emphasis on human exploration of the moon and Mars. The DHHS/NIH research is in the areas of bioanalytical chemistry, biomedical engineering and bioimaging, biomaterials, genomics, metabolomics and proteomics.

Support from DHS and NASA is expected to remain stable over the next 5 years, while an increase in DoD funding is expected in several key areas, including development of adaptive planning systems and defense capabilities against weapons of mass destruction. Growth in NIH funding is anticipated through 2010 in many areas, including mammalian genomics. Reactor licensing activities for the NRC Office of New Reactors are expected to increase beginning in 2007.

ORNL current research funding exceeds one billion dollars (nonconstruction) annually. The American Competitiveness Initiative to double government science programs funding over the next 10 years could result in ORNL becoming a $1.7 billion to $2.0 billion laboratory (Table 3.2). This growth requires full funding of ITER, SNS, HFIR, and LCF operations, and successful bioenergy proposals (e.g., the Genomics: GTL program). It also assumes continued support of SNS and HFIR instrumentation development and the construction of the second SNS target and HFIR cold source and their associated buildings. Over a 10-year period, ORNL staff will grow by several hundred.

Table 3.2. Summary of expected program funding and staffing

	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18
SC – BES	316	361	355	285	296	305	314	324	333	343	354	364
SC – HEP	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
SC – BER	51	82	85	88	93	96	99	102	105	108	111	115
SC – NP	23	24	27	27	28	29	30	31	32	33	34	35
SC – ASCR	89	90	90	90	91	93	96	99	102	105	108	111
SC – Fusion	79	177	233	229	201	207	213	219	226	233	240	247
SC – Other	15	29	49	19	19	19	20	21	21	22	22	23
Total SC	573	763	839	737	728	750	772	795	819	844	869	895
Other DOE	268	259	252	252	257	265	273	281	289	298	307	316
Work for Others	219	226	235	245	256	263	271	279	288	296	305	314
Total ($ in M)	1,060	1,248	1,326	1,235	1,241	1,278	1,316	1,356	1,396	1,438	1,481	1,526
Total staffing (FTEs)	4,187	4,212	4,237	4,262	4,287	4,312	4,337	4,359	4,381	4,403	4,425	4,447

The number of visiting researchers and students will also grow rapidly with the full operations of SNS, CNMS, and HFIR and the planned second SNS target building.

Changes in research mix are driving several infrastructure upgrades. The ever-increasing need for computational capacity puts greater demands on electrical and cooling systems. Increases in national security type work and operating user facilities require honing the ability to physically secure certain information and materials while enabling a community built on open scientific exchange.

More than any change in research mix, the condition and configuration of DOE-owned facilities and infrastructure and the disposition of legacy facility and material will drive space conversion and infrastructure upgrades during the planning horizon. The success of ORNL's revitalization is that the majority of staff and visitors are now housed in new or renovated work spaces. All have access to new on-site amenities and users have large, state-of-the-art tools at their disposal. Efforts to address "legacy issues" have involved demolishing vacant facilities, disposing of legacy materials, consolidating the hot cell footprint, and upgrading nonreactor nuclear facilities. Yet, several revitalization and legacy challenges remain. Many DOE-owned mission-critical facilities simply do not meet the needs of modern research. This includes ORNL's largest chemistry and material sciences complex (4500N and 4500S). Such facilities not only tax researchers' ability to perform work, but they make attracting and retaining highly sought after staff difficult. Site utility and waste-handling systems are incorrectly sized for future missions and are in poor condition. The sewage treatment plant is approaching its design life, and long runs of poorly insulated steam lines add to energy losses. Disposal of facilities excess to mission and materials from 60 years of research and production work have yet to occur. Resources that could be used for modernization and sustainment are directed at managing risk associated with these legacies.

Although not specifically mentioned in the ORNL business plan, the DOE Oak Ridge Office (DOE-ORO) is developing the ORNL Science and Technology Park to enable technology transfer and economic development. Located on the northwest corner of the Central Campus, the park's population will increase demands on roads, site utilities, and site services. The first building, a 100,000 gsf structure, is expected to be completed in 2009.

3.5 Research Program Facility and Infrastructure Projects

Table 3.3 and the following narrative contain information on budgeted or planned research program funded projects. The LCF Building and the Multiprogram Research Facility–2 are proposed as alternative financed projects at this time. It is assumed the required banked space square footage for these buildings, 240,510 gsf, will be derived from excess buildings removed by the Integrated Facility Disposal Project (IFDP) or that a waiver will be granted.

3.5.1 Second Target Building with Target Building Laboratory and Office Facility

The SNS is ten times more powerful than any other spallation neutron source in existence. The design of the SNS provides for the construction of two differently optimized target stations. The high-frequency (60-hertz [Hz]) target station now completed is optimized for experiments in condensed matter physics, materials sciences, magnetic materials, and engineering. The second target station, which will operate at a significantly lower frequency (approximately 10 Hz), will enable studies of fundamental neutron physics, chemical spectroscopy, protein-folding dynamics, and polymer dynamics, among many other topics. The LWTS will approximately double the number of beam lines that can be supported at the SNS, enabling a much broader scientific program and providing the optimal route to a significant number of high-flux beam lines. This project is supported by the DOE-SC *Facilities for the Future of Science: A Twenty-Year Outlook* (DOE 2003) and is an element of the Basic Energy Sciences Advisory Committee Sub-Panel recommendation (the Russell Panel) (DOE 1996) that resulted in the construction of the SNS.

The further development of site infrastructure required by this project will be included in the project with the exception of expanding on-site housing. The planned ORNL User Housing Facility will be designed to accommodate the potential increased visitor need.

Table 3.3. Research program funded projects budgeted or planned

Proposed programmatic facility	Added GSF	Request for space offset or waiver	Demolished space	Inclusion into FIMS	RPV expected ($1000)	Increased maintenance funding (programmatic) ($1000)
Second Target Building with Target Building Laboratory and Office Facility	150,000	No	None	FY 2015	450,000	5,000
Center for Neutron Scattering User Facility	50,510	No	None	FY 2011	19,500	390
HB-2 Second Cold Source and Guide Hall	40,000	No	None	FY 2016	101,000	2,020
Leadership Computing Facility Building	26,000	No	None	FY 2013	87,500	1,750
Central Utility Building for SNS Second Target[a]	15,000	No	None	FY 2015	8,000	160

[a]Other structures and facilities (OSF).

3.5.2 Center for Neutron Scattering User Facility

The number of Center for Neutron Scattering (CNS) users is expected to increase dramatically with the completion of the first cold source and again after the construction of the second cold source and guide hall. Demand is expected to eventually be more than 500 visiting scientists per year. In addition to office space, users will require sample characterization and setup laboratories and general workplace amenities (e.g., conference rooms, eating spaces). The CNS User Facility will accommodate these user needs and a small number of resident HFIR staff.

3.5.3 High-Flux Isotope Reactor Second Cold Source and Guide Hall

A major direction in neutron scattering research is the study of large-scale structures and dynamics typical of soft materials, biological systems, and self-organized electronic and magnetic phenomena—all of which are more effectively studied by using so-called "cold neutrons." Europe has five such sources, most of which are oversubscribed, and is constructing two more. The United States currently has only one cold guide hall in operation, with another moderate power source at HFIR. The second cold source and guide hall will take advantage of the large diameter and high brightness of the HB-2 beam port at HFIR to develop the world's most intense cold neutron facility. It will include a new guide hall and an initial suite of five instruments (up to ten eventually). These additions will complement the proposed LWTS at the SNS and will provide the world's foremost cold neutron research capability. The resulting impact on science would be enormous: it will allow for the study of new materials only available in small quantities, such as correlated systems (e.g., superconductors), nanofabricated specimens (e.g., ultrathin films), biological samples, pharmaceuticals, and weakly scattering systems (e.g., dilute biosolutions).

Melton Valley Campus facilities and infrastructure, in general, are not in adequate condition for future missions. *The Melton Valley Master Campus Plan* (Flad et al. 2006) captures the site infrastructure upgrades and additions required to accommodate planned research and research support activities, including the CNS User Facility and the HFIR Second Cold Source and Guide Hall. Those projects include multiple upgrades to conventional facilities; new maintenance, warehousing, central utility, and office facilities; and upgrades or expansion of utility distribution systems, roads, and parking.

3.5.4 Central Utility Building for SNS Second Target

The Central Utility building will house utility equipment that provides chilled, hot, and tower water and, potentially, compressed air to the second target facility complex. The building will be located to the north of the second target building, outside of the butterfly beam line. The 15,000 gsf structure will be operational in 2015. Total project cost is estimated at $8M. (DOE does not categorize the structure as a building.)

3.5.5 Leadership Computing Facility Building

The LCF at ORNL is DOE-SC's most powerful computing center for open scientific computing. The LCF is currently housed in a 40,000-sf computer room located in Building 5600 and shares that space with ORNL's infrastructure computing systems. As the size and power requirements of leadership-class systems continue to grow, the LCF will need a new, expandable computer building to maintain our leadership position for the DOE-SC.

Plans for new computer systems will fill the existing building by 2011. ORNL's experience with large computer systems, currently available space, and plentiful power makes the LCF a cost-effective location for future large computer systems for DOE, and potentially for other agencies, such as the National Science Foundation, the National Oceanographic and Atmospheric Administration, and DoD. Leadership computing is supported by the DOE-SC *Facilities for the Future of Science: A Twenty-Year Outlook* (DOE 2003).

Twenty-six thousand gsf would be the initial footprint of the FY 2013 expandable building, with 20 MW technical electrical power and cooling capacity. The estimate project cost varies depending on funding mechanism; it is initially estimated at $85M to $91M.

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4. Facilities and Infrastructure

The DOE *2006 Strategic Plan* (DOE 2006) has a new Mission, Management Excellence, and under Management Excellence, the strategy has established a new goal—"Goal 5.3—Infrastructure: Build, modernize, and maintain facilities and infrastructure to achieve mission goals and ensure a safe and secure workplace." The Plan recognizes that DOE's infrastructure is aging; creating both safety and security concerns, and provides various strategies to reach Goal 5.3, including the following:

- invest in the infrastructure to reduce overall facility square footage and improve energy efficiency and sustainability,
- implement an active asset management plan to align resource needs with key DOE goals,
- improve the information technology infrastructure through upgraded networks and technology and strengthened cyber security, and
- integrate safety and security into every element of the DOE mission to safeguard employees and assets.

ORNL's TYSP strategy is consistent with that of the DOE. Planned activities and projects will result in attaining DOE and ORNL infrastructure goals.

4.1 Vision, Goals, and Strategy

The ORNL vision for a modern revitalized research campus will be achieved when

- facilities and infrastructure capability and capacity at the ORNL main campus adequately support the Laboratory's business plan and agenda, including fully developed SNS and HFIR complexes;
- staff and research equipment are housed in new, refurbished, and/or well-maintained space that is safe, secure, sustainable in design, and energy and space efficient;
- the mix of DOE, state, and private-sector-owned buildings is appropriate to ORNL's research and support mission;
- utilities and infrastructure are sized and maintained to meet program needs, with low-maintenance, native species landscaping approaches employed site-wide;
- nonreactor nuclear facilities and radiological laboratories are consolidated to maintain program functionality in a much-reduced, more cost-effective footprint;
- waste management support systems are right sized to accommodate research needs on schedules compatible with the proposed DOE-EM Program scope transition to DOE-SC;
- legacy materials, waste, and facilities are managed to ensure regulatory compliance, health and safety risk reduction, and minimized operating costs;
- excess facilities demolition is conducted in parallel with new construction at a pace consistent with the need for eliminating health/safety risks, meeting DOE space banking requirements, and reducing the continual maintenance and surveillance costs;
- integration with, and support for, the surrounding DOE Oak Ridge National Environmental Research Park as an outdoor laboratory for research, education, and demonstration is achieved;
- a research campus atmosphere is established, including architectural consistency within each campus area and open campus vehicle- and pedestrian-friendly flow patterns; and
- sophisticated R&D facilities for national and international users are provided while delivering the highest standards of safeguards and security for classified information and materials experimentation and development.

To this end, in FY 2000 ORNL established a dedicated Facility Revitalization Project (FRP) team. The FRP was authorized by DOE-ORO as one of the high-priority initiatives of the UT-Battelle management and operating (M&O) contract. ORNL's strategy was and continues to be (1) consolidate staff on the main site; (2) vacate old, expensive space; and (3) build new and refurbish key facilities. The FRP initiative utilized a combination of DOE, state of Tennessee, and private-sector funding to finance new construction. Institutional General Plant Project (IGPP) funding was used to extend utility grids and develop site infrastructure (e.g., parking, roads, sidewalks, and landscape).

Four metrics with associated targets were established to track revitalization progress: (1) number of off-site research staff relocated on-site, (2) square feet of excess space vacated, (3) age of space occupied, and (4) square feet of new facility completed construction. During the first 6 years of the FRP project, all established targets were met. More than 600 staff members were consolidated on-site; 1,800,000 sf of excess space was vacated; more than 600,000 sf of new facilities was constructed; and the average age of space occupied was reduced from 42 years to 32 years.

Today, for the majority of ORNL staff members and visitors, the vision has been achieved (Fig. 4.1). Yet several challenges remain. For example, staff members are still housed in nonstrategic off-site leased buildings, site infrastructure has not kept pace with capacity and efficiency demands, and many DOE-owned facilities are in less than adequate condition and do not meet the functional needs of ongoing research and operations.

The primary ORNL legacy issues resulting from 60 years of research and production, represented by the Central Campus, remain largely unresolved. It is estimated that at least $125M in legacy materials is still present, including highly radioactive reactor and isotope processing equipment, excess chemicals, and unneeded materials. About 270 DOE facilities are now, or will become, excess to mission needs in the next 10 years, including several Office of Science (SC) nuclear facilities. These facilities present an ever-increasing threat to ORNL staff and the SC mission, as reflected in the recent roof

Fig. 4.1. Great progress has been made in creating a vibrant campus setting.

collapse at Building 3026D, an excess EM facility. Liquid, gaseous, and solid waste treatment facilities are outdated, inefficient to operate, and oversized for current and future DOE missions, and portions of the system are in poor condition (e.g., the underground ductwork serving portions of the Central Campus area). Other problems are presented by waste-handling facilities that are located in areas of soil and groundwater contamination and that must be accessed for remediation.

Section 4.9, "Recapitalization and Modernization," details the capital investments planned to address these and other remaining revitalization issues.

4.2 Process for Identifying Facilities and Infrastructure Needs and Development of Plans to Meet the Vision, Goals, and Strategy

The FRP team efforts now continue as an integral part of ORNL operations. Projects are managed, with the support of other ORNL research and support organizations, as part of the routine ORNL Facilities and Operations organization mission.

ORNL facility and infrastructure planning is a risk-based and mission-driven process based on a philosophy of simultaneous excellence in science and technology, laboratory operations, and community service. The planning process considers and integrates proposals to acquire, maintain, rehabilitate, renovate, and construct new facilities, infrastructure, and plant equipment. It provides a systematic approach for developing information to influence day-to-day operational investments and form a long-term facility and infrastructure strategy.

Though requests can be submitted throughout the year, ORNL conducts a formal annual call for major maintenance and recapitalization projects at the time of DOE's budget call. All facility and infrastructure-related, as well as environment, safety, and health (ES&H) projects vying for laboratory-level funding, are documented and submitted on an activity data sheet (ADS). The ADS captures a short project scope description, the total estimated project cost, the requested funding year, linkages to strategic business and operation goals, and the project's effect on

- *Public Safety and Health*—includes potential adverse impacts on the health and safety of the off-site population surrounding a facility.
- *Site Personnel Safety and Health*—includes potential adverse impacts on the safety and health of site workers and visitors.
- *Compliance*—includes failures to comply with laws, regulations, compliance agreements, Executive Orders, and DOE Orders. Such failures may adversely affect the confidence of DOE or other agencies in the ability of the facility to operate while protecting the public, workers, and the environment.
- *Mission Impact*—includes potential adverse impacts on the ability to perform the research or production mission of the facility or the ability to carry out important parts of the mission.
- *Cost-Effective Risk Management*—includes potential accidental losses to a facility's capital investment (buildings, equipment) or an existing opportunity for cost savings, such as infrastructure upgrades, management systems upgrades, or improved program development.
- *Environmental Protection*—includes potential adverse harmful impacts on natural resources (air, water, land, and wildlife).

A team of subject matter experts, the Risk Ranking Board, uses the DOE-developed Capital Asset Management Prioritization (CAMP) methodology to rank the ADSs. Those ADSs that are primarily ES&H-related are then ranked a second time using the DOE Risk Prioritization Model (RPM). All ranked ADSs are maintained in a data base accessible through the Web.

The ranked ADSs are integrated using project management tools. A work breakdown structure

captures all identified proposed, planned, and funded programmatic and multiprogram facility and infrastructure projects. The individual projects are linked to business drivers and milestones. When applicable, strategically important project attributes (e.g., potential deferred maintenance [DM] and energy consumption costs reduction, asset condition, and utilization) are captured for analysis. Relationships between projects are also noted, in some cases creating project dependencies and critical implementation paths.

Within the context of the accepted facility and infrastructure strategy, recommended facility and infrastructure investment options are presented to ORNL leadership during the fourth quarter (Fig. 4.2). Their approved project list requesting project authorizations is formally transmitted to DOE. Out-year funding requirements are captured in this document and the Integrated Facilities and Infrastructure (IFI) crosscut submission.

Fig. 4.2. ORNL site planning methodology.

4.3 Land Use Plans

Lands of the ORR are used for research to meet the mission goals and objectives of DOE in many substantive ways. The research addresses major national issues and contributes to national and international collaborative initiatives on global climate change (temperature, carbon dioxide, precipitation), tropospheric air quality, remediation of contaminated land, sustainable development, biodiversity, and energy operations. These uses require protected blocks of land ranging from a few acres to more than 250 acres. Use of the land area for research is shown in Fig. 4.3, with areas of active research identified. Many of these active areas also include sites where research has been proposed (identified for specific projects for proposal submittals or pending actions) or is planned (areas with high potential for studying research issues of interest to DOE and other Oak Ridge National Environmental Research Park users). Specific major field research facilities or projects have been identified in Fig. 4.3.

ORR land use planning is described in the 1999 document, *Comprehensive Integrated Planning Process for the Oak Ridge Operations Sites* (ORNL 1999) located on the Web at http://home.ornl.gov/general/facility_plans/cip/cip.htm, and the land use planning information is updated in the 2007 *Oak Ridge Reservation Ten-Year Site Plan* (DOE 2007c). The ORR land use planning process document is currently being updated and will be incorporated into the 2008 *Oak Ridge Reservation Ten-Year Site Plan* as an appendix and will also be available on the Web.

Future program and operations land use needs to accomplish DOE missions include areas for environmental research, energy research, system testing, and other future initiatives (Fig. 4.4).

4.3.1 Field Research Areas and Facilities

The ORR offers unparalleled resources for ecosystem-level and large-scale research within a 20,000-acre outdoor laboratory. Along with large blocks of forest and diverse vegetational communities, the Oak Ridge National Environmental Research Park user facility includes the ability to use or establish highly equipped sites in a secure area. Existing road and utility infrastructure provide critical field research components. National recognition of the ORR as a resource has led to proposed uses that are components of continental-scale projects as well as regional ones.

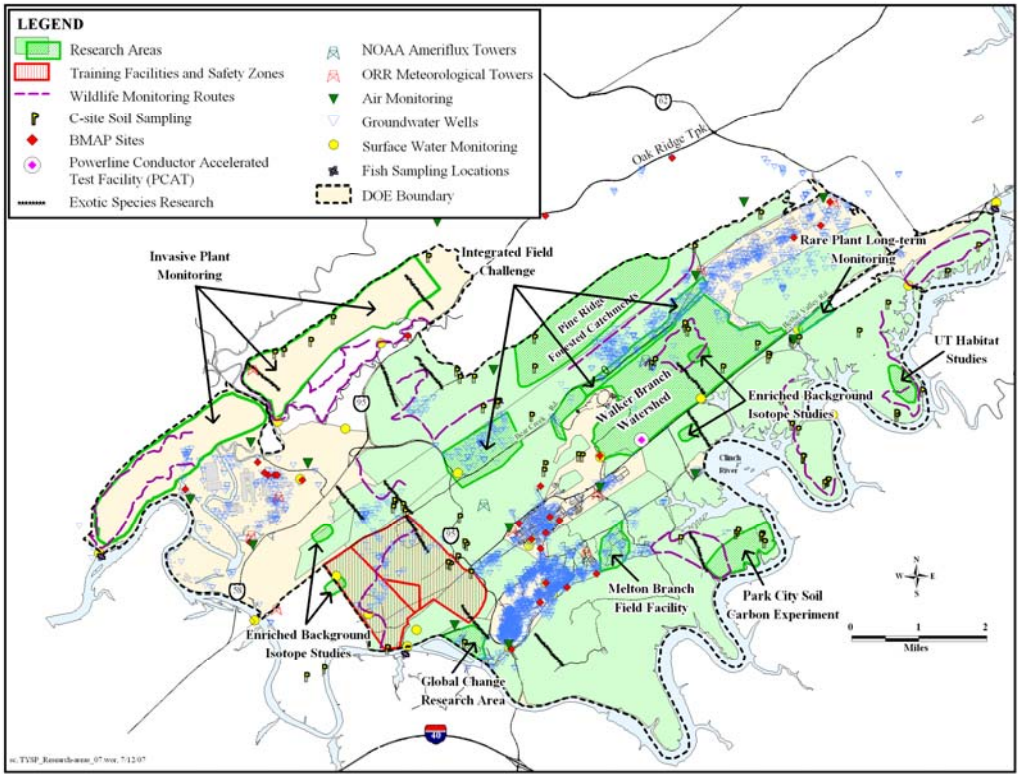

Fig. 4.3. Research areas on the Oak Ridge Reservation.

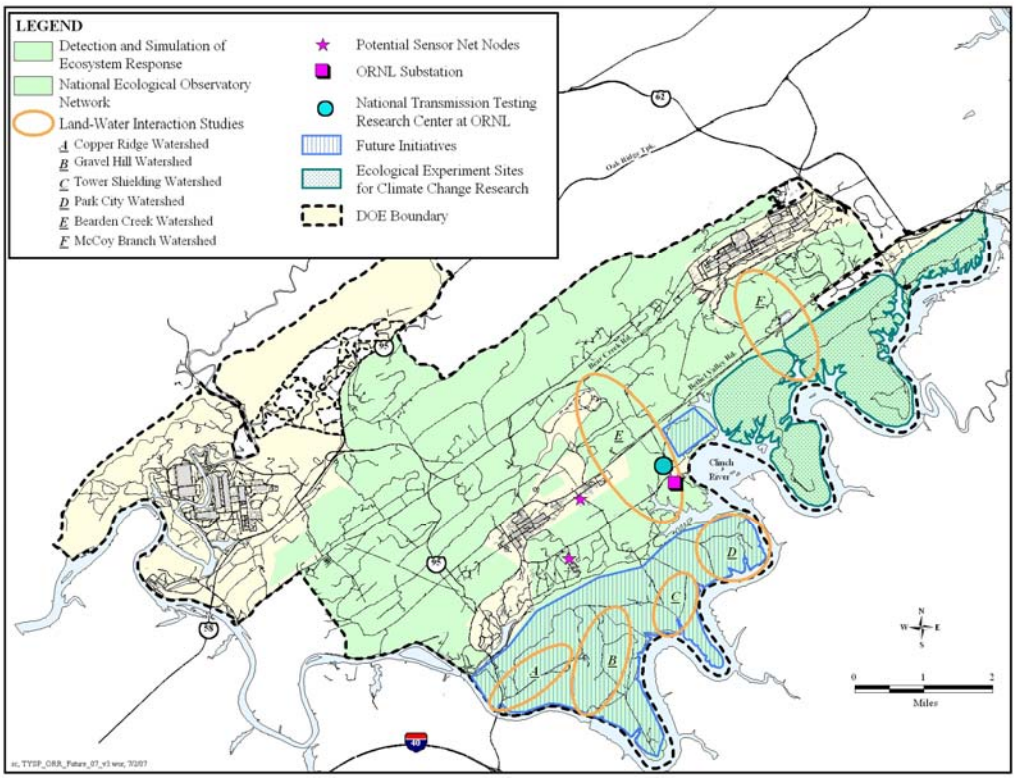

Fig. 4.4. Future ORNL new uses of the Oak Ridge Reservation.

Future environmental research is proposed and/or planned across the entire reservation (except for the ETTP area) in addition to areas where research is already in progress. Future field research areas and facilities include the following:

- Aquatic-Terrestrial Interface Studies,
- Detection and Simulation of Ecosystem Response,
- Ecological Field Station,
- Homeland Security Field Facilities,
- National Ecological Observatory Network (NEON),
- National Transmission Technology Research Center (NTTRC) Facilities,
- Old-Field Succession Free Air CO_2 Enrichment Experiment (FACE), and
- SensorNet Nodes.

4.3.1.1 Aquatic-Terrestrial Interface Studies

A number of small, essentially undisturbed watersheds that have high potential as environmental research sites exist along the southern boundary of the ORR. Walker Branch Watershed (WBW) is the most well-known and intensively studied watershed on the reservation (see http://walkerbranch.ornl.gov/), but it is not the only area worth attention. Bearden Creek and McCoy Branch on the west and east sides of WBW contain second- and third-order perennial streams. The embayments of Melton Hill Reservoir at the mouths of all three of these watersheds are relatively isolated and have good potential for aquatic research. There are also a number of other first- and second-order watersheds along the south shore of the reservation that could be used for replication studies; three of these are downstream of White Oak Creek, and four are between Melton Hill Dam and WBW. The aquatic research that could be conducted at these sites includes development and testing of new environmental tracers to measure ecological processes. The Pine Ridge Forested Catchments represent four adjacent, relatively undisturbed first-order forested catchments that offer a large potential for watershed and stream research. These are similar to Walker Branch in vegetation but differ in that they are underlain primarily by shale and sandstone rather than by dolomite as is the case with Walker Branch. Thus, the Pine Ridge Catchments drain the other major type of geological setting on the ORR. Continuous discharge and weekly water chemistry are now being monitored on one of the Pine Ridge Catchment streams.

Near-Term Actions: Current efforts are focused on the refinement of the science plan and funding actions.

4.3.1.2 Detection and Simulation of Ecosystem Response

The ORR will be an important component of the Detection and Simulation of Ecosystem Response initiative, which is also part of the Laboratory Agenda. Specific locations, from the Cumberland Plateau through the ORR and up to the Great Smoky Mountains, will be used for developing new methods to detect changes in ecosystems at the physiological and genomic levels brought on by natural and human events. This capability, linked to new ecosystem models, may provide insights into ways to detect potential changes early enough so that mitigation plans can be implemented before permanent, irreversible, system-level changes occur.

Near-Term Actions: This initiative will need significant access to the entire ORR for research sites related to measurement systems and manipulative experiments. Utilities, roads, and the preservation of undisturbed areas will all be important. Field sites are anticipated within the next 2 years.

Out-year Plans: Field research on the ORR is planned to begin within the next 3 years.

4.3.1.3 Ecological Field Station

The University of Tennessee at Knoxville (UTK) is interested in locating an ecological field station in the vicinity of the ORR. UTK is currently collaborating with ORNL on DOE research in terrestrial ecology. Future field-based efforts are being planned in response to DOE mission research. The field station will

address DOE missions in both research and education. This facility would facilitate field research in both terrestrial and aquatic ecosystems on the ORR by local scientists, students, and visiting researchers from around the world. The facility would include classrooms, offices, laboratories, and perhaps even modest bunk and kitchen capabilities for visiting researchers. The field station needs to be located in a protected and secure area, yet be accessible to students and guests. Proximity to the UTK campus and field research on the ORR is another important factor.

Near-Term Actions: Analyses of site needs and availability are under way.

4.3.1.4 Homeland Security Field Facilities

Preliminary discussions have been initiated to establish facilities and training areas related to Homeland Security needs. Suitable areas on the ORR are being evaluated.

4.3.1.5 National Ecological Observatory Network (NEON)

ORNL and University Partners were selected by the National Science Foundation's (NSF's) NEON to establish infrastructure for intensive monitoring of a wildland site. These sites will be studied and made available for researchers for up to 30 years. Current plans are to include some portion of the ORR (WBW) as the wildland site. In addition, manipulative experiments (temperature primarily) may be implemented, and the ORR is being considered as a possible node in that network as well.

4.3.1.6 National Transmission Technology Research Center (NTTRC) Facilities (Power Delivery Research Center)

Testing capabilities of the NTTRC will be expanded to include at-voltage testing of overhead conductors and testing of superconducting cables and power electronics. Development of advanced transmission testing in Oak Ridge is a recommendation of DOE's National Grid Study. Steady load demand growth, new and increased power flow patterns, new line siting difficulties with long lead times, and a drop in transmission network investment over the past 20 years have led to a critical R&D need. The need for an emphasis on transmission and sensor R&D is recognized by DOE, which is working with manufacturers (e.g., American Superconductor and Southwire) and utilities (e.g., the Tennessee Valley Authority [TVA] and American Electric Power) on proposals that would significantly expand the role of the NTTRC (Power Delivery Research Center) at ORNL. These proposed projects include

- Powerline Conductor Operational Test Facility,
- Very Low Impedance Cable Project,
- Secure Power Networks, and
- Transmission Power Electronics Test Facility.

Near-Term Actions: The DOE-OE is working with ORNL and partners to pursue funding, identify appropriate locations, and work out necessary agreements for these proposals. Discussions have been initiated with DOE, TVA, TWRA, UT-Battelle, and other potential partners.

4.3.1.7 Old-Field Succession Free Air CO_2 Enrichment (FACE) Experiment

A proposal is being developed for the DOE-SC to plan and initiate a new global change experiment. Forest regeneration and development contribute to the global carbon cycle, but there is still a lack of understanding about how the rates and patterns of woody tree establishment and growth under future atmospheric and climatic conditions will alter predictions of carbon cycling in natural ecosystems.

Successional trajectories are well understood in intact, successional, old-field ecosystems, and the process of succession occurs rapidly, allowing the experiment to be conducted within a realistic time frame. ORNL has been conducting a multifactor manipulation (CO_2, temperature, and soil moisture) of a constructed old-field ecosystem using 4-m-diam open-top chambers in the 0800 area of the ORR. This approach has

limited the ability to sample destructively and has constrained the understanding of key ecological interactions, such as above- and belowground herbivory. Hence, concepts are being developed to establish a FACE experiment that also includes a precipitation manipulation (imposed drought) treatment in an intact old-field system. A key component of the proposed experiment is the evaluation of simulated atmospheric and climatic change on woody plant establishment under realistic ecological field conditions. The experiment will provide key data such as elevated CO_2 effects on old-field productivity, soil carbon cycling, tree seed germination, and seedling mortality as well as data on the modifying influence of drought for ecosystem and dynamic vegetation models that are used to address carbon and climate feedbacks.

Near-Term Actions: The proposed experiment will require a protected and secure area, yet one that is accessible to local and visiting researchers. Sufficient acreage will be needed to establish long-term manipulative experiments, and proximity to infrastructure (roads, electricity, water, and Internet) is essential. The research requires access to sites with ecological characteristics such as replicated habitats; distinct aquatic, old-field, and forest interfaces; successional gradients; and microclimate gradients. Analyses of possible locations on the ORR are currently under way. Preliminary screenings suggest that the Three Bend area offers unique characteristics for this research and that the proposed research is consistent with current missions of the area.

4.3.1.8 SensorNet

The objective of the SensorNet project is to develop an interoperable system that allows real-time analysis for sensor information. The system is being designed to provide the Department of Homeland Security with an incident discovery, awareness, and response capability addressing local, regional, and national needs. The networking infrastructure will be a common data highway for the near-real-time intelligent collection, processing, and dissemination of sensor data that will include chemical, biological, radiation, nuclear, and explosives sensors; meteorological instruments; and other sensors (e.g., video cameras and air quality, environmental, and disease tracking).

SensorNet is transitioning a number of the test beds to operational prototypes sponsored under separate funding, including the Southeast Transportation Corridor Pilot, a Domestic Nuclear Detection Office–led effort to place radiation sensor systems in nine states; the Southeast Region Radiation Pilot Program, sponsored by the Open Geospatial Consortium, to deploy a sensor suite at the Port of Charleston; and the establishment of a Sensor Fusion Center for the state of Kentucky and the city of Memphis. The ORNL test bed will continue to be developed, and in 2007 International Business Machines (IBM) and Oracle have agreed to support the test bed activities as they relate to development of an open source implementation of INFOD (Information Dissemination), currently an Open Grid Forum Specification Effort.

Near-Term Actions: Sites within the ORR are being evaluated for SensorNet nodes to complement emergency response data.

4.3.2 Environmental Collaboration Areas

ORNL will continue to work with others to leverage resources for implementing integrated ecosystem management. Collaboration opportunities include working with state, federal, and education agencies on native community restoration, invasive plant management, preimpact wetland mitigation, wildlife enhancement, and habitat characterization. Some of the areas with opportunities for collaboration are shown in the 2007 *Oak Ridge Reservation Ten-Year Site Plan* (DOE 2007c).

4.3.3 Future Initiatives

Land for future initiatives may not have specific associated projects. Diverse physical characteristics and the evaluation of proposed sites for past projects are factors used to identify suitability of such lands for future initiatives.

Some of the general land areas identified for future needs are shown in Fig. 4.4.

4.3.4 Land Management Issues

The ORR is a valuable and irreplaceable resource for meeting DOE-SC research needs. Protection of land for current research, as well as for buffer areas around these sites, is essential (e.g., land comprising and surrounding the Global Change Field Research Facility and WBW). Future research initiatives include those working with TWRA on global climate change research within the Three Bend Scenic and Wildlife Refuge, Homeland Security initiatives, and large blocks of land for the NEON and the Detection and Simulation of Ecosystem Response Initiative. Major changes in land use in areas adjacent to research sites can result in loss of data and even the inability to continue the research. Examples of this include removal of trees within certain distances of National Oceanic and Atmospheric Administration (NOAA) towers, eliminating access to research or monitoring areas, and fragmentation of forest blocks through widening or developing new infrastructure corridors (e.g., secondary roads and utility right-of-ways).

4.4 Utilization and Excess Real Property

The ORNL AUIs for offices, warehouses, and laboratories meet the long-term DOE targets (Table 4.1). The total AUI for ORNL is 0.94 (Adequate). This includes all strategic long-term leased facilities. As research operations relocate from the Central Campus ahead of final cleanup, the total AUI will decrease. IFDP final disposition of excess facilities will return the index to within an acceptable range.

ORNL has declared a total of 60 DOE-SC facilities (26 buildings, 23 structures, and 11 trailers) (Appendix F) in excess of ongoing mission requirements, a total of 246,539 gsf. The significant reduction from that reported in the May 2006 *Ten-Year Site Plan* is due to a change in the FIMS reporting definition of "excess facility."

Disposition of these facilities is planned through the DOE-EM funded IFDP, the Science Laboratories Infrastructure funded Excess Facilities Disposition Program (SLI-EFDP), and the ORNL overhead-funded excess facility disposition program. The IFDP focuses on cleanup and disposition of contaminated facilities, whereas the SLI-EFDP and overhead-funded disposition focuses on the cleanup and disposition of lightly contaminated and noncontaminated facilities.

The DOE-ORO proposed IFDP will complete cleanup of the ORR by the 2018–2020 time frame. All cleanup actions will be implemented under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) regulations. The IFDP addresses the oldest and most heavily contaminated facilities and media located at ORNL and Y-12 sites. It includes facilities currently in the ORO DOE-EM life-cycle baseline and newly identified excess (or soon to be excess) facilities. It completes the decontamination and decommission of deteriorating DOE-SC ORNL facilities; the treatment and disposal of legacy materials; and the remediation of soil, groundwater, and surface water. It also decontaminates and decommissions oversized and contaminated EM waste treatment systems that are partially used by SC

Table 4.1. Asset Utilization Index (AUI) for FY 2007

	Operating NUSF	Shutdown NUSF	Total NUSF	FY 2007 Percent	Long-Term Target
Office	702,959	36,014	738,973	95.13%	95.00%
Warehouse	211,832	4,521	216,353	97.91%	89.00%
Laboratory	1,717,745	143,812	1,861,557	92.27%	90.00%

facilities and must be replaced. Their replacement is proposed as part of IFDP. Under this strategy, virtually all ORNL Central Campus facilities and structures (Fig. 4.5) transfer to DOE-EM for demolition and disposition. Of the 60 excess facilities shown in Table F.1 (Appendix F), 27 are included in the scope of the IFDP.

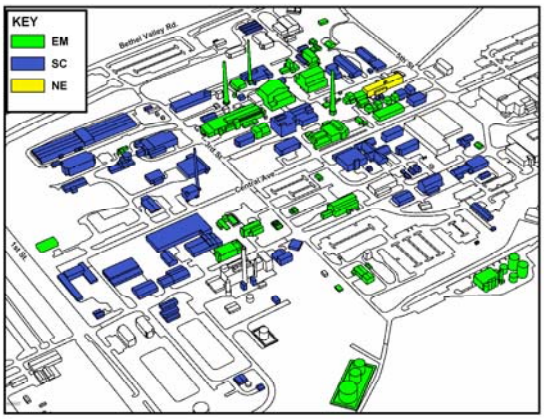

Fig. 4.5. Excess facilities in ORNL Central Campus.

The SLI-EFDP Program is funded through FY 2008. Buildings 2010 and 2009 (dependent upon funding and approvals), 2 of the remaining 33 DOE-SC excess facilities listed in Table F.1, will be demolished in FY 2007 and FY 2008. These facilities are located in the Central Campus (Fig. 4.6) adjacent to the developing ORNL Science and Technology Park. Beginning in FY 2009, the remaining 31 DOE-SC excess facilities listed in Table F.1 (4 buildings, 17 structures, and 10 trailers) and future non-IFDP excess facilities will be dispositioned using ORNL overhead funding or as part of future capital projects. A baseline overhead funding level of $1.5M is planned. Facilities will be prioritized based on condition (ES&H risk, DM, etc.), location, and other considerations.

4.5 Long-Term Stewardship

Responsibility for Long-Term Stewardship (LTS) activities at the ORNL site, including surveillance and maintenance (S&M) of remediation areas, is currently the responsibility of

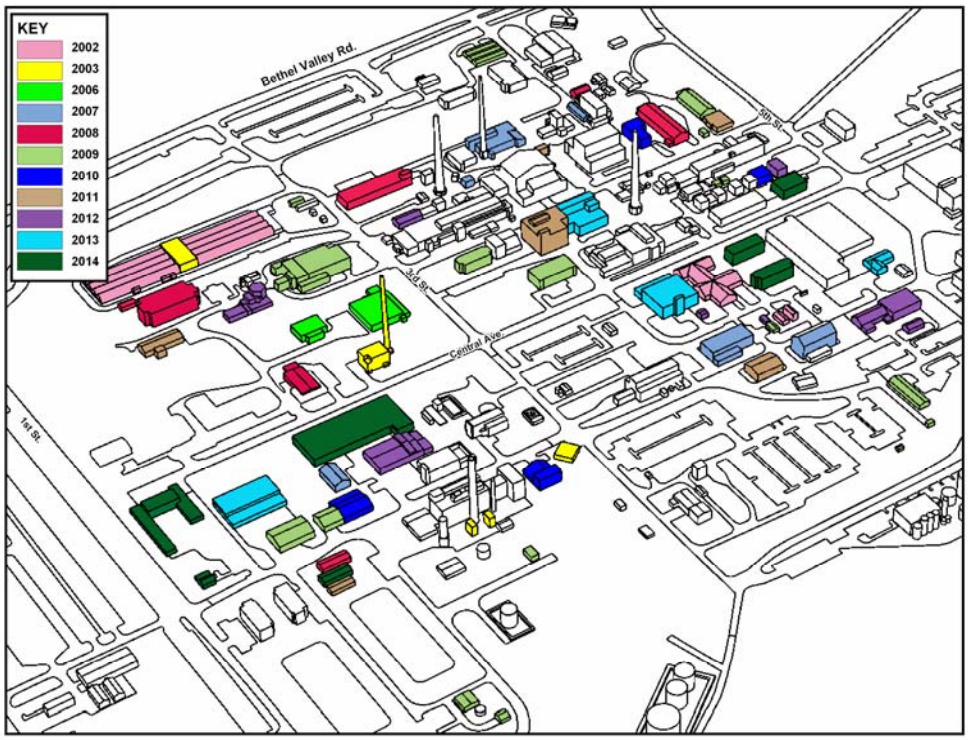

Fig. 4.6. Facilities by planned excess year.

DOE-EM. These activities include (but are not limited to) groundwater, surface water, and air quality monitoring; groundwater level monitoring; surveillance and maintenance of capped waste areas, soil contamination areas, buildings, and other remediated areas; implementation of land use controls; and periodic regulatory reviews and reporting. The current projected cost for these activities proposed in the DOE-EM baseline from FY 2006 is shown in Table 4.2. These costs represent estimates exclusive of the IFDP, and full implementation of the IFDP will likely impact these numbers. More refined estimates will be provided in later TYSP updates as the IFDP scope and schedule become well defined.

It is proposed that, at the end of the DOE-EM program at ORNL, the LTS responsibilities will transition to the DOE-SC after appropriate plans and budget transfers have been developed. Total LTS costs from 2018 to 2070 are estimated at $1.5 billion.

ORNL is working to fulfill its historic preservation requirements under the National Historic Preservation Act. This has resulted in the issuance of a Programmatic Agreement among DOE, the State of Tennessee Historic Preservation Office, and the Advisory Council on Historic Preservation (May 6, 1994) that required the development of the *Cultural Resource Management Plan* (DOE 2001). A second Programmatic Agreement, only applicable to the ORNL site, issued on February 23, 2005, called for the development of an Oral History Program of current and former ORNL employees. This was completed in December 2005. The development of an Interpretive Plan for historical and cultural resources of the Laboratory, as well as conducting a Machinery and Equipment Survey and Assessment to meet a December 2007 completion date, are required by the second Programmatic Agreement.

Table 4.2. Current projected cost for LTS activities proposed in the DOE-EM baseline ($ in millions)

Category	FY06–FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17	FY18	LI Total
ORNL Water Quality Program	-	1.60	1.70	1.60	1.60	1.50	1.50	1.50	1.50	1.50	1.50	15.05
ORR Integrated Footprint Reduction	-	0.60	0.61	0.63	0.01	-	-	-	-	1.84	-	3.07
Long-Term S&M	-	2.50	2.30	2.80	6.30	6.60	6.70	7.00	7.30	7.60	7.90	57.00

4.6 Replacement Plant Value (RPV) Estimates

Proposed construction of new facilities (Table 4.3) increases RPV by approximately $829,660K. Planned facility disposition decreases total RPV by $128,612K. Assuming escalation of 2.3%, the estimated RPV at the end of the planning period will be $2,808,354K (Table 4.4).

4.7 Maintenance

ORNL has invested and will continue to invest significant overhead resources into maintenance of its general facilities and infrastructure as evidenced by the following:

- ORNL's maintenance program invests at the recommended industry standard of 2 to 4% of replacement plant value (Table 4.5).
- ORNL exceeds benchmarking partners in maintenance investments. Annually, ORNL participates in the Facility Issues "Facility Managers Roundtable" benchmarking study. This group consists of 70 to 100 corporations utilizing a consistent set of definitions to allow performance comparisons. Within this group, ORNL has consistently applied more maintenance

dollars per square foot than all other participants. According to the 2006 data submitted, ORNL invested approximately three times the group median.

- As shown in Fig. 2.2, about 1.8 million sf of space is nearing or has exceeded its design life and is still serving its intended purpose. These facilities have received little recapitalization and, without adequate maintenance funding, would be unable to continue serving their intended function for their design life or beyond.

In 2005 ORNL initiated application of the Whitestone Research maintenance and repair system (MARS™), including field condition assessments, to forecast its maintenance requirements and determine facility deferred maintenance. In 2007 ORNL has developed a maintenance investment strategy based on facility condition, functionality, and future mission. This strategy is being used to modify Whitestone's parametric model into a maintenance program tailored to the Laboratory's specific needs. In general, mission-critical and mission-dependant facilities built in year 2000 or later are considered to be modern, with sufficient maintenance performed to prevent the generation of deferred maintenance. For facilities that will be modernized within the next 10 years, maintenance sufficient to retain safety and desired functionality is being performed until modernization occurs. Facilities that will not be modernized during the next 10 years, but that are not excess to mission, will have selective maintenance done to ensure safety, habitability, and environmental compliance. Minimum maintenance resources are applied to facilities designated "not mission dependent" to ensure safety and environmental compliance. In the upcoming year, this strategy will be incorporated into the building-specific maintenance work plans.

In part due to safety consequences, aging and renewal is more critical within nuclear facilities. Although high-priority maintenance and some limited rehabilitation projects have been completed at the nonreactor nuclear facilities, DM and rehabilitation, including necessary recapitalization needs, continue to increase. The condition of nonreactor nuclear facilities makes it more difficult to maintain an adequate safety margin and ensure regulatory/contractual compliance. The most recently completed Five-Year Sustainment and Recapitalization Plan for nonreactor nuclear facilities lists a total unfunded maintenance balance of approximately $16M. It also details a total unfunded recapitalization of approximately $60M. Of particular concern are the unfunded items in three strategic facilities: Buildings 7920, 7930, and 3525. These three facilities comprise approximately 70% of the unfunded maintenance and approximately 80% of the unfunded recapitalization for nonreactor nuclear facilities. Long-term maintenance forecasts indicate a continuing and significant cost growth unless substantial rehabilitation/recapitalization investments are funded. In March 2007, an FY 2008 direct request of $28M was submitted to DOE Nuclear Energy (NE) to fund the operational, compliance, maintenance, and safety activities in the 7920, 7930, 3025E, and 3525 nuclear facilities. It is currently not known if this request will be included in the budget.

The impacts of funding shortfalls at the nonreactor nuclear facilities are minimized through a risk-ranked prioritization process that focuses on complying with Technical Safety Requirements and maintaining safety-related systems. Improved conduct of operations and qualification of personnel have also increased operational awareness of facility limitations.

The results of aging for other old DOE-owned facilities are similar to that of nonreactor nuclear facilities. At the main Bethel Valley Campus, major system failures occur with increasing frequency as many of these buildings and systems have exceeded their design life without substantial rehabilitation or replacement. These system repairs take priority over planned rehabilitation, making it difficult to predict what specific rehabilitation projects will actually be done during a year. Rather, specific funds are identified and planned for preventive maintenance and for general corrective maintenance. In addition, a small project fund is set aside and used for critical rehabilitation

Table 4.3. Proposed new DOE buildings

Project	GSF	FIMS	RPV ($1000)
ORNL User Housing Facility	15,000	2008	4,900
Melton Valley Trailer	8,928	2009	460
West End Research Support Building	9,000	2009	3,000
ORNL User Housing Facility (Based on need)	15,000	2012	4,800
Multiprogram Laboratory Facility (SLI-LI)	140,000	2013	100,000
Center for Neutron Scattering User Facility (Programmatic)	50,510	2013	19,500
Site Utility Modernization (SLI-LI)*	-	2015	80,000
Second Target Building with Laboratory and Office Facility Programmatic)	150,000	2015	450,000
Second Target Utility Building	15,000	2015	18,000
HB-2 Second Cold Source and Guide Hall	40,000	2016	101,000
Site Operations Facility (SLI-LI)	75,000	2017	28,000
Melton Valley Research Operations Support Facility (SLI-LI)	80,000	2017	20,000
Total	598,438		829,660
Completed Outside the Planning Period			
7000 Area Site Maintenance/Fabrication Facility (SLI-LI)	100,000	2020	33,000
Waste Handling Systems (SLI-LI)[a]		2020	36,000

[a] Other Structures and Facilities (OSF)

Table 4.4. RPV estimates for the planning period

Planning Year	RPV of Existing Facilities at Beginning of FY ($1000)	RPV Added from Proposed Additions ($1000)	RPV Eliminated from Central Campus Closure Plan (IFDP) ($1000)	RPV Eliminated from Excess Facility Disposition Plan (EFDP) ($1000)	Total Estimated RPV at end of FY ($1000)	RPV Escalation (1.023*Column G) ($1000)
FY 2004	1,333,887	NA	NA	NA	NA	NA
FY 2005	1,379,178	NA	NA	NA	NA	NA
FY 2006	1,618,776	NA	NA	NA	1,618,776	1,618,776
FY 2007	1,618,776	-	4,334	222	1,614,220	1,651,347
FY 2008	1,651,347	4,900	10,571	1,028	1,644,647	1,682,474
FY 2009	1,682,474	3,460	34,030	4,284	1,647,620	1,685,515
FY 2010	1,685,515	-	4,350	1,518	1,679,647	1,718,279
FY 2011	1,718,279	-	11,470	41	1,706,768	1,746,024
FY 2012	1,746,024	4,800	7,642	434	1,742,748	1,782,831
FY 2013	1,782,831	109,500	13,898	4,823	1,873,609	1,916,702
FY 2014	1,916,702	-	10,083	935	1,905,685	1,949,515
FY 2015	1,949,515	548,000	18,948	-	2,478,567	2,535,574
FY 2016	2,535,574	101,000	-	1	2,636,573	2,697,214
FY 2017	2,697,214	48,000	-	-	2,745,214	2,808,354
FY 2018	2,808,354	-	-	-	2,808,354	-

Table 4.5. Planned maintenance funding

Planning Year	RPV of Existing Facilities at Beginning of FY ($1000)	SC Goal Minimum 2% of RPV ($1000)	Planned Direct Funded Maintenance in FY ($1000)	Planned Indirect Funded Maintenance in FY ($1000)	Total Planned Maintenance Funding in FY ($1000)	MII Calculation
FY 2007	1,333,887	41,131	14,576	31,952	46,528	3.49%
FY 2008	1,379,178	42,365	14,897	32,655	47,552	3.45%
FY 2009	1,618,776	32,376	15,210	33,341	48,551	3.00%
FY 2010	1,618,776	32,376	15,529	34,041	49,570	3.06%
FY 2011	1,651,347	33,027	15,855	34,756	50,611	3.06%
FY 2012	1,682,474	33,649	16,188	35,486	51,674	3.07%
FY 2013	1,685,515	33,710	16,528	36,231	52,759	3.13%
FY 2014	1,718,279	34,366	16,875	36,992	53,867	3.13%
FY 2015	1,746,024	34,920	17,230	37,769	54,999	3.15%
FY 2016	1,782,831	35,657	17,592	38,562	56,154	3.15%
FY 2017	1,916,702	38,334	17,961	39,372	57,333	2.99%
FY 2018	1,949,515	38,990	18,338	40,198	58,536	3.00%

projects. This fund is managed by senior management to ensure that high-priority tasks, critical to continued building occupancy, are completed first. Projects are approved during the year as actual required scheduled maintenance and unscheduled repair (to equipment beyond its service life) costs are better defined.

4.8 Deferred Maintenance Reduction (DMR)

Previously, asset condition assessments were completed in-house using the Condition Assessment Information System (CAIS) methodology and, as implemented, captured only a subset (items in need of repair detected through visual inspection only) of facility deficiencies. Presently, third-party asset condition inspections and the Whitestone Research MARS forecasting software are used to document asset condition and provide a parametric maintenance model. As noted in Sect. 4.7, ORNL is continually improving facility data and will be applying a strategic maintenance investment approach to this parametric model. ORNL's reported $198,506,000 (2006) DM is the summation of replacement costs for all equipment that, in the MARS forecast model, had reached end-of-design life and had not been replaced. This number appears to be higher than expected for several reasons as discussed in the following paragraphs.

ORNL has one of the most aggressive modernization programs within the suite of SC laboratories. To date, over 1 million sf of new space has been built and over 1.9 million sf of space has been either demolished or placed into low-maintenance excess facility status, resulting in a reduction of the average age of facilities from 42 years to 31 years. In conjunction with reducing the total inventory of facilities requiring maintenance and reducing the facility age (i.e., lower maintenance requirements), ORNL has increased its maintenance expenditures per area occupied. The maintenance investment per operating square foot has approximately doubled during the past 6 years with ORNL recorded as having the highest MII of the major SC laboratories at about 3%. In benchmark studies, ORNL has consistently applied more maintenance dollars per square foot than all other participants. To ensure available maintenance funds are utilized to the maximum extent possible, ORNL has tracked its responsiveness for daily work and implemented work execution changes resulting in cycle time reduction from over 40 days to less than 4 days per activity.

Despite these actions, ORNL's recorded DM is two to three times that of any other major SC facility. Due to this inconsistency, ORNL has re-evaluated its reported DM and has concluded that a significant portion of the reported DM is actually rehabilitation and improvement.

Regardless of the accuracy of ORNL's reported DM, the Laboratory's challenge is to provide modern facilities capable of supporting 21st century scientific needs while being regulatory compliant.

Resolution of this issue is being addressed through (1) data validation (see previous paragraphs); (2) modernization, including the SLI renewal program; (3) strategic overhead-funded IGPP investments; and (4) an overhead fund targeting DM directly.

Modernization, based on pre-2005 CAIS inspection information, has resulted in a $70M DM reduction (through UT-Battelle's 6-year consolidation efforts). Planned renovations and replacement buildings will allow ORNL to vacate an additional 500,000 sf of aged, poor-condition facilities during the next 10 years. Currently, $34M of DM is tagged to those assets. The SLI Multiprogram Laboratory Facility line item project will allow portions of Buildings 4500N and 4500S to be downgraded from laboratory to office space and will support space usage. Some $31M of DM will be eliminated as building systems and equipment that support these laboratories are taken out of service.

Since 2002, $50M of overhead funds have supported IGPP modernization projects that expanded utility grids and improved roads, parking, and grounds. The annual IGPP investment will be doubled ($15M) during the next 10 years. These investments, focused on delivering facilities commensurate with the needs of modern research, will address DM, reconfiguration, and improvements concurrently.

An additional $5M of overhead will be redirected to specifically decrease the backlog of maintenance in mission-critical facilities. A summary of these DMR efforts is shown in Table 4.6. Based on implementation of this strategy, ORNL will attain the corporate ACI goals by 2015.

4.9 Recapitalization and Modernization

ORNL's fully modern research campus will have world-class technical and support facilities that enable discovery and attract the best and brightest talent from all fields. The campus will be a vibrant setting where staff members have opportunities to interact and conduct multidisciplinary science safely and securely. It will offer on-site, short-term housing and other amenities for a growing global user community. It will operate in a manner that protects and restores the environment and will be sustained through sufficient maintenance and renewal investments in the facilities and infrastructure.

During the past 6 years great progress has been made. Many of ORNL research facilities are new or renovated. Most staff have modern work environments, and all staff have access to on-site amenities such as conferencing and a cafeteria. Yet there are still parts of the site that remain unaddressed. A tour through many ORNL buildings is a walk through history. Visitors and potential recruits can envision the early Oak Ridge researchers working on the Manhattan Project. The configuration of laboratory space, interior building finishes, and some furnishings remain the same as they were in the 1950s. Behind walls are the original utility distribution systems sized to precomputing and high-technology instrumentation requirements, and some ORNL utility and waste-handling facilities and distribution grids are similarly outdated.

The changing research mix, the rapidly growing number of visiting scientists, and the developing ORNL Science and Technology Park will greatly influence modernization priorities.

Research now depends on computers with ever-increasing computational capacity; they in turn depend on the availability of large electrical and cooling capacities. Nanoscale research taxes the ability to maintain clean, vibration-free, tightly

Table 4.6. TYSP deferred maintenance reduction guidance

Planning Year	DM Estimate at the End of the FY ($1000)	Estimate of DM Growth ($1000)	SC DMR Funding Target ($1000)	Lab Planned DM Reduction Funding ($1000)	Portion of Column (E) from IGPP or Major Repairs ($1000)	DM Reduction Other Contributions (LI, etc.) ($1000)	Expected DM at the End of the FY ($1000)	DM Escalation (DM in column (H)*1.023 ($1000)	Estimated RPV ($1000)	Estimated ACI
FY 2007	198,506		5,544	5,544	2,600	-	192,962	197,400	1,333,887	0.85
FY 2008	197,400		14,400	6,000	1,000	7,000	184,400	188,641	1,333,887	0.86
FY 2009	188,641		21,000	6,500	1,500	7,000	175,141	179,170	1,333,887	0.87
FY 2010	179,170		27,600	14,500	9,500	7,000	157,670	161,296	1,333,887	0.88
FY 2011	161,296		27,600	7,500	2,500	7,000	146,796	150,172	1,333,887	0.89
FY 2012	150,172		27,600	15,500	10,500	-	134,672	137,770	1,333,887	0.90
FY 2013	137,770		27,600	12,900	7,900	31,500	93,370	95,517	1,333,887	0.93
FY 2014	95,517		27,600	14,500	9,500	-	81,017	82,881	1,333,887	0.94
FY 2015	82,881		27,600	13,200	8,200	19,000	50,681	51,846	1,333,887	0.96
FY 2016	51,846		27,600	12,200	7,200	-	39,646	40,558	1,333,887	0.97
FY 2017	40,558		27,600	18,000	13,000	3,300	19,258	19,701	1,333,887	0.99
FY 2018	19,701		27,600	9,000	4,000	-	10,701	10,947	1,333,887	0.99

controlled laboratory environments. More visiting scientists and the nontraditional site population housed in the Science and Technology Park will strain site infrastructure and redefine needed site amenities. However, completing the remaining campus revitalization and legacy cleanup will require the greatest amount of effort during this planning period. ORNL recapitalization and modernization priorities follow:

- replacement in part and renovation of the Materials and Chemistry Building Complex (4500N/S), ORNL's largest laboratory building complex;
- disposition of legacy facilities and materials and right-sizing of waste management systems;
- recapitalization and capacity enhancement of electrical, cooling, and other utilities to support more powerful research equipment and growing site population;
- renovation and renewal of existing buildings and the construction of new buildings in West and Melton Valley Campus to collocate synergistic research capabilities, reduce the nonreactor nuclear footprint, and vacate the Central Campus ahead of site cleanup;
- enhancement of security, safety, health and environmental protection systems and relocation of first responders to better protect people, information, and physical assets; and
- additions of new site amenities to support a growing visiting scientist population and to provide site staff with a healthy, productive work environment.

The total rehabilitation and improvement cost (Table 4.7) associated with planned capital investments reported in Appendix D, "Updated FY 2009 Integrated Facilities and Infrastructure (IFI) Crosscut Budget Submission," is $355,348,000. Programmatic line items (e.g., the second SNS target building) and new capability (e.g., the ORNL User Facility) were not considered rehabilitation or improvement.

Table 4.7. Rehabilitation and Improvement Cost (RIC)

	$ in thousands
Buildings	232,306
Other Structures and Facilities	123,042
Total	355,348

4.9.1 ORNL Master Plan for Facilities Supporting Mission Activities

As depicted in Fig. 4.7, ORNL's TYSP is structured around the primary research and support areas located in

- **Bethel Valley (Main Plant):** East Campus, Central Campus, West Campus, 7000 Area
- **Melton Valley:** HFIR/REDC complex, Fusion/Robotics complex, 7600 Waste Management Facilities
- **Chestnut Ridge:** SNS site
- **Off-Site Locations:** National Transportation Research Center (NTRC), ORNL at Y-12

4.9.1.1 Bethel Valley (Main Plant)

As the primary location for the majority of the ORNL staff and research facilities, Bethel Valley is the hub of activity at ORNL. Because of the age of the facilities there, the main plant area has been the site of initial focus by UT-Battelle in ORNL modernization initiatives. The central location of the facilities, the existing infrastructure, and the investments being made in revitalizing the main plant make this one of the key long-term development areas for ORNL's future.

4.9.1.1.1 East Campus

The East Campus contains the highest population density of the Laboratory, with 70% of ORNL's scientific support staff housed there. This area also serves as the main entry point for visitors to the Laboratory and as a central gathering point for ORNL staff with a cafeteria, conference center, and large outdoor commons area. In addition, the largest portion of ORNL's computing and computational facilities and the Holifield Radioactive Ion Beam Facility (HRIBF), operated as a National User Facility for DOE, and are located in the East Campus.

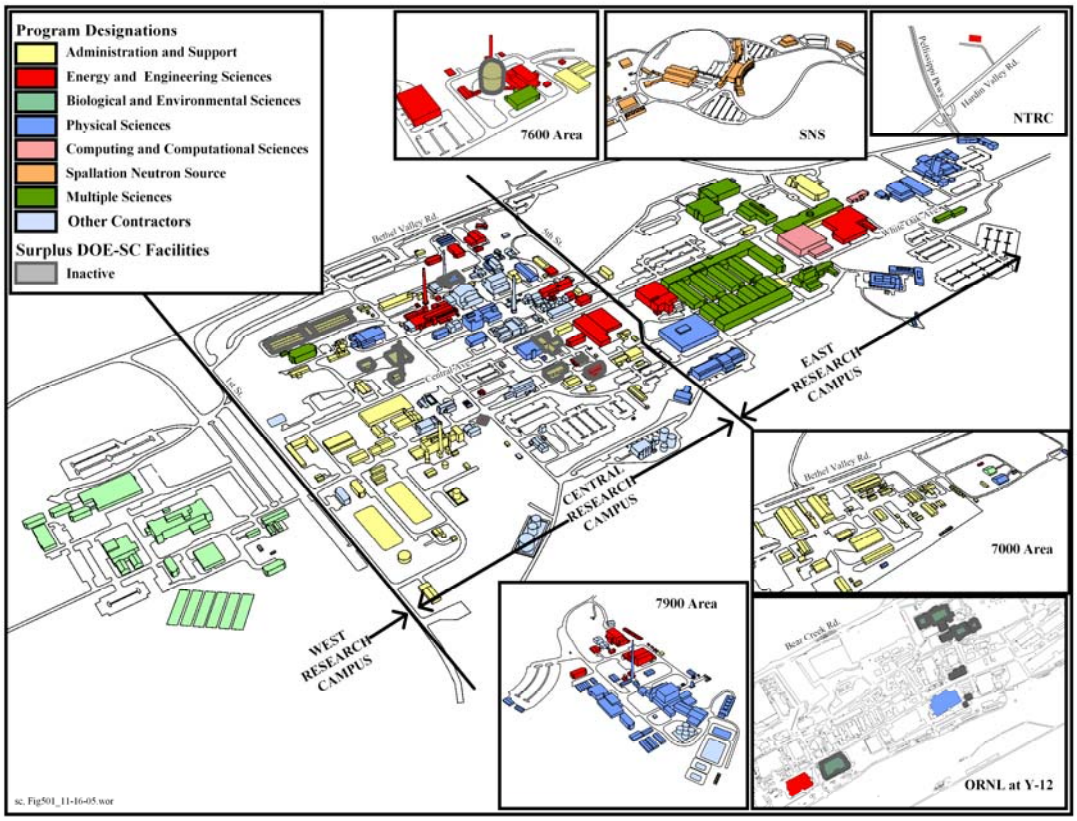

Fig. 4.7. Facility use index for ORNL's primary research support facilities.

The primary facilities development activities planned for the East Campus are a laboratory replacement building, upgrades to utility systems, and the reconfiguration of vacated Buildings 4500N and 4500S laboratory space.

Buildings 4500N and 4500S comprise ORNL's largest chemical and material sciences research facility. This facility is more than 50 years old, in poor condition, and simply does not meet the functional needs of research. The FY 2009 SLI line item project, Multiprogram Laboratory Facility, is planned to replace much of the facility's laboratory space. The 140,000- to 170,000-gsf replacement building will be located directly across from Building 4500N in what is now the flagpole parking lot.

Several research activities that work with either large amounts of radioactive material or large industrial equipment are too expensive to relocate. In these cases, overhead-funded renovations and upgrades to improve interior finishes and building utility distribution systems will be completed with the research remaining in place. Once the replacement building is occupied, IGPP-sized projects will reconfigure vacated 4500N and 4500S laboratories into offices and service support shops. The newly renovated space will accommodate relocation of operations from the Central Campus ahead of site cleanup. It will also accommodate general population growth and staff now located in off-site leased buildings.

ORNL has requested a temporary 10CFR 851 variance from chemical loading and fire barrier requirements for Buildings 4500N and 4500S as well as many other DOE-owned buildings. While the SLI Multiprogram Laboratory Facility plays a large role in ORNL becoming fully compliant, several near-term IGPPs will provide additional chemical storage areas that will improve operations. Other East Campus priority safety, health, and environmental concerns identified through ORNL's internal risk ranking process are being similarly addressed. Upgrades to emergency generator systems and elevators that are not compliant with the Americans with Disabilities Act are typical to these types of IGPPs.

The FY 2011 SLI line item project, Site Utility Modernization, will upgrade central and distributed utility systems that service all of ORNL. In the East Campus these systems include steam, water, sewer, and gaseous waste. In the near term, IGPP-sized electrical and cooling water projects will help keep pace with the demand for computer and computational capacity, and the grid will be expanded to accommodate fluctuations in demand. For instance, the piping and a central cooling plant foundation will be part of the ORNL-owned chilled water system; but as specific programmatic customers require increased cooling capacity, they will lease and site a chiller in the new central plant for the duration of their project.

4.9.1.1.2 Central Campus

The main focus in the Central Campus over the next 10 years will be on remediation and demolition. While there are key research and support operations in the Central Campus (including the High Temperature Materials Laboratory, the new Advanced Microscopy Laboratory, and hot cell facilities), this area is the oldest part of the ORNL campus and is a primary focal point of the Integrated Facility Disposition Plan (Fig. 4.8). This plan to disposition legacy facilities and materials received Critical Decision-0 (CD-0) approval by DOE in June 2007.

Fig. 4.8. Central Campus

Integrated Facility Disposition Plan. A significant, long-term vulnerability for ORNL is the management of legacy issues that have emerged over 60 years of Laboratory operations. These issues include disposition of surplus facilities, elimination of legacy materials, and mitigation of impacts resulting from environmental legacies and waste management facility operations. More than 100 DOE-SC/DOE-NE–owned facilities that are now, or soon will become, excess to mission needs are not addressed in the current DOE-EM baseline. Twenty-four of these facilities are currently inactive and ready for immediate demolition. The balance of the Manhattan Project/Cold War–era buildings will be vacated when proposed replacement buildings are constructed; these include those vacated through nuclear consolidation. DOE-ORO has proposed the IFDP to complete DOE's EM-managed cleanup efforts in Oak Ridge in the FY 2018–2020 time frame.

This project will complete remedial actions and facility decontamination, deactivation, decommissioning, and demolition efforts at ORNL and the Y-12 National Security Complex. Facilities that have been determined to be "excess to the mission" in the next 10 years, including DOE-SC facilities, will be demolished, and contaminated media will be cleaned up. The ORNL portion of the IFDP, the Central Campus Closure Project, defines projects sequenced to right-size waste-handling systems prior to the time DOE-EM transfers its operations to DOE-SC. The planned approach will result in (1) elimination of process waste effluents to allow more cost-effective treatment; (2) installation of new gaseous waste treatment systems for nuclear and radiological facilities planned to be operated well into the future; (3) construction of liquid low-level waste (LLLW) source treatment systems and a solidification facility for Bethel Valley, Melton Valley, and SNS generators; (4) construction of solid waste staging facilities; and (5) an elimination and cost avoidance of $21.9M in annual operating costs.

If the IFDP is not funded, the waste management facilities needed for long-term ORNL operation would have to be provided via another mechanism. As part of the SLI FY 2017 line item project, Waste Handling Systems, DOE-SC would replace the systems required to handle ORNL newly generated waste but not the systems required for processing capability to meet transuranic (TRU) waste packaging certification requirements and storage for radioactive waste (see Appendix E). The current DOE-EM schedule indicates that the existing waste management facilities will not accept materials after FY 2014. Continuing DOE-EM operation of the current waste management facilities past 2014 will require upgrades to extend building design life, additional waste storage capacity, and modifications to safety basis documents. ORNL is closely monitoring developments in this area.

Except for the few mission-critical facilities that have unique capabilities, ORNL operations are being relocated outside the Central Campus ahead of cleanup. Over the next 2 years, material science and technology capabilities are relocating into Buildings 4500S and 4508. Facility maintenance, instrument calibrations, and human resource functions are being relocated to Buildings 6011 and 7601. As part of the nonreactor nuclear facility consolidation, operations are being collocated with other nuclear research in the Melton Valley Campus. The SLI line item project, Melton Valley Research Operations Support Facility (FY 2015) aids this effort with replacement maintenance, storage, and office space.

In the future, the SLI Site Operations Facility (FY 2015) will accommodate relocation of the fire department, protection forces, and other emergency first responders. The new building will be on the east end of the main Bethel Valley Campus and central to all ORNL operations. The current location of the ORNL fire station is far to the west, resulting in 21% of emergency response times falling outside regulatory limits. Any remaining support functions will be relocated to 4500N and 4500S reconfigured laboratory space. In the Central Campus, the SLI Utility Modernization project (FY 2011) will upgrade the central sewage treatment plant and relocate main water lines. The underground

water lines, buried in contaminated soil, will be abandoned, and a new line will circumvent the EM cleanup area to connect the East and West Campuses. Routine refurbishments are planned for the Building 3500 laboratories, and for 4501 and 4505 radiological capabilities. Plans to expand next-generation electron microscope laboratories much like those in the Advanced Microscopy Laboratory, Building 3625, and the Materials Development high bay space in Building 4508 are under study.

Consolidation of Nonreactor Nuclear Facility Footprint. ORNL's nuclear facilities, and the nuclear science and technology programs that they support, are essential for national leadership in understanding the behavior of materials and nuclear fuels under irradiation and in applying radiochemistry techniques and operations to the production of nuclear materials and isotopes. These capabilities also enable the Laboratory to maintain its signature of world leadership in neutron science at the HFIR and the SNS. The ages of ORNL's Category 2 and 3 facilities range from 23 to 65 years, and the condition of nonreactor nuclear facilities makes it increasingly difficult to maintain an adequate safety margin and ensure regulatory/contractual compliance. The most recently completed Five-Year Sustainment and Recapitalization Plan for Nonreactor Nuclear Facilities Division details a funding shortfall. Of particular concern are the unfunded items in these strategic facilities: Buildings 7920, 7930, and 3525.

The Nuclear Facilities Consolidation Project is reducing the total facility inventory from ten to four or fewer facilities (see Fig. 4.9). Buildings 7920, 7930, 3025E, and 3525 have strategically unique capabilities.

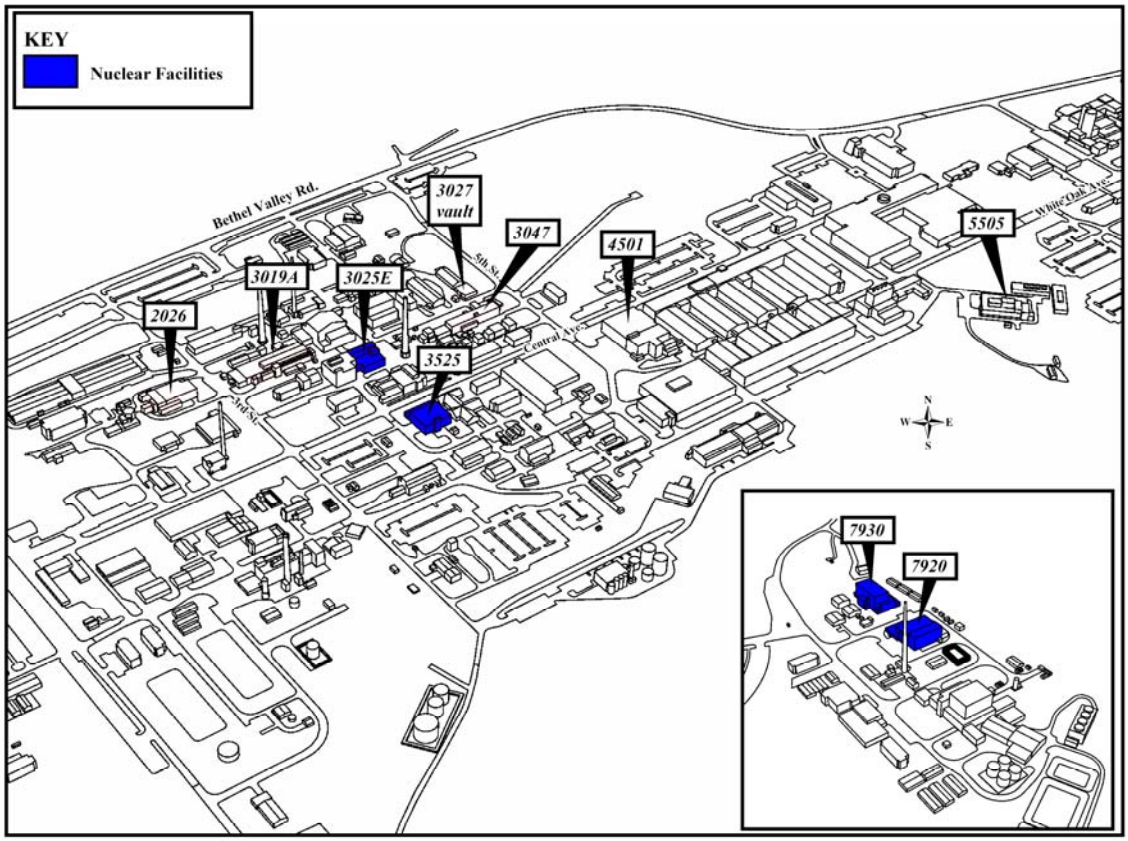

Fig. 4.9. Nonreactor nuclear facilities reduced footprint.

They will continue to be operated as nuclear facilities. Building 3019A has been transferred to Isotek Systems, LLC, as a nuclear facility. Buildings 4501 and 5505 are or will be downgraded to radiological facilities and will continue operations. Research operations have ceased in Buildings 3047 and 2026 in preparation for inclusion in the EM cleanup. The 3027 vault has been cleaned out; the building is within the EM cleanup area and will become excess for disposition once the occupying site services operation can be relocated. Buildings 3025E and 3525 are both sited within the EM cleanup area. Due to the strategic importance of the capabilities housed in these nuclear facilities, options for relocating their capabilities/missions are being considered.

Oak Ridge Science and Technology Park. A new post cleanup mission is being defined for the Central Campus. In 2006, ORO granted the Community Reuse Organization of East Tennessee (CROET), an economic development organization, a 20-year land lease agreement for 12 acres of Central Campus land to start the development of the Oak Ridge Science and Technology Park. The park will be modeled consistent with Association of University Research Parks standards; there are currently 140 such parks located in the United States. It provides space for companies doing research at ORNL, partner universities, start-up companies that want to build around Laboratory technologies, and ORR service contractors. It is envisioned that the park will grow to 40 acres potentially bounded by Bethel Valley Road, Central Avenue, First Street, and Third Street (Fig. 4.10). The first occupant is expected to start the construction of a 100,000-gsf office building during CY 2007. Grants from the state of Tennessee are funding the ongoing construction of basic utility infrastructure. ORO has agreed to transfer Building 2033 and surrounding land for inclusion in the park in FY 2008.

4.9.1.1.3 West Campus

The West Campus area has historically been the primary home to the ORNL Environmental Sciences Division. In 2003 the Laboratory for Comparative and Functional Genomics (LCFG), a vivarium, was constructed there to relocate ORNL's mouse colony from off-site Y-12 facilities. Construction of the state of Tennessee funded Joint Institution for Biological Studies (JIBS) is under way and is expected to be completed in November 2007.

Fig. 4.10. Science and Technology Park.

The ultimate goal for the West Campus area is to be a fully integrated and landscaped office and laboratory complex for conducting primarily bioenergy research. It will have a look, feel, and functionality similar to that of the new ORNL East Campus area (see Fig. 4.11). The JIBS will serve as the new centerpiece research building and will become the nucleus around which the new campus setting will evolve. Following JIBS completion, work will begin to transform the complex into an identifiable designation point.

Fig. 4.11. Future West Campus.

An IGPP will provide a landscaped quadrangle commons that connects West Campus buildings together with walking paths and parking and patio areas. The environmental setting is expected to be greatly enhanced by a conscious

decision to restore the stream-bank riparian zone along First Creek and to emphasize native plantings throughout the landscaped quadrangle area.

IGPPs are reconfiguring 1970s laboratory space into large, open analytical laboratories. These new laboratories along with the general refurbishing of offices, storage, and common spaces have allowed increased utilization and the vacating of 30,000 nsf in the East Campus, which will then be used to relocate staff from Central Campus buildings.

An FY 2007 IGPP will construct a 9,000-gsf facility for research field and facility maintenance materials and equipment storage. The structure, located in the southwest corner of the campus, will include field sample preparation space and will allow the physical separation of "dirty" field sample preparation from other "cleaner" research activities. The building will also provide replacement facility maintenance storage for several Central Campus locations slated for demolition.

4.9.1.1.4 7000 Area

The 7000 Area is currently the primary location for ORNL maintenance and logistics support services. The facilities in this area are generally more than 40 years old, and they house shipping/receiving, new materials stores, vehicle fueling and maintenance, waste/chemical recycling, and a variety of carpentry and fabrication services shops. The 7000 Area also contains many small storage buildings that are individually less than 1,000 gsf.

The TYSP for the 7000 Area will focus on consolidation of services into a smaller operating footprint. The SLI-funded Site Maintenance/Fabrication Shop (FY 2017) will be the anchor building in the 7000 Area modernization. An out-year IGPP will build a more efficient storage facility in which materials and equipment can be consolidated so that the array of small storage buildings can be demolished.

4.9.1.2 Melton Valley

The Melton Valley area of ORNL contains two of ORNL's primary research complexes (the HFIR/REDC complex and the Fusion Energy/Robotics complex), large undeveloped land areas, the majority of ORNL's former radioactive waste management treatment and disposal sites, and two of ORNL's inactive research reactors. Of the approximately 1000 acres in Melton Valley, only about 5% is actively used by ORNL for its current research mission. The largest land area is managed by the DOE-EM Program through the Bechtel Jacobs Company (BJC) and is undergoing accelerated closure. Detailed discussion of these closure activities is beyond the scope of this TYSP, although there will continue to be significant interactions between UT-Battelle and BJC during the 8- to 10-year scope of the accelerated cleanup campaign there. As discussed in Sect. 4.5, a long-term stewardship commitment by DOE for those closure sites would represent a significant legacy cost.

4.9.1.2.1 HFIR/REDC Complex

As home to the High Flux Isotope Reactor (HFIR) and the Radiochemical Engineering Development Center (REDC), the HFIR/REDC Complex is the most important of ORNL's current nuclear facilities. The HFIR is a Category 1 nuclear reactor facility and, when operating at 85 MW, produces the world's highest peak thermal neutron flux. This unique national resource is extensively used annually by a wide variety of national laboratory, university, and industry staff for neutron scattering, isotope production, materials irradiation, and neutron activation analysis experiments. The REDC is a Category 2 nonreactor nuclear facility that includes adjacent office and support buildings and is the production, storage, and distribution center for the DOE heavy element research program, which separates and purifies elements from plutonium through fermium. The REDC is the primary location, other than Building 3525, where ORNL nuclear research will be located as nuclear facilities are consolidated.

Over the long term, the primary facilities needs for the HFIR/REDC complex center around four major areas: (1) addition of a major new cold guide hall to the HFIR HB-2 beam line for expansion of research capabilities and its associated CNS user facility, (2) completion of hot cell consolidation upgrades at the REDC Complex, (3) development and construction of new LLLW and gaseous treatment capabilities for the HFIR/REDC facilities in preparation for potential transfer of waste management responsibilities from EM to SC, and (4) development and construction of new facilities for the storage of solid remotely handled (RH) low-level radioactive waste (LLW) and RH-TRU waste in preparation for transfer of waste management responsibilities from EM to SC. A preliminary site plan showing this fully developed HFIR/REDC Complex is presented in Fig. 4.12. The second cold source and guide hall, as well as CNS user facilities, are proposed to be funded programmatically. Replacement waste handling facilities are proposed as part of the EM-funded IFDP. Ongoing hot cell consolidation is funded as part of Laboratory operations.

Other improvements for the HRIF/REDC in this 10-year period would focus on general infrastructure modernization, nuclear consolidation activities from Bethel Valley facilities, and upgrades necessary to accommodate new program missions (e.g., the DOE ^{238}Pu- Production Program, Global Nuclear Energy Program). Both HFIR and REDC maintenance, warehouse, and fabrication areas are overcrowded and inadequate to support operations. A great number of staff members are housed in temporary trailers. An SLI-funded Melton Valley Research Operations Support Facility (FY 2015) to accommodate these needs is proposed for a location compatible with the needs of the campus. In addition, for REDC (and all other hot cell operations at ORNL), an upgraded manipulator repair facility is planned for construction within existing buildings adjacent to Building 7930. This facility would be the new central location for multiprogram manipulator decontamination and repair, serving both Bethel Valley and Melton Valley. Upgrades to the HFIR/REDC Complex utility systems, including a new central utility building to house a new package steam boiler unit (as part of the

Fig. 4.12. Melton Valley Master Plan.

SLI Site Utility Modernization), are also planned. Additional parking (IGPP) will be provided to accommodate projected growth in the site population. Part of the existing parking lot will be used for new facility construction.

In addition, Buildings 7572 and 7574 are expected to transition from EM to SC in the future (2018 at the latest). These facilities are currently used to store contact-handled (CH) TRU waste and are functionally critical in supporting ongoing research activities at the REDC and other locations that generate TRU waste at ORNL.

4.9.1.2.2 Fusion/Robotics Complex

The 7600 Area in Melton Valley was originally constructed as an experimental gas-cooled reactor complex, but for the past 20 years has served as the home for various ORNL research and support organizations. The 2005 construction of a high bay facility (Building 7625) allowed relocation of fusion energy capability from Y-12. The disposition of the experimental gas-cooled reactor is included in ORO's IFDP.

4.9.1.2.3 7600 Waste Management Facilities

The 7600 waste management facilities are currently owned by EM and managed by BJC. This complex of facilities is being reviewed to determine if they are functionally critical in supporting ongoing research and operations activities. The facilities are operated under a state-issued permit to store hazardous and radioactive mixed wastes. Current plans include consideration of transferring these facilities from EM to SC in the future.

4.9.1.3 Chestnut Ridge

The Chestnut Ridge site, located approximately 2 miles northeast of the main ORNL Bethel Valley Campus, is being developed principally as the home of the SNS, (Fig. 4.13), an accelerator-based, next-generation neutron scattering facility that will produce neutron beams 12 times as intense as any existing pulsed source, enabling researchers to see never-before-observed details of physical and biological materials. The SNS is scheduled to ramp up to high-power user operations by FY 2008, serving 1000–2000 users each year. Adjacent to SNS is the new 80,000-sf CNMS, which provides users with access to a complete suite of nanoscience research capabilities (facilities and expertise). This laboratory and office building will leverage the neutron investigative capabilities at the SNS, as well as the other nearby ORNL world-class neutron science facilities at the HFIR.

Fig. 4.13. Spallation Neutron Source.

The location of the SNS is on an expandable 80-acre Chestnut Ridge site. An $8M state of Tennessee funded JINS is being designed for construction in close proximity to the SNS Central Laboratory and Office (CLO) Building and will provide researcher collaboration laboratory space. To provide on-site ready access to round-the-clock experiments, a limited-scope user housing facility is also being constructed. This modular, basic housing unit will be within walking distance of the SNS/CNMS and will be sized to accommodate the initial expected needs of the site with expansion capability for future growth.

Full development of the Chestnut Ridge site is expected to include completion of a planned power upgrade and new target development at the SNS. Based on current projections of user needs for neutron scattering capabilities around the world, the SNS 20-year plan shows that the SNS should be operating 45 best-in-class instruments with two differently optimized target stations and a beam power in the 3- to 4-MW range. To accommodate this projected need, Power Upgrade and LWTS projects are being proposed for design start in the FY 2010 time frame, with completion by FY 2015.

4.9.1.4 Off-Site Locations

There are very few locations off the main ORNL site where research and support staff still reside. The majority are in four leased office buildings in Oak Ridge, housing some 130 International Thermonuclear Experimental Reactor (ITER) project staff, Biosciences researchers, and ORNL administrative staff. The ITER staff members will remain in leased space for the full term of the project, until 2016. The research and administrative staff members are expected to be brought back to the ORNL site as office space becomes available. Other than a leased property surplus and storage facility, there are only two long-term off-site locations of significant ORNL operations or responsibility: the NTRC and the ORNL facilities of the Y-12 site, both described as follows.

4.9.1.4.1 National Transportation Research Center

The NTRC (Fig. 4.14) is a joint venture of ORNL, UT, DOE, and the Development Corporation of Knox County, with a mission to couple the technology and expertise of its partners to provide solutions to national transportation problems. The NTRC programs are housed in a leased, 85,000-sf laboratory and office building situated approximately 15 miles from ORNL along the Pellissippi Parkway. This facility is a special-purpose building containing engine test cells and other technology-appropriate laboratories, as well as offices for approximately 160 research staff. The NTRC has been in operation since FY 2000, and the expanded NTRC is expected to serve the ORNL transportation program needs through the rest of the TYSP time period. Portions of the main building and annex will be modified as programs change, but it is anticipated that the NTRC will remain one of the few key ORNL off-site leased facilities over the 10-year planning horizon.

Fig. 4.14. National Transportation Research Center.

4.9.1.4.2 ORNL Facilities at the Y-12 Site

ORNL research operations have been relocated from the Y-12 National Security Complex. Approximately 224,000 sf of space has been transferred to NNSA and 225,000 sf of space has been transferred operationally to NNSA (ORNL and DOE-SC still retain responsibility for these buildings, but all operational costs, utilities, and maintenance are borne by BWX Technologies [BWXT]). Conditions for return of these buildings to DOE-SC are defined in a formal Memorandum of Understanding (MOU). Some 445,000 sf is in cheap-to-keep mode awaiting final remediation. The only facilities remaining as operating buildings under ORNL control are Alpha-2 (9201-2) and Beta-3 (9204-3), where NE remains as landlord for that standby calutron facility. The primary focus at Y-12 in the next few years will be to complete actions required to transfer Alpha-2 and Beta-3 to the ORO IFDP so that disposition of the inventory of remaining facilities becomes an element of the EM cleanup program.

4.9.2 Institutional General Plant Projects (IGPPs)

Since FY 2002, ORNL has invested $50M in its IGPP program, and ORNL is committing to a $150M IGPP program over the 10-year planning period. Approximately $15M annually will replace the $7M Landlord GPP provided by Basic Energy Sciences (BES) and provide additional funding for modernization efforts. Depending on out-year priorities, the annual IGPP investment may be reduced (but not below $7M) to cover other priority activities such as excess facility disposition (Table 4.8).

Appendix D, Sect. 3 of the FY 2009–2018 Integrated Facilities and Infrastructure Budget Crosscut lists proposed IGPP-funded projects.

4.9.3 General Plant Projects (GPPs)

There are two authorized FY 2007 GPPs. One will construct a 25-bed ORNL User Facility on Chestnut Ridge to provide on-site housing for visiting scientists. The second will configure new laboratories for material science and technology research work. Two potential projects will occur only if no additional FY 2009 budget authorization is required to complete them.

Appendix D, Sect. 2 of the FY 2009–2018 Integrated Facilities and Infrastructure Budget Crosscut shows proposed GPP-funded projects.

Table 4.8. Planned IGPP/IGPE funding level

Fiscal Year	Planned IGPP/IGPE Funding Level ($1000)
2007	16,000
2008	15,000
2009	15,000
2010	15,000
2011	15,000
2012	15,000
2013	15,000
2014	15,000
2015	15,000
2016	15,000
2017	15,000
2018	15,000

FY 2008 projects are proposed to (1) configure cafeteria space within the Chestnut Ridge Central Laboratory and Office Building to accommodate staff and the growing user population and (2) expand Chestnut Ridge parking. Ongoing projects can be fully funded with FY 2007 and FY 2008 budget allocations; however, authorization of the FY 2008 new

4.9.4 Line Items

ORNL is proposing six SLI line item projects for this planning period (Table 4.9), which meet SLI program criteria. They are general infrastructure in nature, primarily focused on modernization and do not build capacity for new programmatic scope. These projects are too large in scope to be effectively addressed with IGPP and cannot be realistically funded using non-SLI funds.

Of highest priority is replacement of 1950s chemical and material sciences laboratories that simply no longer meet the needs of modern research. The 140,000- to 170,000-gsf Multiprogram Laboratory Facility is requested as an FY 2009 new start.

ORNL's other five projects upgrade site utility systems; provide replacement facilities for emergency first responders; provide expanded research support facilities for the Melton Valley Campus; replace 40-year-old 7000 Area maintenance, fabrication, and operations buildings; and replace and right-size waste handling systems.

Table 4.9. SLI funding profile (FY 2009 $ in millions)

Project Title	Estimated Cost	FY 09	FY 10	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16	FY 17	FY 18	Mortgage
Multiprogram Laboratory Facility	100	9	35	42	14	-	-	-	-	-	-	-
Site Utility Modernization	80	-	-	15	25	20	20	-	-	-	-	-
Site Operations Facility	28	-	-	-	-	-	-	10	18	-	-	-
MV Research Operations Support Facility	20	-	-	-	-	-	-	10	10	-	-	-
Waste Handling Systems	36	-	-	-	-	-	-	-	-	10	20	6
7000 Area Site Maintenance/ Fabrication Facility	33	-	-	-	-	-	-	-	-	10	15	8

Appendix E provides detailed information by project on mission relevance, footprint reduction, return on investment, and the amount of DM reduced. Appendix D, FY 2009–2018 Integrated Facilities and Infrastructure Budget Crosscut, Sect. 1 shows proposed line item funded projects.

Table 4.10 aligns supportive site infrastructure projects to business lines.

Table 4.10. Supportive site infrastructure by business lines

Business Lines and Alignment with DOE Strategic Plan[a]	Major Facility Investments since 2000	Planned Major Facility Investments and related infrastructure (2009–2019)[b]
Neutron Scattering **(Scientific Discovery and Innovation)**	**SNS Target Station and Laboratory/Office Building** **HFIR Cold Source Upgrade** **SANS Guide Hall Extension**	• **Second SNS Long Wavelength Target Station & Laboratory/Office Building (BES)** • **Central Utility Building for SNS** • **Center for Neutron Scattering User Facility** • **HB-2 Second Cold Source and Guide Hall** • **Joint Institute for Neutron Sciences** • SLI Melton Valley Research Operations Support Facility • ORNL User Facility • Chestnut Ridge Cafeteria Upgrade • Chestnut Ridge 3rd Floor Laboratory Build-Out for Material Science and Technology • Spallation Neutron Source Programmatic GPPs • Melton Valley Trailer Replacement • MV Northwest Parking Lot Expansion • Chestnut Ridge Parking • Second ORNL User Facility (only if usage justifies)
Computational Science and Engineering **(Scientific Discovery and Innovation)**	**Computational Sciences Building** **Institution for Computational Sciences**	• **Leadership Computing Facility Building** • 5000 Area 13.8-kV Distribution System Upgrade • 4000 Substation Capacity Expansion • East Campus Chilled Water • Two 13.8-kV Circuits and Switches for 6010 and 5600 • 1500-kV VA Transformers—East • 1500-kV VA Transformers—West • 4508 High Bay Upgrade
Materials Synthesis, Design, Characterization and Processing **(Scientific Discovery and Innovation)**	**Center for Nanophase Materials Sciences** **Advanced Microscope Laboratory**	• SLI Multiprogram Laboratory Facility • ORNL User Facility • Outside Chemical Storage Containers • Advanced Materials Laboratory Expansion • 4508 High Bay Expansion • Second ORNL User Facility (only if usage justifies)
Energy Technology **(Energy Security)**	**Engineering Technology Facility** **National Transportation Research Center** **Research Office Building** **Multiprogram High Bay Facility**	

Table 4.10 (continued)

Business Lines and Alignment with DOE Strategic Plan[a]	Major Facility Investments since 2000	Planned Major Facility Investments and related infrastructure (2009–2019)[b]
Biological and Environmental Sciences **(Scientific Discovery and Innovation)**	**Laboratory for Comparative and Functional Genomics**	• **Joint Institute for Biological Sciences** • West Campus Improvements • West Campus 1500 Facilities Renovations • Telecommunications Upgrades • West End Research Support Facility • West Campus Building System Upgrades • LSS (4512) and Emergency Ops Center (1503) Consolidation • West Campus Parking and Roads Improvement
Arms Control & Nonproliferation **(Nuclear Security)**	**Multiprogram Research Facility**	• **Multiprogram Research Facility 2** • North Hill Parking Lot
Nuclear Physics **(Scientific Discovery and Innovation)**		• 6000 Area Cooling Tower Replacement

[a]DOE (Department of Energy). 2006. U.S. Department of Energy Strategic Plan, Office of Program Analysis and Evaluation, U.S. Department of Energy (www.energy.gov).

[b]Projects in bold are planned major programmatic investments.

4.10 Site Space Bank Analysis

ORNL's space bank analysis (Table 4.11) considers contributions from the DOE-SC SLI-EFDP, DOE-EM IFDP, and ORNL overhead-funded EFDP. The SC and ORNL overhead-funded EFDP are reported in the same column. The table assumes that all proposed new buildings are constructed during the planning period.

ORNL has 98,957 sf in the space bank, and proposed new construction will require 598,438 sf. The DOE-SC EFDP will remove 19,647 sf by the end of FY 2008, and ORNL overhead-funded demolition will remove an additional 48,472 sf during the planning period. The DOE-EM IFDP demolishes 618,907 sf of ORNL legacy facilities in Bethel Valley and 1,266,114 sf at the Y-12 site. Together, the disposition programs should bank more than required during the planning period. However, if the IFDP is delayed, it is possible a waiver will be required for the FY 2009 SLI Multiprogram Laboratory Facility. Due to this potential, ORNL has informally reached an agreement with ORO and ORISE to utilize some of their banked space (55,000 sf and 12,000 sf, respectively).

4.11 Performance Indicators and Measures

In addition to DOE corporate metrics such as MII and ACI, ORNL continues to track the strategic metrics established in 2000 at the start of revitalization. To date, ORNL has vacated 1.9 million sf of aged, expensive-to-maintain space and constructed over 1 million sf. The average age of buildings is now 31 years. There are approximately 400 staff members housed off-site (200 are located at NTRC, the ITER project office at 1009 Commerce Park, and ORNL's surplus property facilities). Because the off-site locations of these facilities provide strategic business advantages, there are no plans to relocate these operations. The remaining staff located off-site will be relocated to the main campus as opportunities avail themselves.

Table 4.11. Space bank[a] (in sf)

Year	Expected Additions	Central Campus Closure Project (IFDP)	Excess Facility Disposition (EFDP)	Y-12 Closure Project (IFDP)	Expected Removals	Net Change	Available Offsetting Space at the Site
FY 2006	NA	-	-	-	NA	NA	98,957
FY 2007	-	-	1,440	-	1,440	1,440	100,397
FY 2008	15,000	39,527	18,207	-	57,734	42,734	143,131
FY 2009	17,928	-	-	-	-	(17,928)	125,203
FY 2010	-	205,806	4,467	-	210,273	210,273	335,476
FY 2011	-	52,396	3,791	-	56,187	56,187	391,663
FY 2012	15,000	47,263	8,270	-	55,533	40,533	432,196
FY 2013	190,510	83,607	5,193	-	88,800	(101,710)	330,486
FY 2014	-	142,856	2,253	-	145,109	145,109	475,595
FY 2015	165,000	47,452	6,508	1,266,114	1,320,074	1,155,074	1,630,669
FY 2016	40,000	-	5,435	-	5,435	(34,565)	1,596,104
FY 2017	155,000	-	5,855	-	5,855	(149,145)	1,446,959
FY 2018	-	-	6,700	-	6,700	6,700	1,453,659

[a]The IFDP schedule is highly dependent on a successful CD-1. This table does not include agreed to use of ORISE (12,000 sf) and ORO (55,000 sf) banked square footage.

Measures related to facilities management included within the *FY 2007 UT-Battelle Performance Evaluation and Measurement Plan* include:

- Objective 2.1: Provide effective facility design(s) as required to support Laboratory programs (i.e., activities leading up to CD-2)
  - Objective 2.1 requires that DOE evaluator(s) consider the following:
    - Effectiveness of planning of preconceptual R&D and design for life-cycle efficiency;
    - Leverage of existing facilities at the site;
    - Delivery of accurate and timely information needed to carry out the critical decision and budget formulation process; and
    - Ability to meet the intent of DOE Order 413.3, Program and Project Management for the Acquisition of Capital Assets.
- Objective 2.2: Provide for the effective and efficient construction of facilities and/or fabrication of components (execution phase, post CD-2 to CD-4)
  - Objective 2.2 requires that DOE evaluator(s) consider the following:
    - Adherence to DOE Order 413.3, Project Management for the Acquisition of Capital Assets;
    - Successful fabrication of facility components;
    - Effectiveness in meeting construction schedule and budget; and
    - Quality of key staff overseeing the project(s).
- Objective 2.3: Provide efficient and effective operation of facilities
  - Objective 2.3 requires that DOE evaluator(s) consider the following:
    - Availability, reliability, and efficiency of facility(ies);

    - Degree the facility is optimally arranged to support community;
    - Whether R&D is conducted to develop/expand the capabilities of the facility(ies);
    - Effectiveness in balancing resources between facility R&D and user support; and
    - Quality of the process used to allocate facility time to users.
- Objective 2.4: Utilization of facility to grow and support the Laboratory's research base and external user community
    - Objective 2.4 requires that DOE evaluator(s) consider the following:
        - The facility is being used to perform influential science;
        - Contractor's efforts to take full advantage of the facility to strengthen the Laboratory's research base;
        - Conversely, the facility is strengthened by a resident research community that pushes the envelope of what the facility can do and/or are among the scientific leaders of the community;
        - Contractor's ability to appropriately balance access by internal and external user communities; and
        - There is a healthy program of outreach to the scientific community.
- Objective 7.1: Sustain excellence in operating, maintaining, and renewing the facility and infrastructure portfolio to meet Laboratory needs
    - Objective 7.1 addresses reduction in DM, consolidation of nuclear facilities (i.e., less underutilized space to maintain/ operate), and addresses the impact of an aged infrastructure on Laboratory missions (minimization of critical mission losses from aged infrastructure failures).
- Objective 7.2: Provide planning for and acquire the facilities and infrastructure to support future Laboratory programs
    - Objective 7.2 provides the assurance that a strategic facility need vision exists and is managed, that current critical Laboratory needs (e.g., Materials and Chemistry Research, Life Sciences, and Bioenergy) are acted upon, and that a modern infrastructure exists to support the programmatic directions.

Together these objectives address not only critical operating conditions for an aged laboratory, but provide the visionary approach to move significantly aged portions of the Laboratory to a modern state in new facilities, rather than attempting to install highly complex scientific tools in aged facilities that cannot rationally be modernized to meet the scientific needs.

FY 2008 facilities management measures will be developed in the next few months and are expected to provide a continuum for the theme that has been established.

4.12 Energy and Sustainability Management

The *Energy Management and Implementation Plan for Oak Ridge National Laboratory FY 2007* (Parker 2007) outlines the general strategy for managing and implementing short-range and long-range energy and energy-related activities at ORNL. This *Energy Management and Implementation Plan* communicates strategy for and progress toward accomplishing the goals and requirements established by the Energy Policy Act (EPACT), August 8, 2005; DOE Order 430.2A, "Departmental Energy and Utilities Management," April 15, 2002; and Executive Order 13423, "Strengthening Federal Environmental, Energy, and Transportation Management," January 24, 2007.

As a result of the ORNL emphasis on energy and utilities management, and the

implementation of DOE Federal Energy Management Program (FEMP) projects, building energy intensity has been reduced by about 28% compared to FY 1985 (based on British thermal units per gross square foot). The new Energy Policy Act of 2005, however, establishes a new baseline year of FY 2003 and a goal of reducing building energy intensity by 2% annually for the next 10 years (Section 102). Additionally, Executive Order 13423 sets this goal at 3% per year for that same time period (see Table 4.12).

To move forward, ORNL is participating in the DOE National Laboratories Improvement Council's Working Group 1 for the DOE Secretary's Transformational Energy Action Management (TEAM) initiative. The working group's overall objective is to develop a proposed DOE laboratory-wide "roadmap" for achieving the aggressive goals of the initiative. The plan will (1) identify the major efficiency, renewable, transportation, and water opportunities across participating DOE sites; (2) prioritize opportunities based on their potential contribution toward meeting overall DOE-wide TEAM goals; (3) recommend a proposed action plan for implementing the roadmap that includes a multiyear timetable, identification of action owners, and, for major investments, proposals for appropriate mechanisms (e.g., third party, DOE, other); and, (4) identify any policy or resource issues that need to be resolved in order to implement the action plan and suggest options for addressing the issues. It is clear that aggressive energy efforts will be required by ORNL in order to continue past progress and to assist DOE in meeting the new goals that are being developed as part of the TEAM initiative.

The ORNL Energy Management Program maintains well-trained energy management staff, completes energy audits and projects, purchases Energy Star® and other energy-efficient products, incorporates sustainable building design in new buildings and significant retrofit projects, uses alternative financing for energy projects where appropriate, and introduces industrial facility efficiency improvements into its operations.

Examples of ongoing actions taken to increase energy efficiency of operations are discussed in the following sections.

4.12.1 Sustainable Building Design

ORNL is continuing the process of implementing major decisions made during the FY 2000 Facility Revitalization Project. This project developed both short-term and long-term

Table 4.12. ORNL's energy intensity for regular buildings/facilities FY 2005–FY 2009

Performance Measures	Baseline FY 2005	Actual FY 2006	Target				Achieve Target
			FY 2007	FY 2008	FY 2009	Long Term	
Operating Costs—Energy Consumption (Btu/sf). 2005 Energy Policy Act. 20% reduction from 2003 baseline by 2015	FY 2003 Baseline **363,902**	**345,184**	349,346	342,068	334,790	291,122	2015
Operating Costs—Energy Consumption (Btu/sf). EO 13423 3% annual reduction or 30% reduction by 2015	FY 2003 Baseline **363,902**	**345,184**	342,068	331,151	320,234	254,731	2015

plans for the disposition of ORNL facilities. Sustainable building design principles are being incorporated into the site selection, design, and construction of new facilities. Also, sustainable criteria, including Leadership in Energy and Environmental Design (LEED®) requirements, are being used in specifications and design criteria for the new facilities. Of the recently completed six-building East Campus Modernization, four of the buildings were LEED-certified and one building was certified LEED-Silver. The last building was completed this year and is rated LEED-Gold:

- Computational Sciences Building—LEED-certified
- Research Office Building—LEED-certified
- Engineering Technology Facility—LEED-certified
- Joint Institute for Computational Sciences—LEED-Silver
- Research Support Center–LEED-certified
- Multiprogram Research Facility–LEED-Gold.

4.12.2 Convert T12 Fluorescent Lighting with Magnetic Ballasts to T8 Fluorescent Lighting with Electronic Ballasts

The majority of the laboratories in the Materials and Chemistry Building Complex (4500N/S) have not had lighting upgrades. This represents approximately 8,000–10,000 tubes with work scheduled in FY 2007 and beyond. Several other projects have been completed, including high-bay lighting replacements in Building 4508 and Building 7603.

4.12.3 Adjust Heating, Ventilation, and Air Conditioning (HVAC) Temperature Settings

Although managed aggressively in years past, it is believed that adjustments of the temperature settings in most of the older buildings will help decrease energy consumption. New buildings in the East Campus have a state-of-the-art direct digital control (DDC) system that is well managed, and these temperature settings are already optimized. Older buildings without DDC systems currently are being evaluated and adjustments made as appropriate. DDC upgrades are currently funded for Building 4515.

4.12.4 Evaluate Lighting Levels in Offices, Laboratories, and Corridors and Make Adjustments

Lighting levels are not routinely checked at ORNL. It is believed that levels can be lowered in most spaces without compromising productivity or safety. Additionally, many lights remain on after-hours in spaces that do not have automated lighting controls. Efforts are being made to encourage staff to turn off unused lighting as a short-term solution, and longer-term fixes using lighting controls will be pursued. Currently efforts are focused on lighting and HVAC controls in nine small, two-story office buildings throughout the campus. Occupancy sensors tied to switch-rated, motor-driven circuit breakers have been installed in four buildings to date, and initial results show dramatic reductions in electrical usage because of the occupancy sensors and timed setbacks.

4.12.5 Rebalance Air Flows/HVAC in Buildings with “Once-Through” Air Flow

Buildings 4500N and 4500S were designed with several large supply fans to bring air into the building, which is then exhausted through chemical exhaust hoods in the laboratories. It has been several years since air balancing has been performed, and many hoods are no longer in use. Additional hoods are being evaluated for need, with the goal of having as few operational hoods as possible. After that, a new calculation of supply air requirements can be performed and the fan speeds lowered accordingly, resulting in savings of electricity, chilled water, and steam. Ideally, for the long term, variable frequency drives (VFDs) and variable-flow dampers should be installed as fans are replaced; however, this approach will not be cost-effective in all cases. Building 4500S has been targeted for like-for-like fan starter replacements that have the additional VFD features. From a life-cycle

costing perspective, these units have a 1- to 3-year payback, and the safety of the facilities will be improved because the new starters will have current design overcurrent and thermal overload protection. To date, all six supply fans and more than 200 fume hood exhaust fans have had the new starters with VFD controls; rebalancing of the building is in progress.

4.12.6 Conduct a Communications Campaign to Inform Staff of Energy Issues

An aggressive campaign to educate and motivate the staff to reduce energy consumption is being implemented. This includes a new Web page devoted to energy management activities at ORNL (see http://www.fo.ornl.gov/eere/). Specific information on buying Energy Star products is also provided on the internal ORNL Today news Web page. The Energy Management team has hosted an annual Energy Education Day for the last 2 years and has participated in Earth Day in April and DOE Energy Awareness month in October this fiscal year. Regular use of internal communication such as ORNL Today and radio and television has also been conducted.

4.12.7 Emergency Load Shedding

In December 2005, ORNL updated the Emergency Electrical Load Shedding Plan. The electrical circuits and load for seven stages of load shedding were identified. Initially, the ORNL staff can be instructed to immediately turn off unneeded loads. Following that announcement, the plan will implement actions to reduce total electrical demand by 60% of current demand levels, down to 10 MW.

4.12.8 Make Improvements to the Insulation on Steam and Chilled Water Piping

Many areas of disrepair have been identified and are being scheduled for repair. Over the last two fiscal years 2,000 ft of insulation on 250-lb 8-in. steam lines has been upgraded, and an additional 1,000 ft of steam line is scheduled for similar improvements.

4.12.9 Make Improvements to the Steam Condensate Recycle System

As designed, the current system returns condensate to the steam plant from buildings in the center of the main campus of the Laboratory. Many of the components need repairing, upgrading, or replacing to ensure that all condensate available from these buildings is in fact being returned. To date, about $200K has been provided for this effort in the last two fiscal years. This system is currently returning record amounts of condensate to the steam plant, with about 1 million gallons additional condensate returned each month.

4.12.10 Make Improvements to the Steam Plant and Distribution System

As a result of new boiler feedwater chemistry, boiler cycles were increased from 19.7 to an average of approximately 25 during FY 2006, resulting in a reduction of approximately 1,000,000 gallons of wastewater, 15,700 gallons of fuel oil, 9,565 Dkt of natural gas, and 796 lb of CO and 1,560 lb of NO_x emissions. Also, ORNL installed a compressed air tie-line from the central Steam Plant's compressed air system to Building 5800. This tie-line eliminated the need for the air compressor in Building 5800, which was oversized and extremely inefficient. Three other areas of the plant are under evaluation for installation of new heating supplies independent of the central steam plant, Building 2519. This would eliminate the longest piping runs in the distribution system and eliminate losses associated with approximately 10,000 ft of steam piping.

4.12.11 Green and Other Alternative Sources of Power

EPACT 2005 (Sect. 203) specifies the amount of renewable energy that must be purchased by the federal government. ORNL is signing up for the TVA Green Power Switch program for 675 MWh/year, thus becoming the TVA's first industrial green power participant. The TVA program presently includes 18 wind turbines

with the capability to generate a total of 29 MW atop Buffalo Mountain in the Southeast's first commercial-scale use of wind power to generate electricity. The TVA program also includes several solar collectors, including those at the ORNL Photovoltaic Distributed Energy Resource showcase project, with additional sites and a landfill gas-to-energy facility planned in the near future. ORNL is planning to participate in TVA's green power program on a long-term basis.

The availability and cost of energy is as great an issue to ORNL as it is to the nation. Step function increases in energy consumption are required to support the operation of the SNS and other large research user facilities, as well as expand computational and computer capacity. Electrical demand alone is projected to increase from 40 MW to 100 MW within the next 2 years. Increases in cooling and chilled water capacity will follow. ORNL's progress toward energy reductions in recent years has been due in large part to the implementation of many FEMP energy projects, replacement of older chillers, construction of new energy-efficient facilities, decommissioning of inefficient facilities, and enhancements at the central steam plant. However, in the years ahead significant challenges must be met if ORNL is to support DOE in meeting the goals of EPACT 2005 and support the scientific research needs of the nation. Large utility upgrade projects similar to the replacement of ORNL's primary electrical substation must be included in out-year investments to ensure little loss of energy as it moves through the distribution system.

4.13 Leasing and Third-Party/Nonfederal Funded Construction of New Buildings

ORNL leases six facilities located off-site near the city of Oak Ridge, Tennessee, two of which are less than 10,000 nsf. The NTRC, ITER Project Management Office, and the Excessing and Surplus Sales facilities are planned as long-term leases. The NTRC is a joint venture of ORNL, UT, DOE, and the Development Corporation of Knox County, whose mission is to couple the technology and expertise of its partners to provide solutions to national transportation problems. This facility is a special-purpose building that houses joint venture staff and contains engine test cells and other technology-appropriate laboratories. The ITER Project has a 10-year life, and an off-site lease with terms consistent with the project life is thought to be the best option to provide housing for the 80 occupants. Excess and Surplus Sales is part of ORNL's asset management system and is located off-site to facilitate surplus material and equipment disposition. Two off-site leases are office space only, and staff housed in these facilities will be relocated to the main campus as space becomes available (see Table 4.13). The NTRC Storage is a short-term lease to accommodate ongoing projects.

Until modification can be made to laboratory space vacated by the construction of the Multiprogram Laboratory Facility, potentially 15,000 to 45,000 sf of office space may need to be leased during the next 3 years to accommodate staff currently housed in substandard space (e.g., attics) and short-term growth.

4.14 Operating Costs for Sustainment and Operations

Table 4.14 reports the combined actual 2006 costs for the multiple site contractors managing SC, EM, and NE facilities. The sustainment value is reported in FIMS as 2006 actual maintenance costs. ORNL did not report any DM reduction, and it is assumed the same is true for other site contractors. Operational costs include janitorial, pest control, grounds, snow removal, recycle, and refuse as reported in FIMS as the 2006 actuals.

ORNL participates in two major facilities benchmark groups. In those comparisons, ORNL maintenance and janitorial costs benchmark in the top quadrant, while grounds maintenance costs are in middle range or slightly below.

Table 4.13. UT-Battelle, LLC, leased facilities greater than 10,000 sf

Off-Site Facilities	Size	Renewable
Life Sciences Division, SAP, Contracts 1060 Commerce Park Drive, Oak Ridge	39,353 net usable square feet	06/10/2012
ITER—Project Management Office 1055 Commerce Park Drive, Suite 100, Oak Ridge	16,414 net usable square feet	03/09/2014
National Transportation Research Center 2360 Cherahala Drive, Knoxville	48,282 net usable square feet	11/04/2010
Excessing and Surplus Sales 115 Union Valley Road, Oak Ridge	27,823 net usable square feet	07/01/2011
On-Site Facilities	**Size**	**Renewable**
Computational Sciences Building Building 5600—850 West Bethel Valley Road	98,348 net usable square feet	08/01/2013
Research Office Building Building 5700—850 West Bethel Valley Road	84,711 net usable square feet	08/01/2013
Engineering Technology Facility Building 5800—850 West Bethel Valley Road	77,492 net usable square feet	08/01/2013
Multiprogram Research Facility 900 West Bethel Valley Road	145,000 net usable square feet	08/01/2013

Table 4.14. ORNL site (including all operating contractors)

Performance Measures	Baseline FY 2005	Actual FY 2006	Target				Achieve Target
			FY 2007	FY 2008	FY 2009	Long-Term Target	
Operating Costs—Sustainment and DM Reduction ($sf)	$6.89	$7.89	$7.00	$7.25	$7.50	$9.00	2014
Operating Costs—Operations ($/sf)	$1.10	$2.40	$1.30	$1.35	$1.35	$1.35	2008

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Appendix A. Land Use Needs Plans

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A. Land Use Needs Plans

Uses of the Oak Ridge Reservation (ORR) by Oak Ridge National Laboratory (ORNL) for programs and operational needs to accomplish Department of Energy (DOE) missions extend across the entire reservation and move across boundaries of the National Nuclear Security Administration, the East Tennessee Technology Park, the Tennessee Wildlife Resources Agency, Oak Ridge Associated Universities, and additional sites under the management responsibility of others (Fig. A.1). ORR land use planning is described in the 1999 document, *Comprehensive Integrated Planning Process for the Oak Ridge Operations Sites* (ORNL 1999),and is updated in the 2007 *Oak Ridge Reservation Ten-Year Site Plan* (DOE 2007c).

A.1 Land Use Planning and Priorities

Land use planning for ORNL identifies and prioritizes needs for stewardship and preservation of reservation land to meet the requirements of existing and future missions. For any parcel of land that will be used to support DOE's ORNL missions, potentially

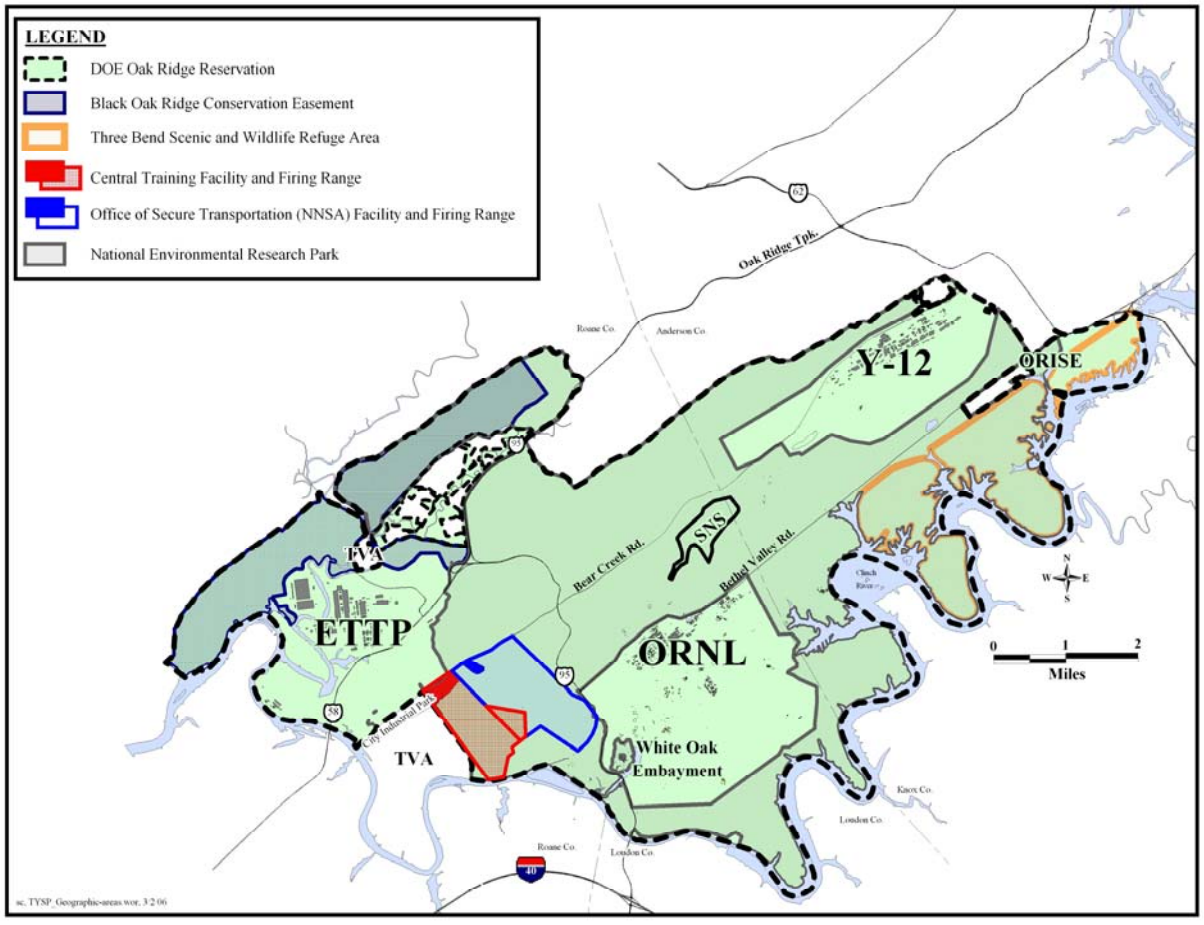

Fig. A.1. DOE Oak Ridge Reservation.

competing uses may or may not be compatible. The following priorities for land use guide the ORNL Site Use and Planning Committee in screening proposed projects:

1. Preserve and protect land to meet the requirements of existing and future scientific facilities and research programs so that DOE can continue to address its national science and technology missions.

2. Preserve and protect land to meet the requirements of environmental research by ensuring that adequate areas within the ORR are protected and preserved for their biological, historical, and physical diversity.

3. Preserve and protect land to meet the requirements of scientific and technical education by ensuring that suitable land is available for facilities and research areas needed to support educational opportunities.

4. Allow for land uses that are compatible with DOE mission uses and do not preclude future options. Decisions concerning these other uses are made on a case-by-case basis to ensure compatibility with higher priority uses.

A.2 Current Land Use on the Oak Ridge Reservation

A.2.1 National Environmental Research Park

In 1980, DOE established the Oak Ridge National Environmental Research Park (Fig. A.1). Consisting of approximately 20,000 acres, the research park serves as an outdoor laboratory to evaluate the environmental consequences of energy use and development as well as the strategies to mitigate these effects. The combination of protected, undeveloped areas with disturbed, developed, or developing areas within the research park allows the demonstration and assessment of various environmental and land use options.

Major DOE Office of Science research programs use the ORR land to meet mission objectives. In FY 2006, almost $10M was spent on DOE-supported environmental field-based research directly dependent on the ORR land base. This expenditure is independent of construction of new facilities such as the Spallation Neutron Source (SNS). The Office of Science considers the research and science value of the ORR to be critical and provides primary operations funding. The Oak Ridge Research Park is one of the few sites in the nation where large-scale ecological research, environmental technology, and measurement science are integrated with 50 years of environmental monitoring and research.

The availability of the protected lands and field research sites on the ORR allows DOE to support major field experiments that could not be conducted if the lands and associated ecological systems were not protected and secured for such long-term studies (Fig. A.2). This research addresses fundamental questions about the effects of energy-related activities on ecological systems and compares such effects with the natural variation of ecological systems.

Fig. A.2. Student researcher measuring soil respiration as part of global change impacts research.

The National Environmental Research Park is a DOE National User Facility that has attracted more than 1200 users from ORNL as well as from 150 colleges, universities, industries, and

other state and federal government agencies over the past 5 years. The 268 users during 2006 represented 49 different organizations, including educational institutions, state and federal agencies, and others (Fig. A.3).

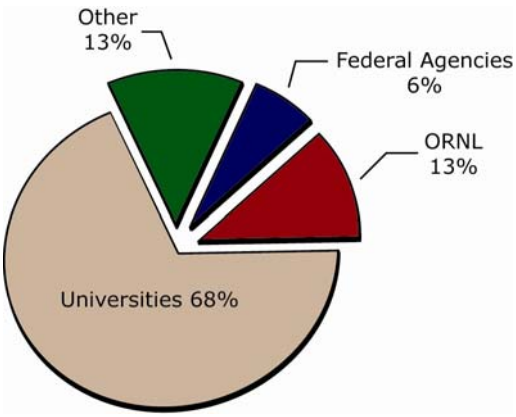

Fig. A.3. Categories of Oak Ridge National Environmental Research Park users in 2006. The park had a total of 268 users in 2006.

A.2.2 Field Research Areas

A.2.2.1 Environmental Research

Lands of the ORR are used for research to meet the mission goals and objectives of DOE in many substantive ways. The research addresses major national issues and contributes to national and international collaborative initiatives on global climate change (temperature, carbon dioxide, and precipitation), tropospheric air quality, remediation of contaminated land, sustainable development, biodiversity, and energy operations. These uses require protected blocks of land ranging from a few acres to more than 250 acres. Use of the land area for research is shown in Fig. A.4, with areas of active research identified. Many of these active areas also include sites where research has been proposed (identified for specific projects for

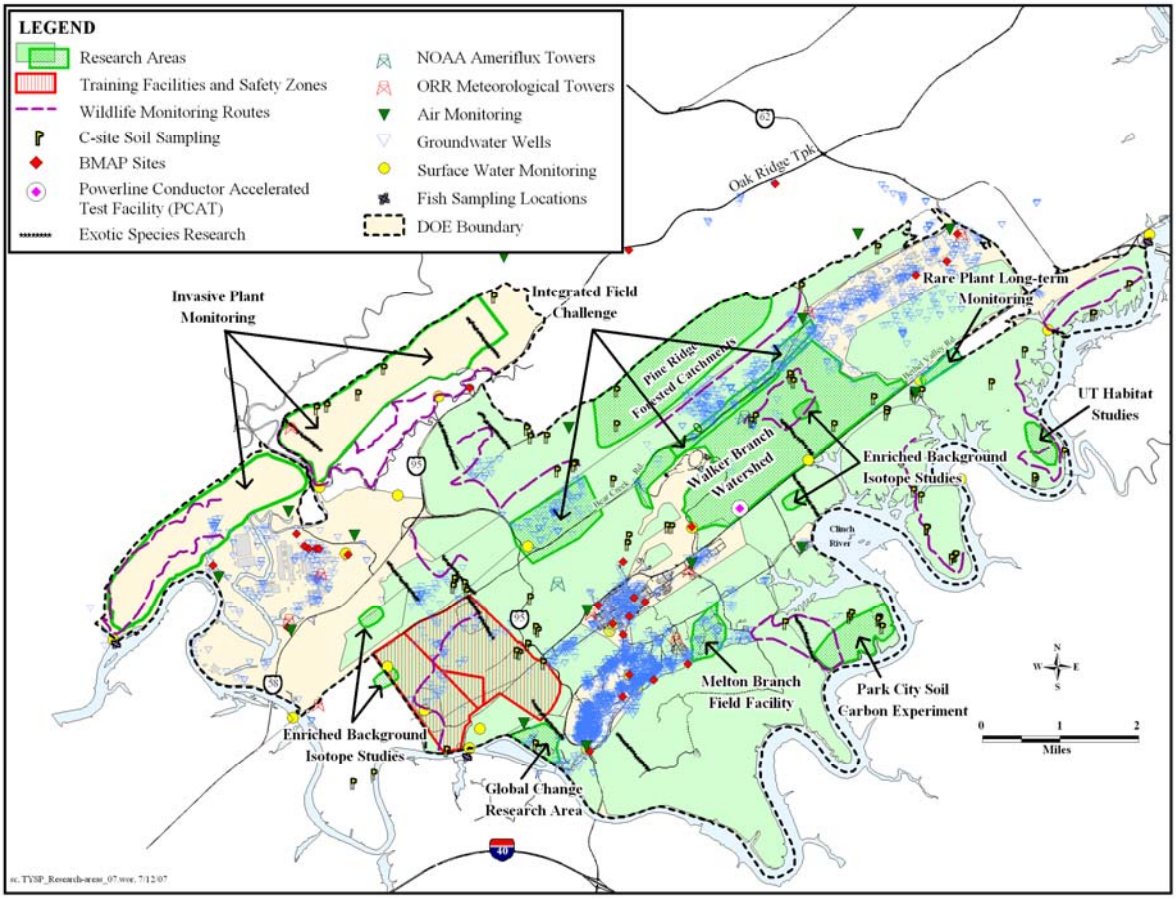

Fig. A.4. Research areas on the Oak Ridge Reservation.

proposal submittals or pending actions) or is planned (areas with high potential for studying research issues of interest to DOE and other Oak Ridge National Environmental Research Park users). Specific major field research facilities or projects have been identified in Fig. A.4.

Walker Branch Watershed

The Oak Ridge National Environmental Research Park contains intensive, long-term ecological research areas, most notably the Walker Branch Watershed, which is a gauged, 250-acre deciduous forest catchment with a 40-year record of forest and stream ecosystem experiments and monitoring. This research includes studies of hydrology, atmospheric chemical deposition, forest biogeochemical cycling, plant physiology and community dynamics, and stream ecology and nutrient cycling. Ongoing research includes (1) the Throughfall Displacement Experiment, a large-scale ecosystem-level manipulation designed to assess the effects of climate-related changes in precipitation on forest growth and productivity; (2) an experiment to determine the critical thresholds of acute responses of mature trees to water stress; (3) continuous measurements of trace gas fluxes between the forest and the atmosphere; (4) an experimental study of the rates and pathways of nitrogen cycling in the stream; and (5) National Oceanic and Atmospheric Administration/Atmospheric Turbulence Diffusion Division (NOAA/ATDD) air pollutant dry deposition monitoring.

National Oceanographic Atmospheric Administration. NOAA has the longest record of air pollutant dry deposition measurements in the world at Walker Branch Watershed. NOAA/ATDD has a similar long record of measuring solar radiation in various wavelengths, and the Walker Branch Solar Station is part of the Integrated Surface Irradiance Study, NOAA's national solar radiation observing network. One of the two NOAA Ameriflux meteorological towers is located at Walker Branch. Walker Branch is also a site in several national research networks, including the National Atmospheric Deposition Program.

Melton Branch Watershed

Three field facilities located at Source Area A in Waste Area Group 5, West Bear Creek Valley, and Melton Branch Subwatershed are extensively instrumented to monitor storm-driven unsaturated flow and saturated groundwater flow (Fig. A.5). The hydrologic and geochemical processes have been well characterized at each site, and instrumentation is available for performing sustained tracer injection studies. Investigations at the various sites have focused on quantifying the mechanisms of preferential flow and matrix diffusion in fractured saprolites and shale bedrock. Research findings have significantly improved decision-making strategies with regard to contaminant remediation in complex heterogeneous subsurface media.

Fig. A.5. Subsurface research on carbon sequestration at Melton Branch Soil Block.

Freels Bend Reference Area

Freels Bend serves as an important reference area for multiple studies investigating the impact and recovery of contaminated systems on the ORR. Detailed studies of water quality, fish

communities, bioaccumulation, and bird communities at Freels Bend have found that the site is unique on the ORR in being highly representative of unindustrialized, uncontaminated habitat. Recent research in remediation and stewardship science on the ORR has focused on the use of large-scale ecological manipulations to reduce risk while leaving wastes in place and enhancing natural resources. Such an ecological management and enhancement strategy, which is being used for the first time nationally at a CERCLA site, is being implemented at contaminated ponds near the East Tennessee Technology Park (ETTP), and Freels Bend is a key reference site for comparison in that long-term study. The Freels Bend area is a valuable reference site for nest box studies of mercury uptake and effects in birds, an important reference area for reservoir sediment and biological comparisons upstream and downstream of DOE facilities, and has nearby streams used as long-term reference sites for fish and benthic macroinvertebrate community monitoring (for the Biological Monitoring and Abatement Program). Freels Bend, along with Gallaher Bend and Solway Bend of the Three Bend Area, is a rare example of riparian, mixed grassland and woodland community intersection and provides key sites for long-term community bird surveys (Partners in Flight routes).

Integrated Field Challenge (IFC)

The Environmental Remediation Sciences Program Integrated Field Challenge (IFC) project is located in Bear Creek Valley with research that will lead to new methods of reducing and understanding risks associated with subsurface contamination from DOE's metals and radionuclides. The IFC includes field plots in a contaminated area near the Y-12 facility along with an instrumented background area to the west (Fig. A.6). In addition, several large lysimeters located nearby are the site of manipulative, ecosystem-level experiments that use genetically engineered microorganisms to investigate contaminant biodegradation in soil. While not currently in active use, these lysimeters provide a unique facility for safely evaluating the efficacy of such organisms.

Fig. A.6. Geoprobe in use at the Integrated Field Challenge (IFC) DOE Field Research Center.

Pine Ridge Forested Catchments

The Pine Ridge Forested Catchments consist of four adjacent first-order forested catchments underlain by shale and sandstone of the Rome formation. As such, they represent the second dominant geology of the ORR—dominated by shale rather than dolomite of the Knox formation (e.g., Chestnut Ridge). One of these catchments is being studied as part of the Walker Branch Watershed project because it offers a contrast in geology and hydrology while providing similar forest vegetation. Stream discharge and weekly stream water chemistry are being monitored in this catchment.

Free Air CO_2 Enrichment

The thousands of acres of eastern hardwood forests on the ORR also support several large-scale ecological manipulation experiments that have established ORNL's national leadership role in global change impacts research. Diverse, complex, and large-scale experimental approaches are used to understand how forest ecosystems respond to the changes in

temperature, precipitation, and atmospheric carbon dioxide (CO_2) concentrations expected from global climate change. For example, the FACE Facility in the 0800 Area was completed in 1997 to investigate the response of a forest ecosystem to increased CO_2 concentrations. This unique global change research facility is providing an opportunity for researchers from all over the United States to increase collaborative research on the effects that changes in precipitation or CO_2 may have on the long-term development of these forest communities (Fig. A.7).

Fig. A.7. Experimental towers of DOE FACE Facility from the air.

Environmental research use on the reservation has been categorized into one of four main types. Figure A.8 shows the ORR areas with active, proposed, and planned research in each of these research categories: carbon cycling and management research, ecosystem dynamics research, global climate change research, and remediation research and monitoring.

Table A.1 lists the FY 2006 funding for each category of field research utilizing the reservation.

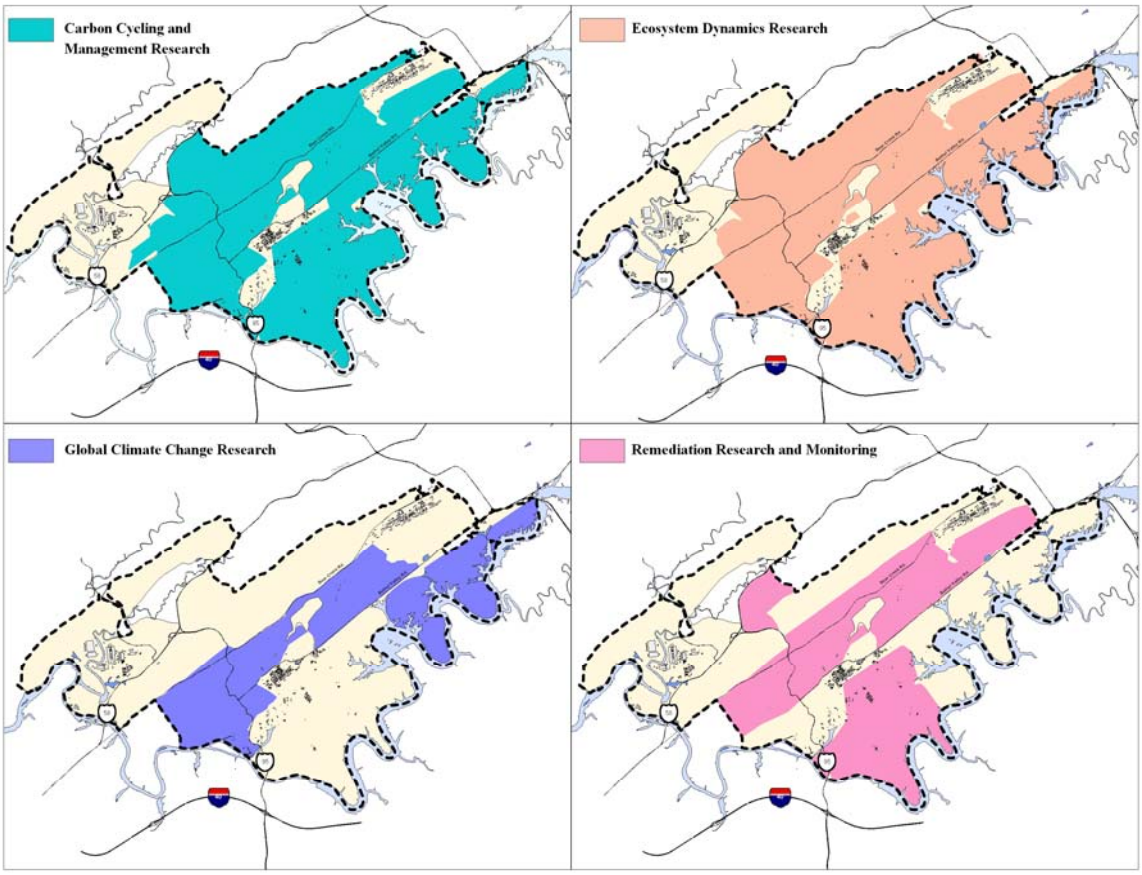

Fig. A.8. Use of DOE lands for specific types of research.

Table A.1. Current field-based research funding dependent on ORR land base

Program	Research type	FY 2007 ($K)
Carbon cycling and management research	Carbon flow through terrestrial and aquatic ecosystems	2,700
Ecosystem dynamics research	Ecosystem response to natural and human perturbations	1,300
Global climate change research	Impact of atmospheric and climatic changes on ecosystems	1,800
Remediation research and monitoring	In situ contaminant pathway studies and comparison to reference sites	4,000

More detailed information on environmental research is found on the Environmental Sciences Division site at http://www.esd.ornl.gov/. In addition to DOE, past and present sponsors of research on the site include the National Science Foundation, the U.S. Department of Defense, the U.S. Environmental Protection Agency, the U.S. Department of Agriculture, the Forest Service, the Nuclear Regulatory Commission, and the Electric Power Research Institute. Ongoing research collaborations also exist with NOAA and the Tennessee Valley Authority (TVA).

A.2.2.2 Energy Research

As part of DOE's emphasis on transmission system research and development, advanced overhead transmission composite conductors are subjected to various types of environmental stresses to simulate 20–30 years of field operation at the National Transmission Technology Research Center's Powerline Conductor Accelerated Testing (PCAT) Facility. This research site, operated by ORNL in partnership with TVA, is sponsored by DOE's Office of Electricity Delivery and Energy Reliability in partnership with industry (Fig. A.9).

DOE is also focusing on distributed energy (DE) systems and their integration into the electric grid. ORNL has developed the Distributed Energy Communications and Controls (DECC) testing facility over the past 2 years for studying dynamic voltage and power factor control supplied from DE resources. Because ORNL owns and operates its own electric distribution utility for the laboratory campus, the distribution system can be configured to provide optimum opportunities for testing of nonactive power (including reactive power) injection effects from rotating and inverter-based DE. The DECC laboratory is also unique in that the tests are designed by representatives from the electric utility industry and DE manufacturers to address the actual challenges facing utilities and potential scenarios in the future.

Fig. A.9. Aerial view of the PCAT Facility.

A.2.2.3 SensorNet

The objective of the SensorNet® project is to develop and/or discover the technology, standards, and technical requirements for an integrated national warning and alert system.

The system is being designed to provide the Department of Homeland Security with an incident discovery, awareness, and response capability addressing local, regional, and national needs. The networking infrastructure will be a common data highway for the near-real-time intelligent collection, processing, and dissemination of sensor data that will include chemical, biological, radiation, nuclear, and explosives sensors; meteorological instruments; and other sensors (e.g., video cameras and air quality, environmental, and disease tracking). A small area test bed has been established in the courtyard area between Buildings 5100 and 5200.

Appendix B. Inventory and Maps of Buildings

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Table B.1. Mission dependency listing of ORNL operational buildings as of May 2007

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
1005	Lab for Comparative & Functional Genomic			35,973	11,032,022	371,446		Mission Critical
1055COM	U.S. ITER Project Management Office			16,414	2,046,915			Mission Critical
1059	Health Effects Information			6,998	872,689	86,004	54,400	Mission Critical
1060	Environmental & Life Sciences Laboratory			9,516	2,918,320	59,413		Mission Critical
1060COM	Life Sciences Division, SAP, Contracts			39,353	4,907,533			Mission Critical
1061	Health Protection Services Facility			6,999	2,032,105	56,867	3,181	Mission Critical
1062	West Office Building			6,998	872,689	24,722	52,164	Mission Critical
1503	Plant Sciences Lab			6,223	776,042	66,378	343,205	Mission Critical
1504	Aquatic Ecology Laboratory			12,174	3,733,462	44,798	320,018	Mission Critical
1505	Environmental Science Laboratory			88,843	25,794,875	804,448	2,166,658	Mission Critical
1506	Controlled Env & Animal Bldg.			16,785	5,147,541	131,942	504,128	Mission Critical
1507	Life Sciences Data Analysis Bl			6,996	872,439	37,663	3,035	Mission Critical
1509	Environmental Engineering Faci			6,996	872,439	29,327	4,148	Mission Critical
2019	Solar Energy Lab/Laser Lab	2008	2011	878	287,033	9,142	143,060	Mission Critical
2525	Fabrication Department Shop A	2014	2014	27,149	5,883,067	237,927	1,068,860	Mission Critical
2547	General Machine Shop	2012	2014	9,369	2,036,034	34,321	67,408	Mission Critical
3025E	IMET Hot Cell Facility	2013	2015	16,741	10,826,170	239,476	1,254,768	Mission Critical
3025M	Solid State Office & Laboratory Building	2011	2013	33,840	9,779,823	163,067	2,687,866	Mission Critical
3037	Chemical Technology Offices	2014	2014	7,679	957,613	87,861	202,170	Mission Critical
3114	Cooling Heating, Power & React Power Lab			2,034	635,364	79,259	205,262	Mission Critical
3115	Solid State Off.	2008	2011	2,782	346,930	7,146	220,589	Mission Critical
3137	Surface Science Lab	2009	2013	6,806	2,225,000	27,334	204,923	Mission Critical
3138	Roof Thermal Research Laboratory			252	78,718		3,476	Mission Critical
3144	Buildings and Power Technologies Lab.			11,482	3,586,652	191,117	539,197	Mission Critical
3147	Buildings and Power Technologies Offices			13,387	1,669,432	166,735	116,574	Mission Critical
3150	Solid State Research Facility	2009	2013	11,929	3,447,503	73,619	13,692	Mission Critical
3153	Envelope Systems Research Center			2,282	699,833	3,783	2,458	Mission Critical
3156	Commercial & Residential Bldgs. Offices			6,990	871,691	37,181	55,898	Mission Critical
3500	Instrumentation Research Facility			71,154	22,226,496	491,802	2,275,746	Mission Critical
3525	High-Rad Level Exam Lab.	2013	2015	26,332	17,028,536	796,431	4,269,482	Mission Critical
3546	CCSD Office Building	2014	2014	7,344	915,837	21,627	223,806	Mission Critical

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
3606	Instrumentation Development Facility	2014	2014	7,843	978,065	14,334	118,271	Mission Critical
3625	Advanced Materials Characterization Lab			6,681	1,876,593	148,011		Mission Critical
4500N	Cen Res & Admin. North			359,320	104,330,230	2,926,659	31,081,796	Mission Critical
4500S	Cen Res & Admin. South			316,662	91,515,903	3,041,013	29,543,316	Mission Critical
4501	Radiochemistry Laboratory			76,338	25,118,228	2,182,863	4,018,361	Mission Critical
4505	Exper Eng			41,470	13,645,274	145,498	3,354,204	Mission Critical
4508	M&C Laboratory			93,297	30,500,409	247,682	6,867,748	Mission Critical
4512	Lab Emer. Response Center			5,354	814,590	32,477	66,781	Mission Critical
4515	High Temp. Materials Lab			65,093	21,280,032	309,203	3,528,654	Mission Critical
5100	Joint Inst. for Computational Sciences			51,464		194,418		Mission Critical
5300	Multiprogram Research Facility			145,000	18,082,287			Mission Critical
5500	High-Voltage Accel Lab			56,747	17,726,157	247,668	2,615,231	Mission Critical
5505	Transuranium Research Lab			23,191	7,630,758	297,626	1,719,400	Mission Critical
5507	Electron Spectrometer Fac			3,798	1,249,693	27,168	475,082	Mission Critical
5510	Isotope Development Laboratory			6,195	2,038,401	41,881	43,109	Mission Critical
5510A	QSD Metrology & Intercompison Study Labs			7,360	2,127,054	43,330	60,603	Mission Critical
5600	Computational Sciences Building			98,348	11,623,717	623,756		Mission Critical
5700	Research Office Building			84,711	10,563,921	477,508		Mission Critical
5800	Engineering Technology Facility			77,492	9,663,673	435,591		Mission Critical
6000	Holifield Heavy Ion Research Facility			113,181	35,354,542	427,553	8,638,010	Mission Critical
6000B	Atomic Physics Research Lab			7,395	2,309,989	10,639		Mission Critical
6008	Joint Inst-Heavy Ion Res			6,042	753,470	13,743	207,345	Mission Critical
6010	ORELA			55,104	17,212,930	157,925	2,869,337	Mission Critical
6012	Computer Science Research Fac.			12,569	1,567,423	89,139	124,925	Mission Critical
6025	Eng Physics Office Bldg			17,382	2,167,630	54,866	718,762	Mission Critical
7625	Multiprogram High Bay Facility			30,183	9,428,315	44,744		Mission Critical
7900	Hi Flux Isotope Reac Fac			64,436	150,745,219	990,609	2,299,935	Mission Critical
7901	Elec Bldg For 7900			3,136	219,319	574,450	949,398	Mission Critical
7903	Cooling Tower Equipment Building			640	44,759	19,124	102,776	Mission Critical
7910	Office Bldg For 7900			13,988	1,744,380	190,346	895,298	Mission Critical
7912	Fan Shed for 7911			1,419	99,239	38,247	88,846	Mission Critical

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7917	Research Reactors Office Bldg.			14,963	1,865,967	83,213	85,750	Mission Critical
7918	REDC Office & Training Facility			6,992	871,940	57,696	15,920	Mission Critical
7920	Transur. Proc. Facility			33,923	21,937,529	3,243,476	4,998,604	Mission Critical
7930	Thorium-U Recycle Facility			48,780	31,545,343	1,166,630	4,942,348	Mission Critical
7930A	Filter Pit for 7930			1,327	92,805			Mission Critical
7962	Neutron Users Office			7,373	919,453	61,516	35,622	Mission Critical
7970	Neutron Science Support Building			5,400	1,776,814	1,912		Mission Critical
7971	H.O.G. Filter Facility			841	420,573	191,237		Mission Critical
7972	SANS Guide Hall			11,857	3,703,791	382,474		Mission Critical
8100	Front End Building - 8100FE			15,562	4,000,499	74,577		Mission Critical
8200	Beam Tunnel - 8200BT			64,030	16,460,091	74,971		Mission Critical
8300	Klystron Gallery - 8300KL			49,553	15,478,955	261,018		Mission Critical
8310	Central Helium Liquifier Facility			13,978	4,132,653	111,865		Mission Critical
8320	Superconducting Radio Frequency Building			12,825	1,878,214			Mission Critical
8330	RF Test Facility			13,436	2,717,753	74,577		Mission Critical
8340	HEBT Service Building - 8340HS			4,693	1,465,960	37,288		Mission Critical
8520	Ring Injection Dump			3,768	762,168			Mission Critical
8540	Ring Service Building			16,344	3,305,966	149,153		Mission Critical
8550	RTBT Service Building			2,834	615,874	149,153		Mission Critical
8600	Central Laboratory and Office Building			249,950	72,236,012	1,548,115		Mission Critical
8610	Center for Nanophase Materials Sciences			80,000	24,534,005	361,663		Mission Critical
8700	Target Building			140,955	41,673,928	708,715		Mission Critical
8702	Target Building - Beam Line 2			6,400	1,892,186			Mission Critical
8711	Target Building - Beam Line 11			5,789	1,711,542			Mission Critical
8920	Receiving Acceptance Testing Storage Bldg			25,092	1,754,829			Mission Critical
NTRC	National Transportation Research Center			48,282	6,021,027	3,203		Mission Critical
0817	ESD Instrument & Monitoring Shed			96	6,714	1,943	1,211	Mission Dependent
0819	Farm Implement Storage Building			200	13,987		162	Mission Dependent
0823E	Shed, Face CO_2 Tank / Evaporators			196	13,707			Mission Dependent
0855	Operations Building 0800 Area			2,400	736,020	7,583	373	Mission Dependent
0907	Walker Branch Watershed Lab			4,739	1,453,333	26,864	64,590	Mission Dependent
0931	Ish Creek Monitoring Station			64	19,627			Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
0941	ATDD/NOAA Instrument Bldg 2			49	15,027		1,136	Mission Dependent
0943	ATDD/NOAA Facility			656	45,878			Mission Dependent
0950	Walker Br E. weir Instr H			96	6,714	1,053	2,777	Mission Dependent
0951	Walker Br. W Weir Instru Hs			96	6,714		2,777	Mission Dependent
0955	Walker Br storage Bldg			352	24,617		271	Mission Dependent
0957	Sample Storage Building			349	24,408		271	Mission Dependent
0963	White Oak Creek Headwaters monitoring st			96	6,714	825	2,496	Mission Dependent
0966	Entry Control Building, West			121	16,505	28,634	14,050	Mission Dependent
1009COM	Benefit Plans and Asset Management			6,059	755,590			Mission Dependent
115UNV	Excessing and Surplus Sales			27,823	1,945,824			Mission Dependent
2003	Process Water Cont Station	2009	2010	269	18,813	4,094	10,100	Mission Dependent
2007	Calibration Lab	2012	2012	6,780	1,473,403	118,442	627,094	Mission Dependent
2008	ORNL Whole Body Counter	2011	2012	4,726	682,794	21,872	555,247	Mission Dependent
2018	Elect & Air Cond Service Ctr	2012	2012	7,817	1,698,760	130,286	510,946	Mission Dependent
2026	Radioactive Materials Analytical Lab	2009	2011	26,641	17,228,362	596,925	927,393	Mission Dependent
2033	Measurements & Controls Fac	2011	2011	31,710	3,954,409	210,021	100,366	Mission Dependent
2500	Guard & Fire Headquarters	2014	2014	10,912	1,272,622	517,718	1,567,136	Mission Dependent
2510	Utilities Training Facility			786	54,970		37,413	Mission Dependent
2518	Support Services Building	2013	2014	13,399	1,670,928	839,295	862,399	Mission Dependent
2523	Decontamination Laundry	2010	2014	7,384	1,440,072	60,086	359,822	Mission Dependent
2528	Coal Research Lab	2010	2013	4,105	1,186,353	5,154	266,280	Mission Dependent
2536	Coal Sample Preparation Bldg.	2009	2009	576	40,283		34,318	Mission Dependent
2540	Steam Plant Substation			282	19,722		31,459	Mission Dependent
2546	2545 Monitoring Building			62	4,336	163	9,717	Mission Dependent
2548	Sludge Drying Facility	2009	2009	1,600	111,897			Mission Dependent
2549	Storage Bluilding Steam Plant			2,027	141,760		5,327	Mission Dependent
2621	Waste Operations Support Shop	2009	2014	5,385	376,604	11,323	178,821	Mission Dependent
2628	Fire Protect Maint & Storage	2014	2015	1,081	75,601		19,585	Mission Dependent
2638	Steam Plant Scale House	2009	2014	640	129,455		12,157	Mission Dependent
2643	Chlorinator Building	2009	2014	117	8,182			Mission Dependent
2644	Steam Plant Wastewater Treatment Plant			4,409	308,347		30,142	Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
2648	Fire Training Facility	2015	2015	1,042	118,718		53	Mission Dependent
2656	Sewage Trt Plt Water Monitor Station			64	4,476		686	Mission Dependent
2661	ORNL Regional Science Ed Ctr			6,996	872,439	36,900	2,819	Mission Dependent
2664	Sodium Metabisulfie Building	2009	2009	80	25,906		6,537	Mission Dependent
3003	Solid State Accel. Fac.	2007	2011	12,104	3,780,947	5,961	1,312,600	Mission Dependent
3008	Source & Spec Mat Vault	2011	2011	563	39,374		18,357	Mission Dependent
3010A	BSR Facility Building	2009	2009	2,132	265,872	3,059		Mission Dependent
3012	Rolling Mill	2008	2013	10,160	3,321,480	6,550	4,016,183	Mission Dependent
3017	Quality Services Division Building	2008	2013	10,021	1,249,673	34,747	994,861	Mission Dependent
3027	Dispatch Center	2011	2011	3,542	483,161	39,138	73,613	Mission Dependent
3034	Radioisotope Area Services	2010	2013	1,129	113,077	8,661	65,014	Mission Dependent
3036	Isotope Area Storage & Service Building	2012	2012	2,198	444,598	8,160	95,633	Mission Dependent
3044	West Complex Field Shop	2009	2012	5,952	1,293,465	1,867	152,273	Mission Dependent
3074	Interim Manipulator Repair Fac	2012	2012	3,529	766,908	144,431	76,765	Mission Dependent
3080	Reactor Exper Control Room	2007	2011	1,915	553,439	57,189	360,469	Mission Dependent
3095	Reac Area Equip Bldg	2009	2011	7,008	490,110	211	135,850	Mission Dependent
3104	West Complex Maintenance Shop	2010	2012	7,410	1,610,312	27,374	514,909	Mission Dependent
3112	Misc. Storage Building	2009	2012	182	12,728		2,240	Mission Dependent
3129	Personnel Monitoring Station	2009	2013	408	125,123	483	8,162	Mission Dependent
3502	East Res Service Ctr	2012	2014	12,439	2,703,195	207,616	479,901	Mission Dependent
3504	Geosciences Lab	2011	2014	7,557	942,399	68,780	243,110	Mission Dependent
3523	Electronic Fabrication Shop	2012	2014	1,176	82,245	3,010	19,562	Mission Dependent
3543	Msr Dev Lab	2009	2014	612	42,801	89	17,632	Mission Dependent
3587	Mail Services Building	2013	2014	3,421	743,438	4,977	525,267	Mission Dependent
3602	Cylinder Tank Stor Bldg 3525	2012	2012	122	8,532		600	Mission Dependent
3605	TSD Storage Building	2012	2013	387	84,101		1,250	Mission Dependent
3607	Cask Tool Stor	2012	2012	612	42,801		250	Mission Dependent
3610	Storage Building	2009	2014	197	13,777		430	Mission Dependent
4007	Security and Counter Intelligence Office			7,033	877,053	44,198	34,393	Mission Dependent
4514	Equipment Building - Html			676	47,277	26,171	19,619	Mission Dependent
5002	Guest Users Facility			7,056	879,921	45,292	41,516	Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
5200	ORNL Conference Center			53,943	9,049,428	373,402		Mission Dependent
5500A	Center for Transportation			7,005	873,562	8,894	342,608	Mission Dependent
6005	Gas Compressor Hse 6000			4,200	293,730	19,932	36,434	Mission Dependent
6007	Joint Institute for HIR			4,260	553,028	101,794	97,389	Mission Dependent
6011	C&TD Office Building			18,636	2,324,010	122,476	19,325	Mission Dependent
6013	Chemical Feed System Enclosure			36	11,845		20,560	Mission Dependent
6016	Outfall 314 Dechlorination System			110	7,693		25	Mission Dependent
7000A	Sewage Pumping Station Equipment Storage	2010	2016	76	5,315			Mission Dependent
7001	General Stores	2009	2011	33,446	2,339,073	172,781	1,310,970	Mission Dependent
7002	Garage & Ironwrkg Shop			28,918	2,896,326	202,026	1,044,786	Mission Dependent
7003	Welding & Brazing Shop	2013	2013	5,149	1,118,961	48,422	279,585	Mission Dependent
7005	Lead Shop	2009	2011	5,406	1,174,811	8,847	215,485	Mission Dependent
7006	Paint Stores	2013	2013	2,520	816,044	105,683	134,353	Mission Dependent
7007	Paint Shop	2013	2013	3,461	752,131	20,491	571,550	Mission Dependent
7009	Carpenter Shop	2013	2013	9,300	2,021,040	424,995	406,769	Mission Dependent
7012	Central Mechanical Shops			30,079	6,517,985	87,863	1,775,438	Mission Dependent
7013	Acid Chem & Flam Liq Stg			7,291	2,361,023	13,633	111,300	Mission Dependent
7015	Metal Storage & Cut Fac.	2012	2014	1,995	433,546	2,665	68,822	Mission Dependent
7018	Salvage & Reclam Fac			18,200	1,272,832	43,757	684,182	Mission Dependent
7019	Haz Materials Storage			1,920	134,277	864	12,550	Mission Dependent
7020	Interim Grnds Equip Stg	2014	2014	1,056	73,852	987	13,217	Mission Dependent
7020A	HVAC Decontamination Facility	2009	2011	1,178	255,998		711	Mission Dependent
7021	Fab Equip Storage	2014	2015	1,464	102,386	1,771	82,768	Mission Dependent
7022	Lamp Recycle Facility			1,200	83,923		650	Mission Dependent
7026	M&C Storage	2014	2014	1,120	78,328		22,456	Mission Dependent
7030	Heavy Equipment Storage Shelter	2014	2015	4,998	349,539	750		Mission Dependent
7031	Fabrication Storage Shed	2014	2016	1,152	80,566	1,064	4,474	Mission Dependent
7033	Electrical Material Strg.	2010	2012	5,500	384,647	1,073	51,001	Mission Dependent
7035	Vacuum Asbestos Equip. Cleaning Fac.			558	39,024	2,209	33,143	Mission Dependent
7035A	Paint Mix Building	2014	2014	620	43,360	30,532	9,890	Mission Dependent
7035B	Paint Storage	2014	2014	651	45,528		2,314	Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7035C	Equipment Storage	2014	2014	589	41,192		2,367	Mission Dependent
7035D	Can Drying Facility	2014	2015	268	18,743		848	Mission Dependent
7035E	Utility Mechanics Storage	2014	2015	620	43,360		217	Mission Dependent
7035F	Shed Storage Facility	2014	2015	589	41,192		27	Mission Dependent
7037	Cold Storage Bldg			606	42,381		6,314	Mission Dependent
7039	Storage for LLW Line Item			11,600	811,255	2,000	6,645	Mission Dependent
7040	Gas Cylinder Storage			3,520	246,174	1,334	4,440	Mission Dependent
7041	Cold Storage Building			8,000	559,487		761	Mission Dependent
7042	Core Storage Facility			6,040	422,412		1,584	Mission Dependent
7057	Sandblast Cleaning Fac	2009	2016	504	35,248		34,677	Mission Dependent
7058	Machine Auxiliaries Strg	2009	2012	1,008	70,495	1,288	30,067	Mission Dependent
7060	Steel Yard Office	2008	2008	100	12,471		6,611	Mission Dependent
7061	Hlth. Phys. Envrn. Stg.	2008	2008	1,060	74,132		13,938	Mission Dependent
7062	Storage-Miscel Materials	2010	2014	372	80,842	2,639	17,763	Mission Dependent
7065	Rigger Equip Storage	2009	2009	1,008	70,495	946	39,116	Mission Dependent
7066	Grounds Maint. Storage	2009	2009	1,008	70,495	158	39,116	Mission Dependent
7067	Com Gas Hoses & Reg			784	170,376	3,146	40,573	Mission Dependent
7069	Gasoline Service Facility			96	6,714	2,915	17,614	Mission Dependent
7070	Storage Shed	2010	2015	6,700	468,570	60,362	840	Mission Dependent
7073	Air Monitoring Station			64	4,476		1,025	Mission Dependent
7075	Waste Storage Building	2009	2012	475	153,818			Mission Dependent
7077	Grounds & Laborers Building			4,299	934,242	98,629	24,846	Mission Dependent
7081	Portable Generator Storage Shed	2009	2014	960	67,138			Mission Dependent
7082	Salt Storage Building	2014	2016	1,491	104,274			Mission Dependent
7085	90-Day Waste Storage	2009	2012	600	41,961			Mission Dependent
7086	Flammable Gas Storage			62	15,938			Mission Dependent
7089	Flammable Storage			67	21,696			Mission Dependent
7553	Pump House - TSF Water			116	8,113		78,737	Mission Dependent
7601	Energetic Systems Office Building			25,895	3,229,247	80,346	1,260,939	Mission Dependent
7603	Energetic Systems Laboratory Facility			50,083	15,644,512	206,564	2,530,630	Mission Dependent
7604	Utility Building			4,250	297,227	32,152	76,026	Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7605	Storage Building			11,781	823,914	17,060	165,842	Mission Dependent
7606A	Energetic Systems Fac Management Offices			7,417	1,500,266	46,248	652,907	Mission Dependent
7606B	S Res Serv Maint Bldg			5,792	405,068	58,131	229,007	Mission Dependent
7611	Guard House-Cfrp			140	19,097	211	38,412	Mission Dependent
7615	REDC Storage			760	53,151	66	4,168	Mission Dependent
7624	Energetic Systems Maint. Strg. Building			525	36,716			Mission Dependent
7709	Health Physics Research Reactor (HPRR)	2009	2010	3,698	3,244,523	1,581	757,020	Mission Dependent
7710	Dosimetry Applications Research Facility	2009	2010	9,356	2,703,901	15,907	1,907,352	Mission Dependent
7712	DOSAR Low-Energy Accelerator	2009	2010	1,025	320,181	6,625	681,192	Mission Dependent
7735	Radiation Calibration Laboratory	2009	2010	2,800	874,641	4,420	3,732	Mission Dependent
7740	Radio Trans. Fac. (Melton			543	37,975	4,115		Mission Dependent
7740A	Melton Hill Radio Facility			208	31,646		770	Mission Dependent
7740C	Melton Hill Paging Building			70	10,650			Mission Dependent
7751	Sen Post 22 Tsf Exclu			64	8,730			Mission Dependent
7756	Meter House Hpm			187	13,078		420,328	Mission Dependent
7758	HFIR Parts Storage	2014	2016	400	27,974		9,663	Mission Dependent
7859A	Sample Storage Buildings			80	5,595			Mission Dependent
7875	Surface Water Monitoring Strg Building			360	116,578		16,832	Mission Dependent
7892	Storage Building for 7856 Operations			600	41,961			Mission Dependent
7911C	Instrument Shed for 7911			41	2,867	57,371		Mission Dependent
7914	Eqp & Parts Strge Bldg			1,920	134,277	19,486	35,900	Mission Dependent
7914A	Equipment Storage			960	67,138	19,124	31,421	Mission Dependent
7915	Oper. Stor. Bldg.			2,119	148,194	15,570	31,183	Mission Dependent
7916	HFIR Electrical Service Shop			896	62,662	14,733	104,645	Mission Dependent
7919	Process Waste Monitor (HFIR)			259	79,429			Mission Dependent
7921	Emerg Gen Bldg (For B7920			569	39,793		154,532	Mission Dependent
7922	Breeching & Fan Area for 7920			83	8,313		151,401	Mission Dependent
7925A	Storage Building			207	14,477		285	Mission Dependent
7925B	Storage Building			207	14,477		285	Mission Dependent
7931	Emerg Gen Bldg For B7930			333	23,289		136,453	Mission Dependent
7932	Waste Sample Bldg. (7930)			148	29,937		25,941	Mission Dependent

Table B.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	GSF	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7934	Controlled Storage Facility			2,529	176,868		54,311	Mission Dependent
7936	Storage Bldg for REDC			3,145	964,493	16,283	32,885	Mission Dependent
7953	Hprr Pump House			300	20,981		13,775	Mission Dependent
7955	Sentry Post No. 19A			48	6,548	1,077		Mission Dependent
7958	Sentry Post 23 - Hprr			56	7,639		16,253	Mission Dependent
7960	Cask Tool Stor			1,524	106,582			Mission Dependent
7969	Haz Material Enclosure			240	77,718	1,912	327	Mission Dependent
7977	Cold Source Equipment Building			2,590	181,134	382,474	2,211	Mission Dependent
BWO	Battelle Washington Office			3,558	443,702			Mission Dependent
XC1402	American Museum of Science and Energy			54,200	18,401,760	240,000	260,000	Mission Dependent
XC1403	Solar Energy House			1,840	183,923		12,000	Mission Dependent
XC1404	Age of The Automobile Exhibit			1,183	71,653	1,000	1,500	Mission Dependent
XF1303	Barn E - Deer Checking Station	2010	2010	8,025	561,235	1,372		Mission Dependent
XF1305	Entry Control Building, East			121	16,505	6,746	4,198	Mission Dependent
XG1401	Freels Bend, Log Cabin			1,490	170,754			Mission Dependent

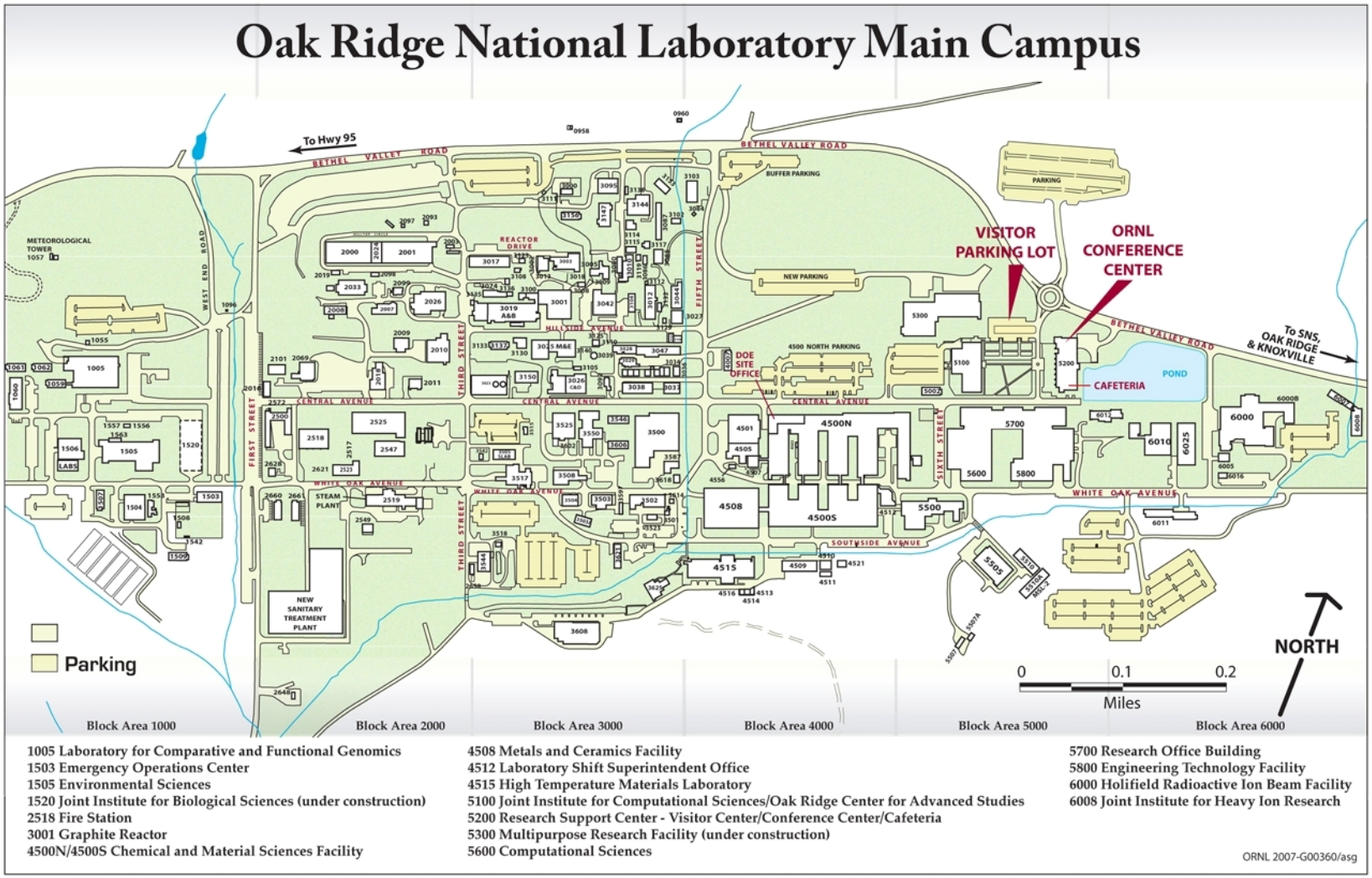

Fig. B.1. ORNL main campus.

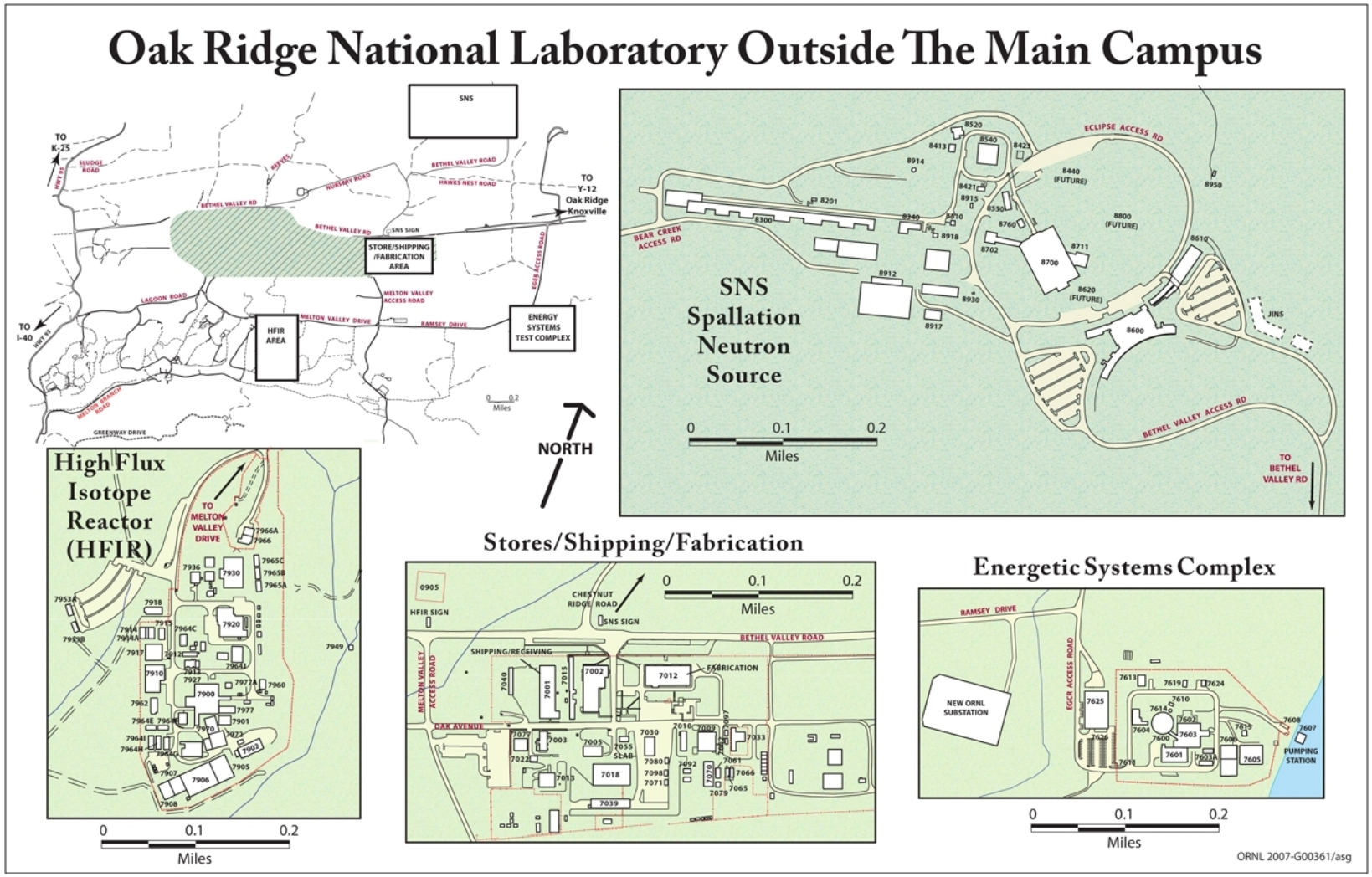

Fig. B.2. ORNL facilities outside the main campus.

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Appendix C. Inventory and Maps of Infrastructure/Site Utility Systems

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Table C.1. Mission dependency listing of ORNL operational infrastructure/site utility systems as of May 2007

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
0043	ORIC Accelerator			25,000,000			Mission Critical
0826	Water Storage Tank			2,607			Mission Critical
0901	161 KV Substation			12,877,097		292,692	Mission Critical
0902	Main Reservoir			2,762,372		2,272,208	Mission Critical
0926	Water Reservoir			1,353,257			Mission Critical
0936	ESD Twin Towers Walker Branch			185,784			Mission Critical
0938	ATDD/NOAA Stairway Tower			185,784			Mission Critical
0939	ATDD/NOAA			185,784			Mission Critical
0956	Spring Water Pumphouse			1,029			Mission Critical
1055	Water Well No. 9			9,287			Mission Critical
1556	Cooling Twr. For Esl (E)			86,146	4,891	1,837	Mission Critical
1557	Cooling Twr. For Esl (W)			86,146		1,837	Mission Critical
1563	Substation No. 234-4			1,029		5,280	Mission Critical
2519	Steam Plant			58,055,562	116,855	15,863,783	Mission Critical
2521	Sewage Treatment Plant Control Building	2015	2015	1,531,763	274,083	281,145	Mission Critical
2522	Fuel Oil Tank (2519 Steam Plant)			108,329		1,600	Mission Critical
2543	East Aeration Pond			336,131			Mission Critical
2544	West Aeration Pond			343,914			Mission Critical
2555	Fuel Oil Storage Facility (2519)			537,983			Mission Critical
2572	Emergency Generator for 2500	2015	2015	66,349	6,566	96,501	Mission Critical
2632	5000-KVa Substation			2,994,687		1,071,487	Mission Critical
2645	Emergency Generator, Coal Handling			168,035			Mission Critical
2646	LLLW BVEST Substation No. 33-6			1,029			Mission Critical
2663	Sewage Plant Effluent Ozonation Facility			16,686			Mission Critical
3000	13.8 KV Substation			440,089		1,198,789	Mission Critical
3132	Emergency Generator for 3127, 3129, 3027	2011	2011	26,007	5,056		Mission Critical
3501	Sewage Pumping Station			318,892			Mission Critical
3538	Cooling Tower (For 3525)	2013	2015	70,352			Mission Critical
3598	Emergency Generator For 3500 Area			256,514	12,479	2,222	Mission Critical
3609	Substation No. 25-1-C			19,684		241,940	Mission Critical
4000	13.8/2.4 KV Secondary Substation			750,592			Mission Critical
4503	Standby Emergency Generator for 4500N			459,492			Mission Critical

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
4509	Central Chill Water Plant			7,393,408	634,075	695,828	Mission Critical
4510	Cooling Tower for 4509			665,187	58,375	358,822	Mission Critical
4513	Html Substation			144,867		5,199	Mission Critical
4521	Cooling Tower for Building 4509			604,833	33,993	32,515	Mission Critical
5554	Elect Substation For 5505			171,866		35,594	Mission Critical
6001	Cooling Tower-6001			514,108	6,926	433,248	Mission Critical
6551	West Reservoir, Haw Ridge			1,353,257			Mission Critical
6552	East Reservoir, Haw Ridge			1,353,257			Mission Critical
6553	Standby Generator and Valve Pit			66,297		62,717	Mission Critical
7044	Substation 27-8, West of 7003			46,957		408,675	Mission Critical
7063	Emergency Generator For Bldg 7003			19,473	4,646		Mission Critical
7099	Pressure Reducing Valve Station			14,814			Mission Critical
7618	Diesel Generator for 7600			2,433	8,599	5,194	Mission Critical
7619	Cooling Tower			233,583	2,685		Mission Critical
7902	Cooling Tower For 7900			5,150,839	382,474		Mission Critical
7911	Stack (For 7900)			254,374	38,247	36,876	Mission Critical
7913	Filter Pit for 7911 Stack			254,022	76,495		Mission Critical
7923	Cooling Tower for REDC			1,098,582		3,539	Mission Critical
7987	Diesel Generator for 7977			0			Mission Critical
7988	Diesel Generator for 7977			0			Mission Critical
8413	Ring HVAC Building West			440,765			Mission Critical
8423	Ring HVAC Building East			440,765			Mission Critical
8760	Target Helium Compressor Building			1,033,466	18,644		Mission Critical
8910	Central Utility Building - 8910CU			18,945,804	1,546,767		Mission Critical
8911	Switch Yard			2,992,019	41,209		Mission Critical
8912	Switch House - 8912SH			3,543,331			Mission Critical
8913	Cooling Tower - 8913CT			6,598,494			Mission Critical
8914	SNS Water Storage Tank			3,675,939	347,736		Mission Critical
8915	Central Exhaust Facility			6,026,839			Mission Critical
8918	Diversion Tanks			1,510,423			Mission Critical
8950	Potable Water Pumphouse			1,510,423			Mission Critical
920001	Fire Alarm System			2,666,083	1,011,129	2,547,486	Mission Critical

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
920014	Water Lines, Nonpotable			771,166		57,522	Mission Critical
920015	Compressed Air Line System			5,173,492			Mission Critical
920017	Underground Water Lines, Fire Protection			1,462,883		36,347	Mission Critical
920021	Telephone System, Underground Conduit			387,444			Mission Critical
920052	Underground Water Line, Potable			4,878,717		167,188	Mission Critical
920054	Overhead Electric Transmission Sys, EGCR			179,018			Mission Critical
920060	Chilled Water Lines, Supply			913,344	962,507	7,712	Mission Critical
922501	Alarm System - Offsite Warning Device			600,607			Mission Critical
0902-80	Optional Standby Generator (X184005)			26,827			Mission Critical
0905-NG	7000 Natural Gas Metering Station			37,853		15,592	Mission Critical
0926B	Emergency Generator			26,827			Mission Critical
1005-80	Level 1 (Emergency) Generator (X188915)			191,784			Mission Critical
2519-0	2519-0 Generator			120,285			Mission Critical
2519-1	2519-1 Generator			76,848			Mission Critical
2519-2	2519-2 Generator			231,439			Mission Critical
2519A	Standby Emergency Genera for Steam Plant			574,366		723	Mission Critical
2519B	Level 1 (Emergency) Generator (X188451)			231,439			Mission Critical
2519-NG	2519 Natural Gas Metering Stations			58,754			Mission Critical
2519-PGT	2519 Compressed Air Receivers			25,658			Mission Critical
2519-SB1	2519 Steam Boiler - Hi Bay (X156613)			4,440,878			Mission Critical
2519-SB2	2519 Steam Boiler (X174274)			2,105,306			Mission Critical
2519-SB3	2519 Steam Boiler (X174275)			2,105,306			Mission Critical
2519-SB4	2519 Steam Boiler (X174276)			2,105,306			Mission Critical
2519-SB5	2519 Steam Boiler - Furnace (X174277)			2,105,306			Mission Critical
2519-SB6	2519 Steam Boiler #6 (X188655)			4,111,924			Mission Critical
2519-ST1	2519 Steam Turbine - #1 (X187019)			30,017			Mission Critical
2519-ST2	2519 Steam Turbine - #2 (X187950)			110,002			Mission Critical
2521-80	2521D Optional Standby Generator			86,385			Mission Critical
2521A	Sewage Treatment Aeration Facility			2,617,934			Mission Critical
2521E	Calgon Tank for 2521A Sewage Treatment	2015	2015	26,071		6,454	Mission Critical
2521-FS	Sewage Trt. Plant Filter Sys. (X189189)	2015	2015	155,598			Mission Critical
2521-TK	2521D Diesel Fuel Storage Tank (X188034)			191,644			Mission Critical

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
2536-AREA	Sewage Sludge Holding Tank at 2536			41,906			Mission Critical
2572-TK	2572 Diesel Fuel Storage Tank (X188141)			134,136			Mission Critical
3003-LC	3003 Liquid Chiller (X187404, Rm 111)			193,592			Mission Critical
3027A	Dispatch Center Emergency Generator	2011	2011	104,285			Mission Critical
3047-CT	3047 Cooling Tower (X185557)	2009	2012	43,134			Mission Critical
3047-GEN	3047 Emergency Generator	2009	2012	1,029			Mission Critical
3047-TK	3047 Diesel Fuel Storage Tank (X188085)	2009	2012	268,382			Mission Critical
3132-TK	3132 Diesel Fuel Storage Tank (X188003)			194,072			Mission Critical
3598-TK	3598 Diesel Fuel Storage Tank (X188090)			271,509			Mission Critical
4500S-TK	S3 Dock Diesel Fuel Strg Tank (X188004)			228,754			Mission Critical
6000-CT	6000 Mini Cooling Tower, Roof (X187422)			505,158			Mission Critical
6010-ACC	OR Electron Linear Accelerator (X900047)			10,000,000			Mission Critical
7506G-80	7506G Level 1 (Emergency) Generator			64,433			Mission Critical
7603A	7600 Complex Diesel Fuel Storage Tanks			52,585			Mission Critical
7603-SB	7603 Steam Boiler (X186348)			173,016			Mission Critical
7700-AREA	Tower Shielding Facility (TSF) Tanks			80,885			Mission Critical
7900-D	7900 Demineralizer (X186667)			38,830			Mission Critical
7900-R	7900 High Flux Isotope Reactor (X900046)			2,000,000,000			Mission Critical
7911B	Monitoring Equipment Building for 7911			18,856	57,371	4,192	Mission Critical
920016-2	Site Pressurized Sanitary Sewer Lines			1,190,653			Mission Critical
X10-CWRL	Site Chilled Water Return Lines			1,217,791		7,468	Mission Critical
X10-EP	Site Electrical Poles			2,628,457			Mission Critical
X10-SCRL	Site Steam Condensate Return Lines			1,028,668		54,730	Mission Critical
X159377	Transformer SN #331-4508, 130			56,196			Mission Critical
X163891	Transformer GE 225 - 6010, H			22,117			Mission Critical
X164115	Transformer 750 KV-6010, OSide			116,228			Mission Critical
X164117	Transformer 750 KV-6010, OSide			45,588			Mission Critical
X165069	Transformer 300 KV-6025, OSide			45,588			Mission Critical
X166095	Magnet Positioner-6000, T106			350,000			Mission Critical
X169272	Roughing Pump Sta-6000, Bay			12,860			Mission Critical
X173911	7900 Demineralized Water Storage Tank			50,553			Mission Critical
X174495	Accelerator WaveGu-6010,Storag			800,000			Mission Critical

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
X175092	Accelerator Tandem-6000, TOW			30,000,000			Mission Critical
X176264	Transformer 225 KV-3017, OSide			22,117			Mission Critical
X176552	Accelerator - 6010, B			712,542			Mission Critical
X177799	Emergency Generator - 4500S			574,366			Mission Critical
X177800	Emergency Generator - 4500S K135A			139,479			Mission Critical
X182293	Silo, Diatomaceous Storage - 2644			37,914			Mission Critical
X182294	Silo, Lime Storage - 2644			37,914			Mission Critical
X182332	Transformer West 2-6000			260,888			Mission Critical
X182333	Transformer West 1-6000,T308			260,888			Mission Critical
X182334	Transformer West1-6000,T308			260,888			Mission Critical
X182336	Transformer West 1 - 4509			174,887			Mission Critical
X182420	Transformer - 2525			56,196			Mission Critical
X182813	Transformer - 4512, 116			56,196			Mission Critical
X183728	Transformer 100KV-4508, SCreek			56,196			Mission Critical
X183729	Transformer 750KVA-3047,OSide			45,588		64,212	Mission Critical
X183730	Transformer 1000KV-4508,SCreek			45,588			Mission Critical
X183731	Transformer 750 KVA - 7033			56,196			Mission Critical
X183732	Transformer Elec 1 - 7033			56,196			Mission Critical
X183845	Transformer, 5510 Outside			45,588			Mission Critical
X183897	Transformer 225RV - 6011			22,117			Mission Critical
X184699	Substation, Secondary Metal Sub for 4509			234,003			Mission Critical
X184700	Substation, Secondary Metal Sub at 4509			234,003			Mission Critical
X188036	Sludge Dewatering System			1,114,879			Mission Critical
X188344	Analyzer Magnet B-6010, B			223,468			Mission Critical
X188364	Transformer, Three-Phase Outside 7900			164,750			Mission Critical
X188365	Transformer, Three-Phase Outside 7900			56,196			Mission Critical
X188370	Transformer, Three-Phase Outside 7900			56,196			Mission Critical
X188371	Transformer, Three-Phase Outside 7900			56,196			Mission Critical
X188798	Ion Source, SNS Front End System – 8100			5,820,500			Mission Critical
X188799	RFQ, SNS Linac Tunnel - 8200			6,699,300			Mission Critical
X188800	MEBT, SNS Linac Tunnel - 8200			8,334,600			Mission Critical
X188871	Transformer, Power - Outside 7977			56,196			Mission Critical

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
X920000	Overhead Electrical Distribution System			259,407,136	4,509,756		Mission Critical
X920013	Steam Lines, Supply (Plant Wide)			15,370,160	3,040,846	2,937,660	Mission Critical
X920016	Sanitary Sewer, Underground			3,673,891		103,628	Mission Critical
X920030	Natural Gas Distribution Lines			1,741,594		52,098	Mission Critical
0821	Ambient Air Station N0. 39			1,029		791	Mission Dependent
0823	Free Air CO_2 Experiment Complex			214,618	6,435		Mission Dependent
0825	Well, Nonpotable Water			2,144			Mission Dependent
0856	NOAA Tower			181,785			Mission Dependent
0929	Ish Creek Weir			284,276			Mission Dependent
0932	WBW Soil Block 1			8,585			Mission Dependent
0933	WBW Soil Block 2			8,585			Mission Dependent
0935	WBW Subsurface Weir			16,096			Mission Dependent
0946	Water Well, Katie's Kitchen			7,335		3,433	Mission Dependent
0952	E Weir Walker Br Wtrshed			161,129			Mission Dependent
0953	W Weir Walker Br Wtrshed			161,129			Mission Dependent
0958	Water Well No. 1			16,193	210		Mission Dependent
0960	Water Well No. 2			16,193	245		Mission Dependent
0972	Sanitary Waste Septic Tank			1,227			Mission Dependent
1057	Tower Meterological-1000 Area			123,406			Mission Dependent
1553	Service Pit For Bldg 1504			24,359	5,661	238,566	Mission Dependent
1558	N.W. Tributary Weir 1558			95,802		8,232	Mission Dependent
1566	First Creek Monitoring Station			28,517			Mission Dependent
2545	CYRO Retention Basin			26,418		23,182	Mission Dependent
3078	Septic Tank for 3000 Pump Sta.	2016	2016	969			Mission Dependent
3160	3019 Motor Control Center #1 and #2			22,222			Mission Dependent
3619	White Oak Creek Flume			1,029		12,075	Mission Dependent
6555	30M Meteorological Tower-B			48,289		89,953	Mission Dependent
7080	Cardboard Compressor	2011	2016	40,623			Mission Dependent
7571	Tower Meterological-7002 Area			48,289			Mission Dependent
7613	Waste Retention Basin			1,029		7,500	Mission Dependent
7614	Exhaust Stack			1,029			Mission Dependent
7616	Septic Tank			13,355			Mission Dependent

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7672	7666 Passenger Shelter			2,683			Mission Dependent
7755	DOSAR (HPRR) Reservoir			62,740			Mission Dependent
7864	Gaging Station-E. Seep			39,995			Mission Dependent
7865	Gaging Station-W. Seep			39,995			Mission Dependent
7867	Wier-Melton Br			58,625		1,645	Mission Dependent
7868	Sampling Station - White Oak Creek			72,800			Mission Dependent
7869	Monitor Sta 5			2,141,432		12,553	Mission Dependent
7871	Monitor Station 3			419,121	279		Mission Dependent
7872	Monitor Station 4			783,336	105		Mission Dependent
8620	Target Bldg Elevated Pedestrian Walkway			1,138,750			Mission Dependent
920003	Sidewalks			532,614			Mission Dependent
920004	Area Fences			23,236,425		2,615,090	Mission Dependent
920005	Off-Site Fences			73,347		2,401,210	Mission Dependent
920023	Storm Water Drainage System			8,489,944	582,364		Mission Dependent
920050	Roads, Secondary			17,522,647	646,161	1,831,408	Mission Dependent
920051	Roads, Tertiary			94,693,396			Mission Dependent
920059	Broadband Data Transmission Cable System			124,581			Mission Dependent
940000	Wells, Groundwater Monitoring - Capital			1,111,212			Mission Dependent
940001	Wells, Groundwater Monitoring - NonCapit			1,111,212			Mission Dependent
0902-AREA	Water Dist. Sys. Maint Materials Storage			21,462			Mission Dependent
2026-CT	2026 Cooling Tower (X185479)	2009	2011	54,426			Mission Dependent
2521C	Sludge Drying Beds	2015	2015	21,192			Mission Dependent
2521D	Aerators and Shed, East and West Lagoons	2009	2014	66,482		82,396	Mission Dependent
3078-DF	3078 Septic System Drain Field			2,044			Mission Dependent
4500S-PA	Radio Frq Power Cont Amplifier (X188088)			44,599			Mission Dependent
5507-AREA	Septic Tank			1,227			Mission Dependent
7069E	Underground Diesel Fuel Storage Tank			2,701,806			Mission Dependent
7069F	Underground Gasoline Storage Tank			270,183			Mission Dependent
7503-AREA	Septic Tank			3,159			Mission Dependent
7666-AREA TANK	Septic Tank			1,227			Mission Dependent

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
7709-AREA TANK	Septic Tank			835			Mission Dependent
7710-AREA TANK	Septic Tank			3,159			Mission Dependent
7735-AREA TANK	Septic Tank			1,227			Mission Dependent
7860-AREA TANK	Septic Tank			1,227			Mission Dependent
7930B	REDC Compressed Gas Cylinder Storage			0			Mission Dependent
7967A	Melton Branch Subsurface Weir			16,096		1,342	Mission Dependent
7967C	Melton Branch Soil Block			8,585			Mission Dependent
C20324	Main Parking Area, South side			431,964			Mission Dependent
C20343	Paved Areas, North and West side			90,388			Mission Dependent
SNS-Parking	SNS Parking Lots			11,852,827			Mission Dependent
X10-WB	Site Walking Bridges			241,707			Mission Dependent
X154802	Condenser Air Cool-3508, OSide			87,153		16,733	Mission Dependent
X154803	Condenser Air Cool -3508,OSide			125,437		16,733	Mission Dependent
X173627	Paging System SN#5-3017			7,743			Mission Dependent
X177874	Tower Meterologica-110 CRBR			189,574			Mission Dependent
X183459	Microwave Signal Trans-3500			510,773			Mission Dependent
X183460	Microwave Signal Trans-3500			510,774			Mission Dependent
X184271	Environmental Monitoring Shelter - 7601			18,453			Mission Dependent
X188736	Secondary Server, SACS			752,598			Mission Dependent
X188737	Com Server, SACS			752,598			Mission Dependent
X188738	Primary Server, SACS			752,598			Mission Dependent
X910016	Bridge, Popular Creek 509			12,877			Mission Dependent
X910017	Bridge, Popular Creek 510			16,096			Mission Dependent
X910018	Bridge, Popular Creek 511			12,072			Mission Dependent
X910019	Bridge, Popular Creek 512			6,439			Mission Dependent
X920012	Parking Area, North			1,161,083			Mission Dependent
X920020	Bridge, 6011 Vehicular Culvert Crossing			69,179			Mission Dependent
X920024	Site Preparation, Grading & Landscaping			987,148			Mission Dependent
X920025	Site Preparation, Grading & Landscaping			3,767,567			Mission Dependent

Table C.1 (continued)

Property ID	Property Name	Exc Year	Est Disp Yr	FY07 RPV ($)	FY06 Actual Maint ($)	FY06 Deferred Maint ($)	Mission Dependency
X920026	Site Preparation, Grading & Landscaping			339,384			Mission Dependent
X920034	Bridge, Vehicular - HTML (4515)			68,941			Mission Dependent
X920045	Parking Area - 45			36,314		972,288	Mission Dependent
X920046	Parking Area, 4500N			652,727			Mission Dependent
X920053	Parking Area, South Side Avenue			101,564			Mission Dependent
X920062	Parking Area, Southside Fifth Street			25,020			Mission Dependent
X920063	Parking Area, 7000			804,290			Mission Dependent
X920064	Parking Area, Sixth Street			80,691			Mission Dependent
X920065	Sign, HFIR Way Finding			101,508			Mission Dependent
X920066	Sign, SNS Way Finding			101,508			Mission Dependent
X920067	Sign, HTML Way Finding			101,508			Mission Dependent
X920068	Sign, Envir & Life Sciences Way Finding			101,508			Mission Dependent
X920072	East Campus Telecommunication Upgrade			2,452,800			Mission Dependent
X920100	Parking Area, Graphite Reactor Visitors			781,931			Mission Dependent
X926026	Parking Area, 6026 North Lot			314,267			Mission Dependent
X926027	Parking Area, 6026 South Lot			858,205			Mission Dependent
X926028	Parking Area, SIOU			271,141			Mission Dependent
X927600	Site Preparation, Grading & Landscaping			883,761			Mission Dependent

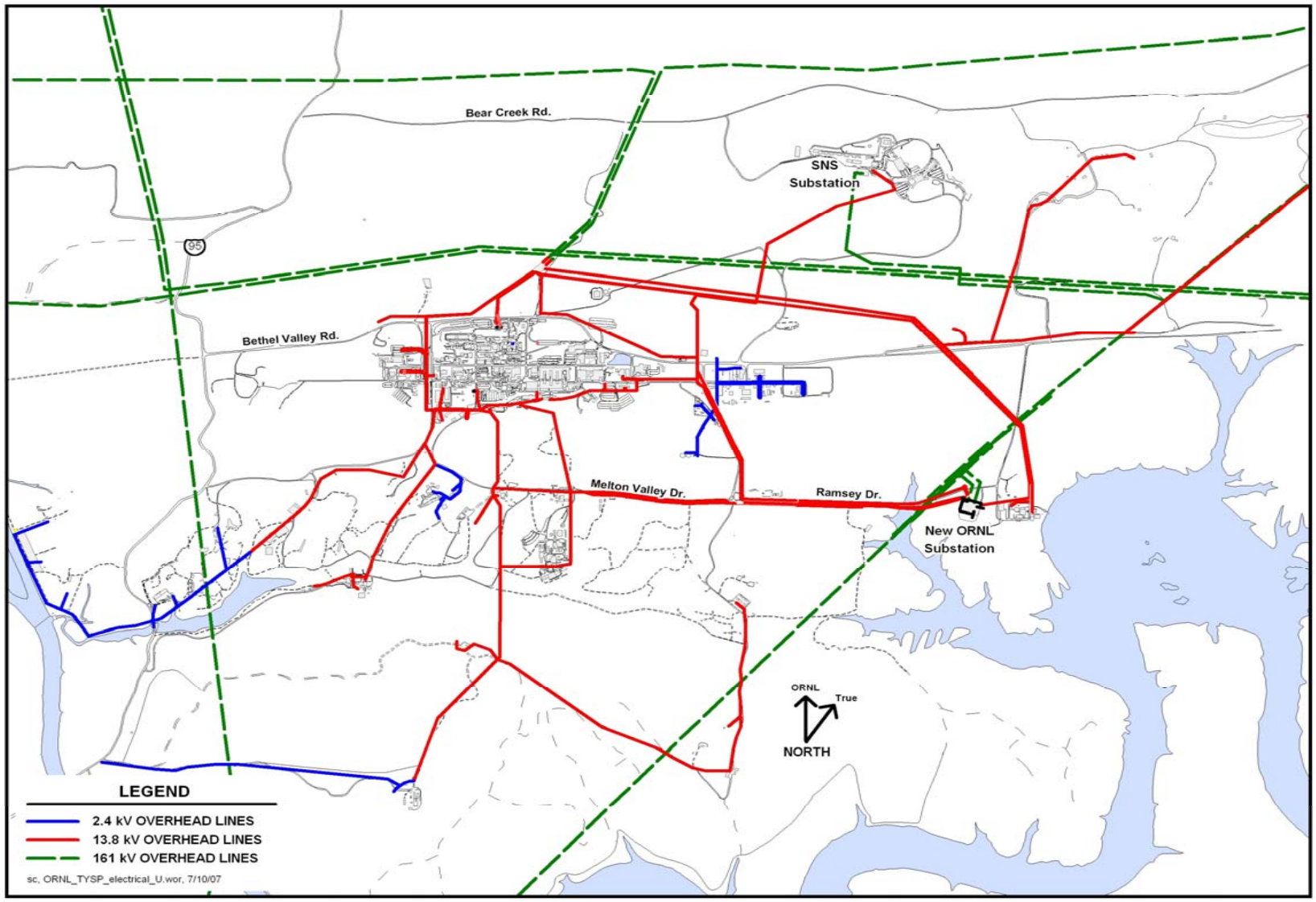

Exhibit 3.1.1 – ORNL electrical distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005 (revised July 11, 2007).

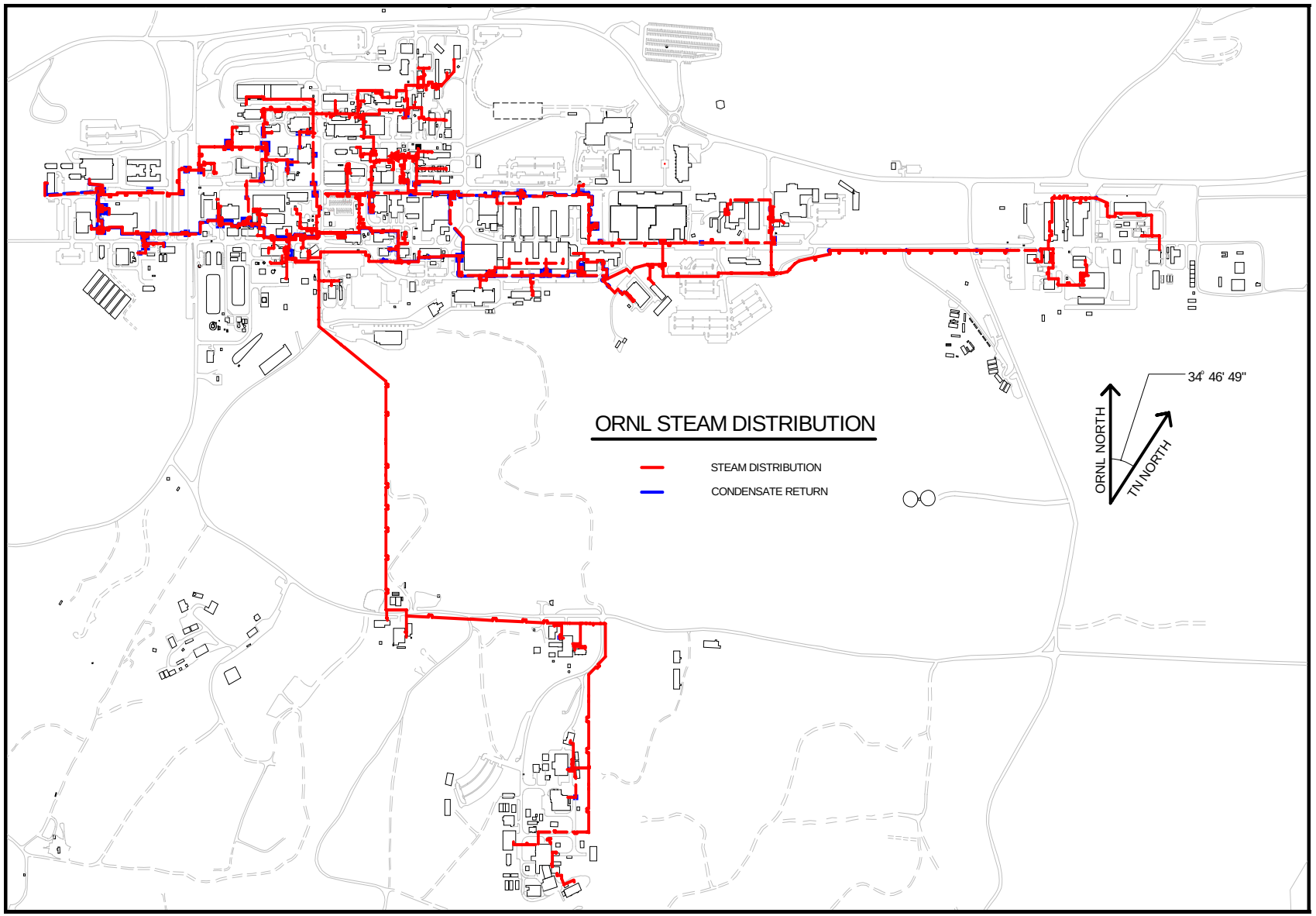

Exhibit 3.2.1 – ORNL steam distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

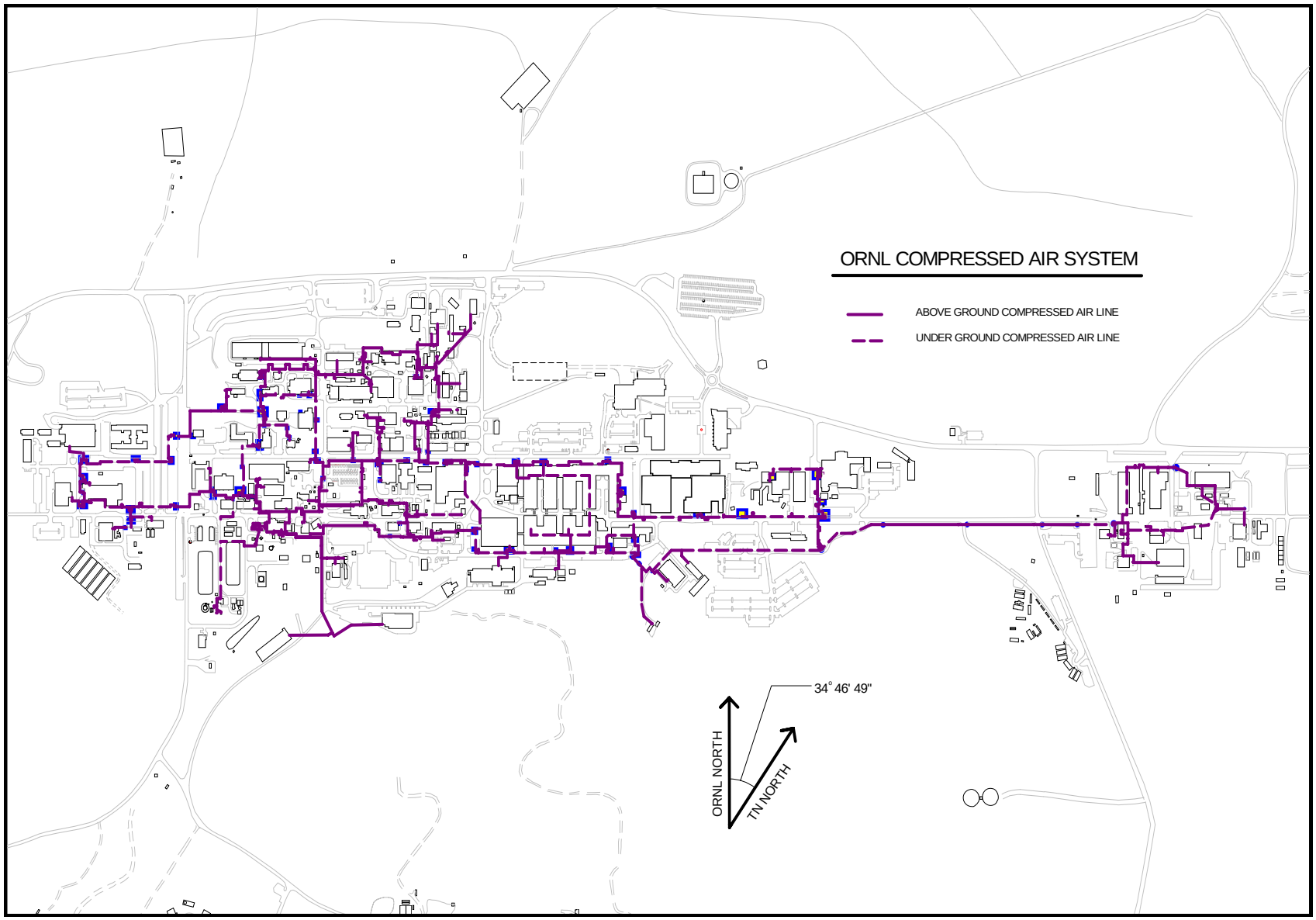

Exhibit 3.3.1 – ORNL compressed air distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

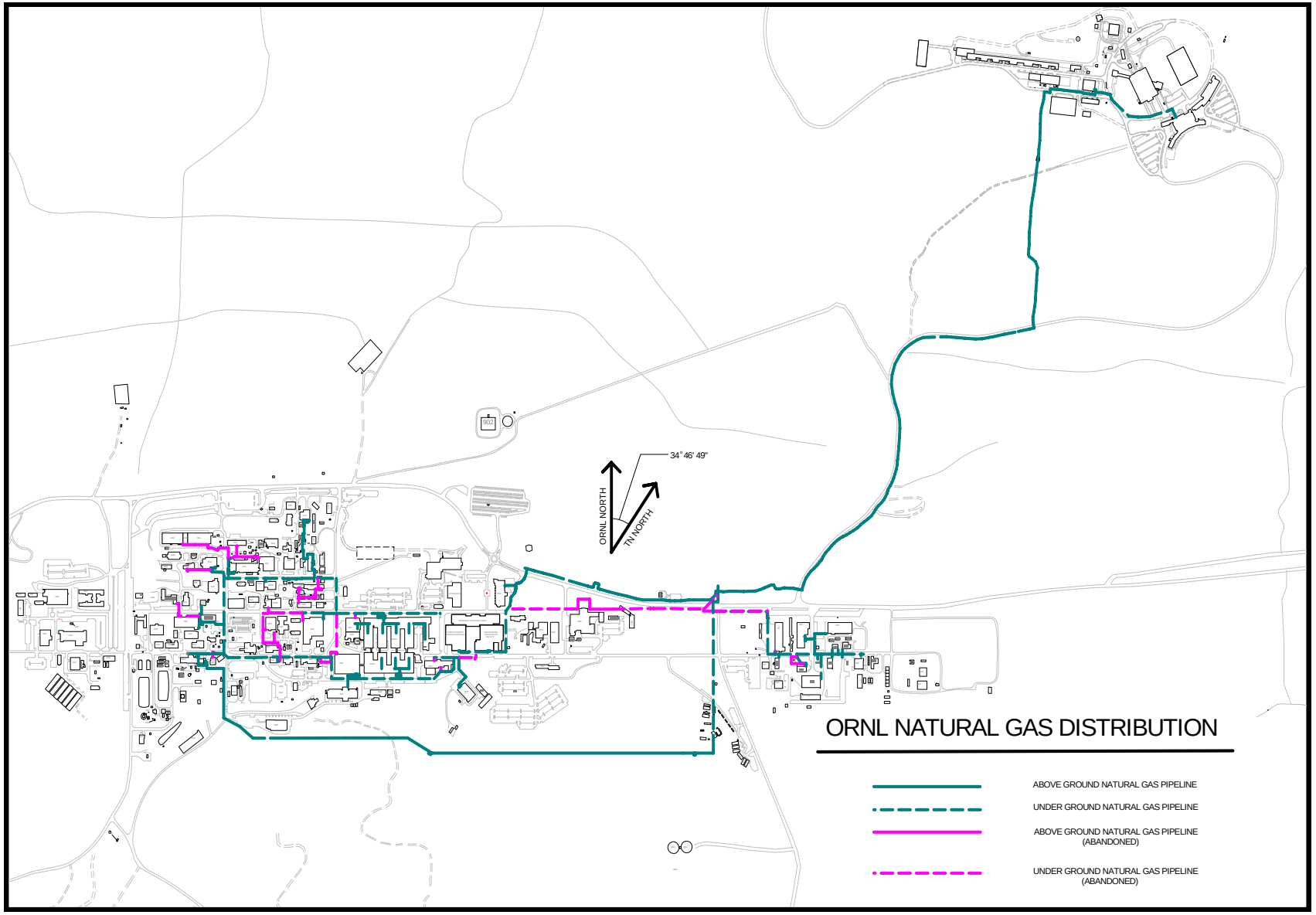

Exhibit 3.4.1 – ORNL natural gas distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

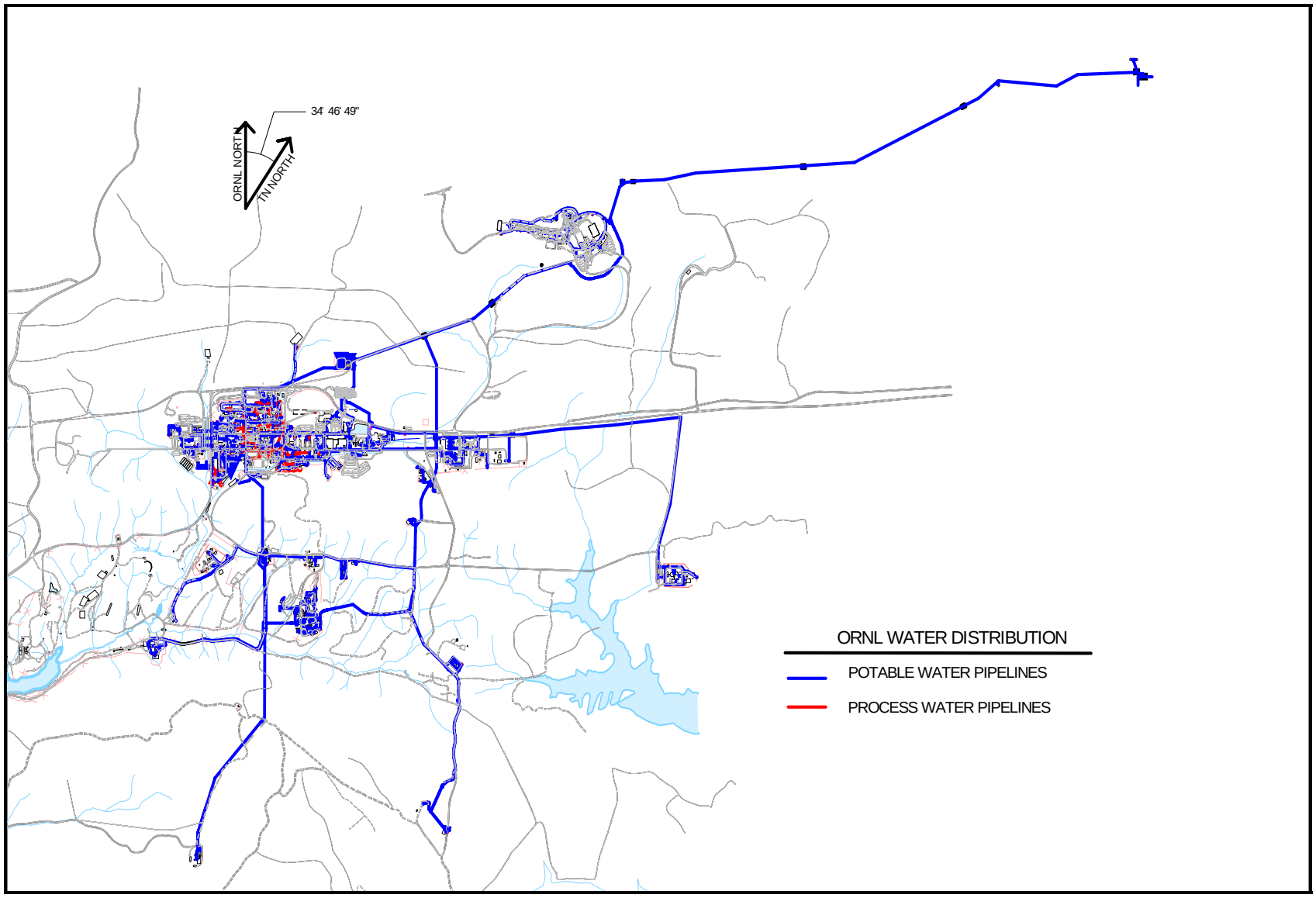

Exhibit 3.5.1 – ORNL water distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

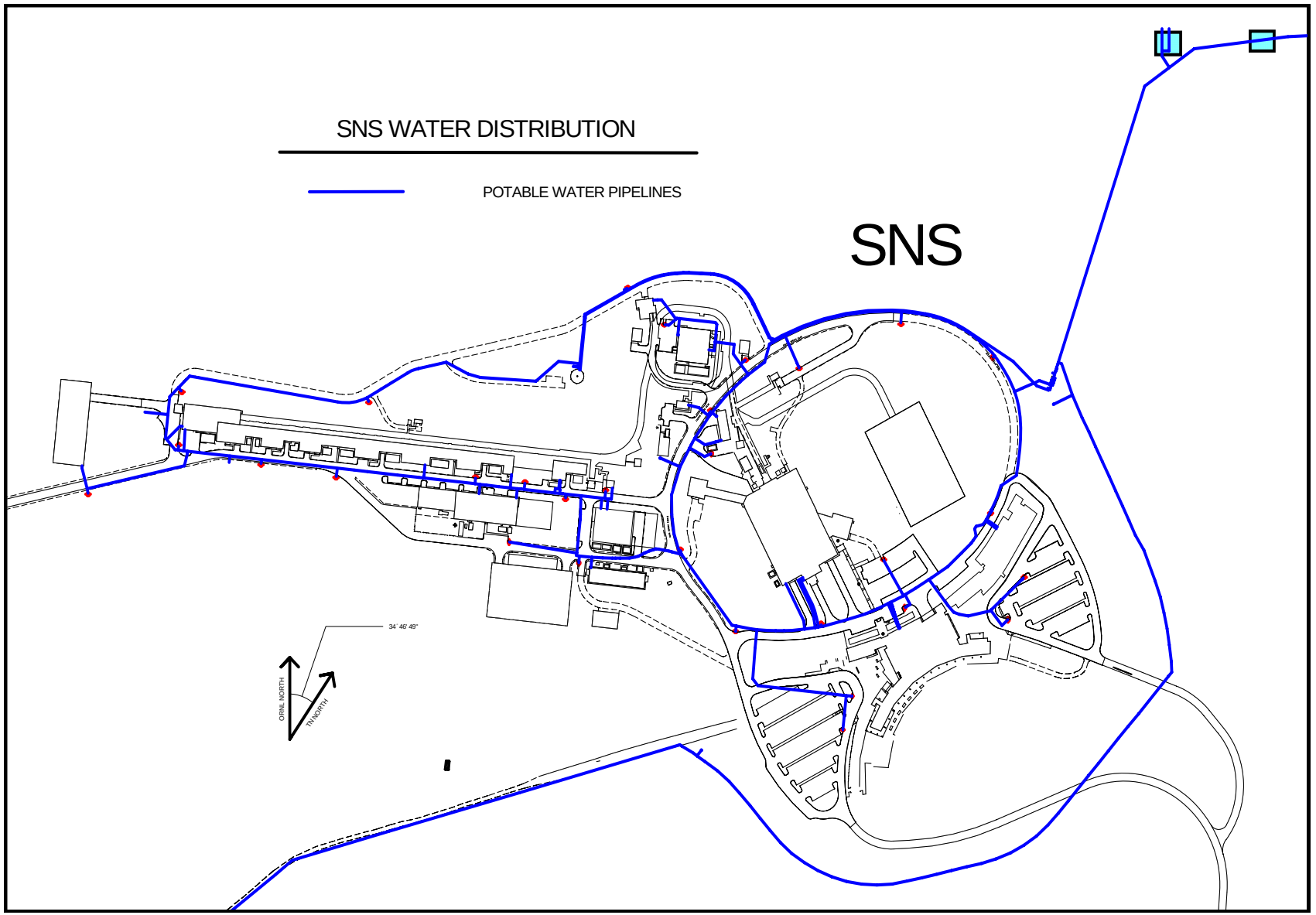

Exhibit 3.5.2 – SNS water distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

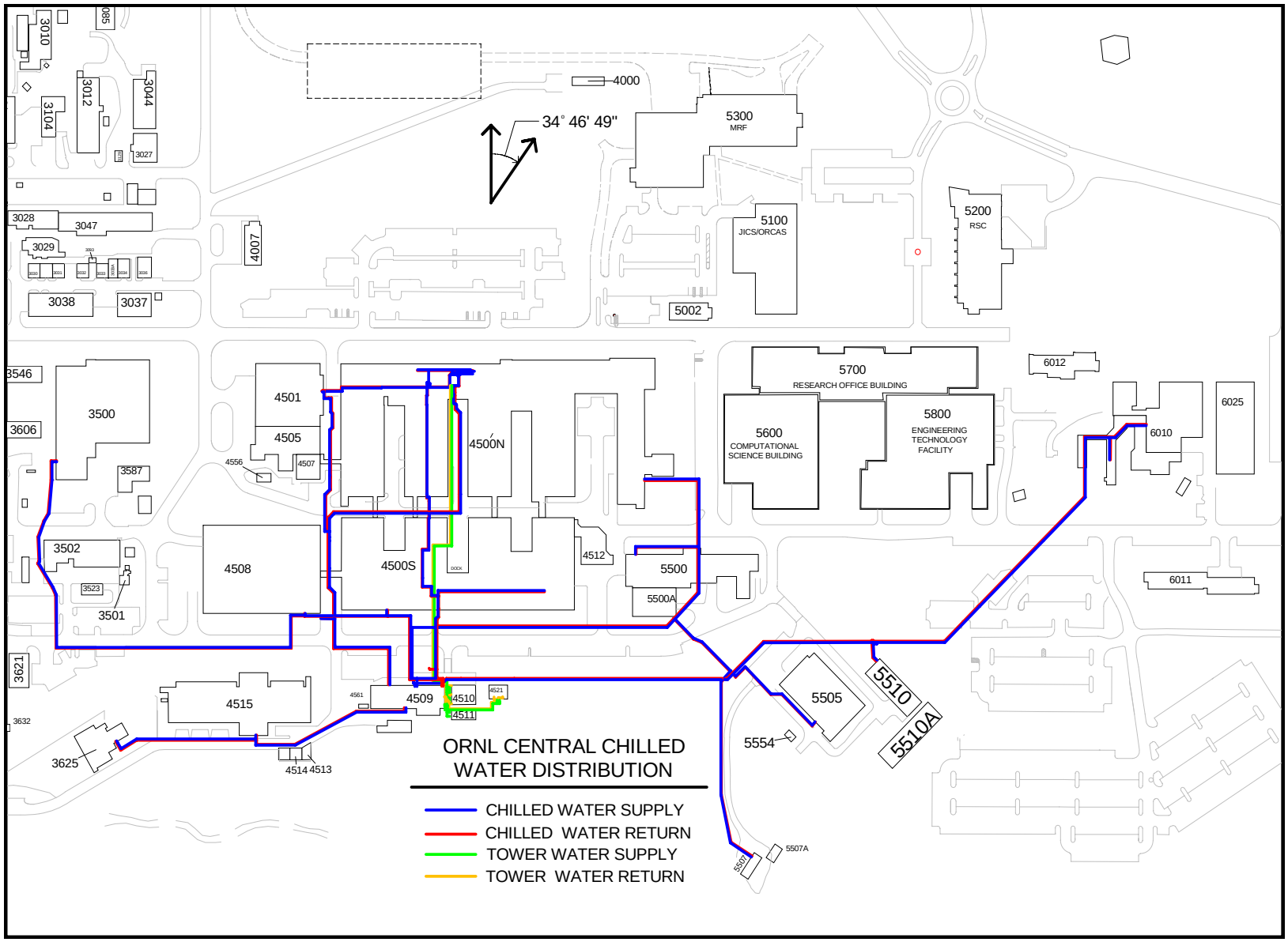

Exhibit 3.6.1 – ORNL chilled water distribution system map. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

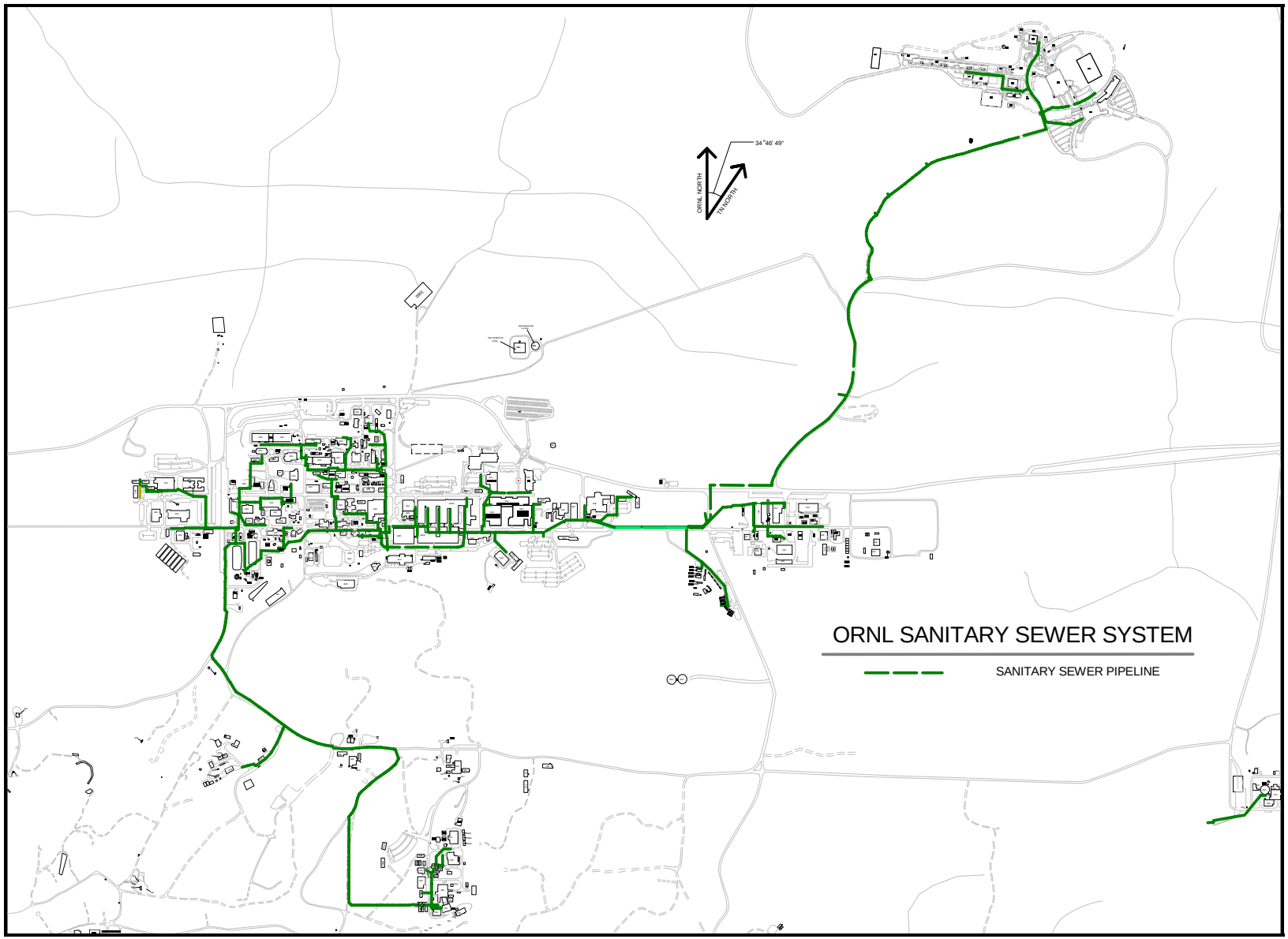

Exhibit 3.7.1 – ORNL sanitary sewage collection system. *Source: Oak Ridge National Laboratory Utilities Complex Ten-Year Management Plan, FY 2006*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, December 20, 2005.

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Appendix D. Updated FY 2009 Integrated Facilities and Infrastructure (IFI) Crosscut Budget Submission

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Table D.1. FY-2009 Facilities and Infrastructure Budget Crosscut Data Entry Sheet

Integrated facilities and infrastructure budget data sheet (ifi)	Project number	Deferred maintenance reduction ($000)	Gross building area added	Gross building area removed	FY 2007 approp. ($000)	FY 2008 to congress ($000)	FY 2009 budget ($000)	FY 2010 budget ($000)	FY 2011 budget ($000)	FY 2012 budget ($000)	FY 2013 budget ($000)	FY 2014 budget ($000)	FY 2015 budget ($000)	FY 2016 budget ($000)	FY 2017 budget ($000)	FY 2018 budget ($000)
SITE NAME: ORNL																
PROGRAM: SC																
1.0 Capital Line Item (Include project number & identify Funding Program)																
1.1 New Infrastructure Construction (facilities and additions)																
Multi-Program Laboratory Facility	AA7D0050	31,500	140,000				8,700	35,000	42,378	13,922						
Site Operations Facility	AA7D0052	3,300	75,000	46,000									10,000	18,000		
Melton Valley Research Operations Support Facility	AA7D0053		80,000										10,000	10,000		
7000 Area Site Maintenance/Fabrication Facility	AA7D0054	5,200	100,000	123,000											10,000	15,000
Subtotal 1.1		**40,000**	**395,000**	**169,000**			**8,700**	**35,000**	**42,378**	**13,922**			**20,000**	**28,000**	**10,000**	**15,000**
1.2 All Other Infrastructure Projects (recap)																
Site Utility Modernization	AA7D0051	19,000							15,000	25,000	20,000	20,000				
Waste Handling Systems	AA7D0057														10,000	20,000
Subtotal 1.2		**19,000**							**15,000**	**25,000**	**20,000**	**20,000**			**10,000**	**20,000**
Total Infrastructure line Items (1.1 +1.2)		**59,000**	**395,000**	**169,000**			**8,700**	**35,000**	**57,378**	**38,922**	**20,000**	**20,000**	**20,000**	**28,000**	**20,000**	**35,000**
1.3 Programmatic Line Items that Add Space																
Second SNS Long wavelength Target Station & Lab/Office Bldg	AA6D0037		150,000					6,600	40,500	125,000						
Central Utility Building for SNS	AA7D0062		15,000					3,000	5,000							
Center for Neutron Scattering User Facility	AA1D0003		50,510					7,000	10,500	2,000						
HB-2 Second Cold Source and Guide Hall	AA4D0054		40,000								6,600	84,000	10,400	84,000	10,400	
Subtotal 1.3			**255,510**					**16,600**	**56,000**	**127,000**	**6,600**	**84,000**	**10,400**	**84,000**	**10,400**	
Subtotal Line Item Projects (1.1 + 1.2 + 1.3)		**59,000**	**650,510**	**169,000**			**8,700**	**51,600**	**113,378**	**165,922**	**26,600**	**104,000**	**30,400**	**112,000**	**30,400**	**35,000**
2.0 General Plant Project (GPP) (Include project number; funding program and whether it is programmatic or not)																
2.1 New Construction (facilities and additions)																
ORNL User Facility	AA5D0123		15,000		2,500	2,300										
Subtotal 2.1 New Construction GPP			**15,000**		**2,500**	**2,300**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
2.2 All other GPP Projects (recap including alterations and improvements)																
Chestnut Ridge Cafeteria Upgrade	AA6D0025					3,000										
Chestnut Ridge 3rd Floor Laboratory Build-Out for Material Sci &Tech	AA7D0017				500	1,500										
Spallation Neutron Source Programmatic GPPs (KC0204019)	AA6D0038				3,000	3,000	4,000	4,160	4,326	4,499	4,679					
Subtotal 2.2 All other (recap) GPP					**3,500**	**7,500**	**4,000**	**4,160**	**4,326**	**4,499**	**4,679**	**-**	**-**	**-**	**-**	**-**
Subtotal GPP (2.1 + 2.2)			**15,000**		**6,000**	**9,800**	**4,000**	**4,160**	**4,326**	**4,499**	**4,679**	**-**	**-**	**-**	**-**	**-**

Table D.1 (continued)

Integrated facilities and infrastructure budget data sheet (ifi)	Project number	Deferred maintenance reduction ($000)	Gross building area added	Gross building area removed	FY 2007 approp. ($000)	FY 2008 to congress ($000)	FY 2009 budget ($000)	FY 2010 budget ($000)	FY 2011 budget ($000)	FY 2012 budget ($000)	FY 2013 budget ($000)	FY 2014 budget ($000)	FY 2015 budget ($000)	FY 2016 budget ($000)	FY 2017 budget ($000)	FY 2018 budget ($000)
3.0 Institutional General Plant Project (IGPP)																
Melton Valley																
Melton Valley Trailer Replacement	AA7D0060				1,000											
MV Northwest Parking Lot Expansion	AA5D0088								1,500	1,500						
Walk-In Hood and Scrubber	AA5D0096	562													373	1,500
7930 VOG Fans and Pit Filters	AA5D0112	1,138												1,800	2,935	
West Campus																
West Campus Improvements	AA7D0016	1,050			500	1,000	2,500									
West Campus 1500 Facilities Renovations	AA7D0009	600			1,600	2,400										
Telecommunications Upgrades	AA5D0004				160											
West End Research Support Facility	AA7D0007	900	9,000		500	1,800										
West Campus Building System Upgrades	AA7D0063						1,000	3,000	3,000			3,000				
First Street Reconfiguration	AA7D0040	960						3,000	3,000							
LSS (4512) and Emergency Ops Center (1503) Consolidation	AA6D0054	750								3,000	3,000					2,000
East Campus																
6025 HVAC Upgrade	AA3D0004	880			20											
5000 Area 13.8kv Distribution System Upgrade	AA6D0033				500	1,800										
4000 Substation Capacity Expansion	AA6D0032				100	2,250										
East Campus Chilled Water	AA6D0052				500	4,300										
North Hill Parking Lot	AA6D0002				3,130											
Outside Chemical Storage Containers	AA7D0004				540	300	300	300								
5800 Short Term Parking	AA7D0061				110	40										
4501/4505 Vacuum pump instrumentation/sump diversion	AA7D0014				200											
Automatic Transfer Switch for 4500S emergency generator	AA4D0030				200											
Two 13.8kv Circuits and Switches for 6010 and 5600	AA7D0041						2,500									
1500kv VA Transformers - East	AA7D0042						3,000									
1500kv VA Transformers - West	AA7D0043						3,000									
Smoke Detectors	AA7D0064					200	200									
Flagpole Parking Lot Replacement	AA7D0065									3,000						
Building 4500N Elevator Upgrade	AA5D0078	900							1,000	500						
4500 Reconfiguration for Offices & Service Support	AA7D0046	6,900									6,000	6,000	6,000	6,000	6,000	6,000
15KV 4509 SWITCHGEAR A	AA5D012								1,000							
6000 Area Cooling Tower Replacement	AA7D0044	900							1,300							
Chestnut Ridge																
Chestnut Ridge Parking	AA4D0095						2,000									
Second ORNL User Facility (only if usage justifies)	AA7D0032		17,000					560	4,240							
Chestnut Ridge Main Entrance Pavement	AA7D0033									1,000						
Central Campus																
Relocation Whole Body Counter and Calibration Labs	AA600024							8,000								
4508 High bay Upgrade	AA7D0045	600								2,000	2,800					

Table D.1 (continued)

Integrated facilities and infrastructure budget data sheet (ifi)	Project number	Deferred maintenance reduction ($000)	Gross building area added	Gross building area removed	FY 2007 approp. ($000)	FY 2008 to congress ($000)	FY 2009 budget ($000)	FY 2010 budget ($000)	FY 2011 budget ($000)	FY 2012 budget ($000)	FY 2013 budget ($000)	FY 2014 budget ($000)	FY 2015 budget ($000)	FY 2016 budget ($000)	FY 2017 budget ($000)	FY 2018 budget ($000)
Advanced Materials Laboratory Expansion	AA7D0018									2,500	2,300					
Miscellaneous locations																
7601 Chiller Upgrade	AA7D0002	225			300			750								
Implementation of Fire Hazards Analysis Corrective Actions	A01D0047	75								250						
Normal/Emergency Diesel Generators and Switchgear	AA2D0032	390											800	500		
Northwest Parking Lot Expansion	AA5D0088												1,000			
Fire Protection Systems Upgrade	C97D0071	1,770									1,000	1,000	2,500		1,400	
CSB & ENERGY PLANT UPGRADES FOR RED STORM COMPUTER	AA5D0057									700						
7000 Area Storage Facility	AA7D0066											2,500	2,300			
Upgrade Electrical Systems, 6000 & 7000 Areas	C97D0070	1,230									300	1,500	600	500	600	
Other out year IGPP Investments																
Local Utilities	Various													500	500	1,000
Roads and Grounds	Various													500		1,000
Facility Enhancements	Various													2,000	1,000	1,000
Building Systems	Various											1,500	2,000	3,000	3,000	3,000
IGPP Reserves					6,640	910	500			550				200		
Subtotal IGPP Projects		**18,130**	**26,000**		**16,000**	**15,000**	**15,000**	**15,610**	**15,040**	**15,000**	**15,400**	**15,500**	**15,200**	**15,000**	**15,808**	**15,500**
4.0 Operating/Expense for Excess Elimination and Other																
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column																
2010-ORNL Cafeteria				12,946	976	650										
2009-ORNL Cafeteria Warehouse				4,368		639										
4.1 Subtotal (SLI EFDP)				**17,314**	**976**	**1,289**										
4.2 All Other (List direct O&E maintenance under 5.1)																
4.2 Subtotal																
Subtotal 4.0 Operating/Expense Projects (4.1 + 4.2)				**17,314**	**976**	**1,289**										
TOTAL Capital & Operating Investment:		**59,000**	**665,510**	**186,314**	**6,976**	**11,089**	**19,000**	**55,760**	**110,326**	**161,499**	**31,279**	**104,000**	**30,400**	**112,000**	**30,400**	**35,000**
TOTAL Overhead Investments (IGPP)		**18,130**	**26,000**		**16,000**	**15,000**	**15,000**	**15,610**	**15,040**	**15,000**	**15,400**	**15,500**	**15,200**	**15,000**	**15,808**	**15,500**

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
SITE NAME: ORNL														
PROGRAM: SC														
5.0 Maintenance & Repair														
5.1 Direct Funded (by HQ or Site Program)														
List direct O/E maintenance projects>$500,000														
Coal (AA)			23	23	24	24	25	25	26	26	27	27	28	28
Nuclear Energy Research & Devt (AF)			492	503	514	525	536	547	558	570	582	594	607	620
Magnetic Fusion (AT)			38	39	40	41	42	43	44	44	45	46	47	48
Weapons Activity (DP)			111	113	116	118	120	123	126	128	131	134	137	139
DSAC (EY)			284	290	296	303	309	316	322	329	336	343	350	357
Field Security (FS)			52	53	54	55	56	57	59	60	61	62	64	65
Nuclear Physics (KB)			34	35	36	37	38	38	39	40	41	42	42	43
Basic Energy Science (KC)			11,612	11,867	12,117	12,371	12,631	12,896	13,167	13,444	13,726	14,014	14,308	14,609
Biological & Environmental RSC (KP)			380	388	397	405	413	422	431	440	449	459	468	478
Nonprolif & Nat Sec Prog (NN)			35	36	37	38	38	39	40	41	42	43	44	44
Isotope Production & Distrb Pg (ST)			305	311	318	325	331	338	346	353	360	368	375	383
Vehicle Technologies (VT)			45	46	47	48	49	50	51	52	53	54	55	56
WFO			1,165	1,191	1,216	1,241	1,267	1,294	1,321	1,349	1,377	1,406	1,436	1,466
Subtotal 5.1 Total Direct Maintenance & Repair			**14,576**	**14,897**	**15,210**	**15,529**	**15,855**	**16,188**	**16,528**	**16,875**	**17,230**	**17,592**	**17,961**	**18,338**
5.2 Indirect (from Overhead or Space Charges)														
Include indirect O/E maintenance projects>$500,000														
Corrective Maintenance														
HVAC			11,862	12,123	12,378	12,638	12,903	13,174	13,451	13,733	14,021	14,316	14,617	14,923
Electrical			8,712	8,904	9,091	9,281	9,476	9,675	9,879	10,086	10,298	10,514	10,735	10,960
Plumbing			2,713	2,772	2,831	2,890	2,951	3,013	3,076	3,140	3,206	3,274	3,343	3,413
Interior Finishes			2,035	2,080	2,124	2,168	2,214	2,260	2,308	2,356	2,406	2,456	2,508	2,560
Exterior Finishes			373	381	389	397	405	414	422	431	440	450	459	469
Elevators			237	243	248	253	258	264	269	275	281	286	292	299
Roofing			219	224	228	233	238	243	248	253	259	264	270	275
Preventive Maintenance														
HVAC			2,339	2,390	2,440	2,492	2,544	2,597	2,652	2,708	2,764	2,823	2,882	2,942
Electrical			1,808	1,848	1,887	1,927	1,967	2,008	2,051	2,094	2,138	2,183	2,228	2,275
Elevators			805	822	840	857	875	894	913	932	951	971	992	1,012
Plumbing			650	664	678	692	707	721	737	752	768	784	801	817
Roofing			126	129	131	134	137	140	143	146	149	152	155	158
Exterior Finishes			56	57	58	59	61	62	63	64	66	67	69	70
Interior Finishes			19	19	19	20	20	21	21	21	22	22	23	23
Subtotal 5.2 Total Indirect Maintenance & Repair			**31,952**	**32,655**	**33,341**	**34,041**	**34,756**	**35,486**	**36,231**	**36,992**	**37,769**	**38,562**	**39,372**	**40,198**
Subtotal Total Indirect Maintenance & Repair (5.1 + 5.2)			**46,529**	**47,552**	**48,551**	**49,570**	**50,611**	**51,674**	**52,759**	**53,867**	**54,999**	**56,153**	**57,333**	**58,537**
5.3 Hqs Direct Funded Deferred Maintenance Reduction														
Subtotal 5.3 Total Direct Deferred Maintenance														

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
5.4 Indirect Funded Deferred Maintenance Reduction (from Overhead or Space Charges)														
Deferred Maintenance Reduction Misc. (Indirect Funded)			2,985	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000	5,000
Staff consolidation enabling closure of 7 buildings			584											
General laboratory renovations			1,725											
Energy Management - steam line insulation& perimeter heat system removal			85											
Building 2518 electrical service center replacement			125											
Building 3156 flooring replacement			20											
4500N Parking lot light repair			20											
Subtotal 5.4 total Indirect Deferred Maintenance			**5,544**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**	**5,000**
Total Maintenance (5.1+5.2+5.3+5.4)			**52,073**	**52,552**	**53,551**	**54,570**	**55,611**	**56,674**	**57,759**	**58,867**	**59,999**	**61,153**	**62,333**	**63,537**
6.0 Indirect O&E														
6.1 Excess Elimination (demolition, sales, lease, transfer) funded from indirect funds. Show area eliminated in Gross Area column														
Planning Management and Analysis			1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Deactivation and Demolition			400	400	400	400	400	400	400	400	400	400	400	400
6.1 Total Indirect Excess Elimination		TBD	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
6.2 Other Indirect Funded (includes modifications, additions, improvements, etc. that does not qualify as GPP or maintenance) e.g. energy savings performance contract payments														
6.2 Total Other Indirect		0	0	0	0	0	0	0	0	0	0	0	0	0
6.0 Total Indirect O&E			**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**	**1500**

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross SF Removed	FY 2007 Area Removed	FY 2008Area Removed	FY 2009 Area Removed	FY 2010 Area Removed	FY 2011 Area Removed	FY 2012 Area Removed	FY 2013 Area Removed	FY 2014 Area Removed	FY 2015 Area Removed	FY 2016 Area Removed	FY 2017 Area Removed	FY 2018 Area Removed
SITE NAME: ORNL														
PROGRAM: SC														
7.0 Summary of Area Added & Eliminated by Year														
List of projects, by type of funding, with project number, and excess AREA eliminated by fiscal year accomplished.														
Line Item from block 1 (show each that removes space)														
Subtotal Line Items														
GPP from block 2 (show each that removes space)														
Subtotal GPP														
IGPP from block 3 (show each that removes space)														
Subtotal IGPP														
Operations/Expense from block 4.1														
2010-ORNL Cafeteria - D&D completed over FY07 & FY08.		12,946		12,946										
2009-ORNL Cafeteria warehouse		4,368		4,368										
Subtotal Block 4.1		**17,314**		**17,314**										
Indirect Operations/ Expense from block 6.1 (show each that removes space)		**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
Subtotal Block 6.1		**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**
* Scope to be determined based on the final scope of the IFDP/CCCP.														
Transfer by sale or lease, or transfer to an outside federal agency														
Subtotal Transfer or Lease														
Subtotal 7.1 Space Removed		**17,314**		**17,314**										
7.2 Total Area to be Added by GPP, IGPP and LI Construction (List of projects, by type of funding, with project number, and AREA added by fiscal year accomplished	**Project Number**	**Gross SF Added**	**FY 2007 Area Added**	**FY 2008 Area Added**	**FY 2009 Area Added**	**FY 2010 Area Added**	**FY 2011 Area Added**	**FY 2012 Area Added**	**FY 2013 Area Added**	**FY 2014 Area Added**	**FY 2015 Area Added**	**FY 2016 Area Added**	**FY 2017 Area Added**	**FY 2018 Area Added**
Line Item (list)														
Multi-Program Laboratory Facility	AA7D0050	140,000							140,000					
Site Operations Facility	AA7D0052	75,000												75,000
Melton Valley Research Operations Support Facility	AA7D0053	80,000												80,000
7000 Area Site Maintenance/Fabrication Facility	AA7D0054	100,000												
Second SNS Long wavelength Target Station & Lab/Office Bldg	AA6D0037	150,000							150,000					
Central Utility Building for SNS		15,000						15,000						

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross SF Removed	FY 2007 Area Removed	FY 2008Area Removed	FY 2009 Area Removed	FY 2010 Area Removed	FY 2011 Area Removed	FY 2012 Area Removed	FY 2013 Area Removed	FY 2014 Area Removed	FY 2015 Area Removed	FY 2016 Area Removed	FY 2017 Area Removed	FY 2018 Area Removed
Center for Neutron Scattering User Facility	AA1D0003	50,510							50,510					
HB-2 Second Cold Source and Guide Hall	AA4D0054	40,000												40,000
Subtotal Line Items		550,510	-	-	-	-	-	**15,000**	**340,510**	-	-	-	-	**195,000**
GPP (list)														
ORNL User Facility	AA5D0123	15,000			15,000									
Subtotal GPP		30,000	-	-	**15,000**	-	-	**15,000**	-	-	-	-	-	-
IGPP (list)														
West End Research Support Building	AA7D0007	9,000			7,000									
Second ORNL User Facility (only if usage justifies)	AA7D0032	17,000						17,000						
Sutotal IGPP			-	-	**7,000**	-	-	**17,000**	-	-	-	-	-	-
Subtotal 7.2 Area Added		**409,510**			**22,000**			**47,000**	**340,510**					**195,000**

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Deferred Maintenance Reduction	Gross Building Area Added	Gross Building Area Removed	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
SITE NAME: ORNL at Y-12																
PROGRAM: SC																
1.0 Capital Line Item (Include project number & identify Funding Program)																
1.1 New Infrastructure Construction (facilities and additions)																
Subtotal 1.1																
1.2 All Other Infrastructure Projects (recap)																
Subtotal 1.2																
Total Infrastructure line Items (1.1 +1.2)																
1.3 Programmatic Line Items that Add Space																
Subtotal 1.3																
Subtotal Line Item Projects (1.1 + 1.2 + 1.3)																
2.0 General Plant Project (GPP) (Include project number; funding program and whether it is programmatic or not)																
2.1 New Construction (facilities and additions)																
Subtotal 2.1 New Construction GPP																
2.2 All other GPP Projects (recap including alterations and improvements)																
Subtotal 2.2 All other (recap) GPP																
Subtotal GPP (2.1 + 2.2)																
3.0 Institutional General Plant Project (IGPP)																
Subtotal IGPP Projects																
4.0 Operating/Expense for Excess Elimination and Other																
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column																

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Deferred Maintenance Reduction	Gross Building Area Added	Gross Building Area Removed	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
4.1 Subtotal (SLI EFDP)																
4.2 All Other (List direct O&E maintenance under 5.1)																
4.2 Subtotal																
Subtotal 4.0 Operating/Expense Projects (4.1 + 4.2)																
TOTAL Capital & Operating Investment:																
TOTAL Overhead Investments (IGPP)																

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
SITE NAME: ORNL at Y-12														
PROGRAM: SC														
5.0 Maintenance & Repair														
5.1 Direct Funded (by HQ or Site Program)														
List direct O/E maintenance projects														
Subtotal 5.1 Total Direct Maintenance & Repair														
5.2 Indirect (from Overhead or Space Charges)														
Include indirect O/E maintenance projects>$500,000														
Corrective Maintenance														
Electrical			275	275	275	275	275	275	275	275	275	275	275	275
HVAC			83	83	83	83	83	83	83	83	83	83	83	83
Elevators			43	43	43	43	43	43	43	43	43	43	43	43
Plumbing			29	29	29	29	29	29	29	29	29	29	29	29
Roofing			13	13	13	13	13	13	13	13	13	13	13	13
Preventive Maintenance														
Electrical			205	205	205	205	205	205	205	205	205	205	205	205
HVAC			120	120	120	120	120	120	120	120	120	120	120	120
Elevators			45	45	45	45	45	45	45	45	45	45	45	45
Plumbing			5	5	5	5	5	5	5	5	5	5	5	5
Subtotal 5.2 Total Indirect Maintenance & Repair			**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**
Subtotal total Maintenance 7 Repair (5.1+5.2)			**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**
5.3 Hqs Direct Funded Deferred Maintenance Reduction														
Subtotal 5.3 Total Direct Deferred Maintenance														
5.4 Indirect Funded Deferred Maintenance Reduction (from Overhead or Space Charges)														
Include indirect O/E maintenance projects>$500,000														
Subtotal 5.4 Total Indirect Deferred Maintenance														
Total Deferred Maintenance (5.3 + 5.4)														
Total Maintenance (5.1 + 5.2 +5.3 + 5.4)			**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**	**818**

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2007 Approp. ($000)	FY 2008 to Congress ($000)	FY 2009 Budget ($000)	FY 2010 Budget ($000)	FY 2011 Budget ($000)	FY 2012 Budget ($000)	FY 2013 Budget ($000)	FY 2014 Budget ($000)	FY 2015 Budget ($000)	FY 2016 Budget ($000)	FY 2017 Budget ($000)	FY 2018 Budget ($000)
6.0 Indirect O&E Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Future Excess Facility Elimination														
* SF credited under 4.0														
Total Indirect Excess Elimination		N/A	-	-	-	-	-	-	-	-	-	-	-	-

Table D.1 (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross SF Removed	FY 2007 Area Removed	FY 2008Area Removed	FY 2009 Area Removed	FY 2010 Area Removed	FY 2011 Area Removed	FY 2012 Area Removed	FY 2013 Area Removed	FY 2014 Area Removed	FY 2015 Area Removed	FY 2016 Area Removed	FY 2017 Area Removed	FY 2018 Area Removed
SITE NAME: ORNL at Y-12														
PROGRAM: SC														
7.0 Area of Excess Eliminated														
List of projects, by type of funding, with project number, and excess AREA eliminated by fiscal year accomplished.														
Line Item														
GPP														
IGPP														
Operations/Expense														
Indirect Operations/ Expense														
Transfer by sale or lease, or transfer to an outside federal agency														
Subtotal of Excess Facility Area Eliminated														
Total Area to be Eliminated Each Year (Demolition, Sale or Transfer Completion Year)														
Total Area to be Added by GPP, IGPP, and LI Construction (List Area Under Occupancy Year)														

Appendix E. Detail Information for Line Item Projects

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Project No. ORNL-001: Multiprogram Laboratory Facility

The Building 4500 Complex, housing the primary and largest chemical and materials science facility at Oak Ridge National Laboratory (ORNL), simply does not meet the needs of modern science. The complex is unreasonably expensive to operate and poses undesirable operational risks. The complex has facilitated the mission at ORNL for more than 50 years, but now its condition, configuration, and functionality limit the Laboratory's ability to perform certain aspects of the Department of Energy (DOE) mission, to conduct research operations safely and efficiently, and to attract and retain top scientists. The complex accounts for one-third of deferred maintenance at ORNL. It houses approximately one-fourth of the staff at ORNL; and it is the hub or a major pass-through point for site-wide services such as telephone, computing network, and emergency notification systems. The sporadic, unforeseen failures of building systems and inefficient laboratory configurations are limiting the productivity of the complex's 200 laboratories and staff.

Because ORNL is one of DOE Office of Science's largest "user laboratories," the success of many users depends on productive interaction with ORNL research programs. It is imperative that the site infrastructure provide workplace facilities that attract staff and users and facilitate their research with modern laboratory configurations and equipment, controllable environments, robust utility and service systems (e.g., computational capability, clean reliable electricity), appropriate space allocation, and state-of-the-art safety systems. This strategy focuses required line item investments on the materials and chemical sciences space that is in the direst condition. Failure to renovate or replace the fume hood–intensive wet chemistry laboratories and analytical instrumentation laboratories that demand clean, reliable power supplies will further inhibit scientific output and threaten those missions supported by materials and chemical sciences, core capabilities at ORNL. Failure to provide modern laboratory space for staff and users jeopardizes ORNL's missions to foster a large, productive user program and perform exceptional science for DOE programs in a safe, secure, and environmentally sound manner.

The science operations of these research groups are already being affected by the functionality of the old, deteriorating building facilities. The condition of the buildings threatens the viability

Table E.1. Project No. ORNL-001: Multiprogram Laboratory Facility

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	8,700	35,000	42,378	13,922	-	-	-	-	-	-	-

Gross square footage	Added	Removed	Rehabilitated
	140,000	-	-

Estimated cost ($K)	100,000
Time frame	Near term
Deferred maintenance reduction ($K)	31,500
CAMP score	72.4
Principal driver	MI AS

of several research programs and no longer adequately supports DOE mission accomplishment. It is a deterrent in attracting and retaining scientific staff. Immediate action to house programs in modern, reliable laboratory space is required. Construction of a replacement laboratory facility, including supporting infrastructure, is the most efficient and cost-effective approach to address the need for modern, reliable laboratory space.

It is proposed that ORNL construct a new laboratory replacement building that will provide 140,000 to 170,000 gross square feet (gsf) of modern, 21st century laboratories, with associated space for support functions, for materials and chemical research and development use. The design will use modern, efficient laboratory planning benchmarks as the basis for determining the size and configuration of space types. The design of the facility will also emphasize more open, collaborative environments and flexibility to respond to future mission changes. In addition to the research laboratories, the facility will include laboratory offices for researchers, small group conference rooms, equipment areas, restrooms, circulation space, and any needed supporting infrastructure. The design will incorporate all current applicable codes; standards; best management practices; meet sustainability principles and environmental, safety, and health (ES&H) features; and implement Integrated Safety Management at all levels per DOE Policy 225.1 in a new state-of-the-art facility.

Project No. ORNL-002: Site Utility Modernization

This project accomplishes basic but critical modernization of various ORNL utility systems. Major components of the water, chilled water, steam and waste handling facilities and their distribution systems require upgrade.

Recent and proposed water conservation, as well as influent and infiltration reduction efforts, have freed treatment capacity of the existing sewage treatment plant to meet ORNL and Science and Technology Park growth for the foreseeable future. Current capacity is at approximately 60%; however, the current package treatment plant was constructed in 1985 using a design life of 25 years. Maintenance and operational costs are escalating, and the potential for catastrophic equipment failure increases with the age of the plant components. Elevated replacement and repair costs are also age related. A proposed replacement bioreactor would utilize modern treatment technology (membrane bioreactor [MBR]), increase treatment efficiencies, reduce operation and maintenance costs, and restore reliability to an essential Laboratory infrastructure.

MBR systems can run at very high biosolids concentrations, resulting in efficient treatment within a small footprint and low production of excess sludge. This project assumes that EM funds decontamination and decommissioning of their waste-handling systems.

The ORNL central steam plant services both Bethel Valley and Melton Valley facilities. The plant was constructed in 1948; parts of the plant have been upgraded. Recent energy management studies have questioned both the efficiency of the plant and the centralized approach; especially in light of the extremely poor condition of the above ground distribution lines. This project will upgrade and/or replace the ORNL steam generating system to ensure efficiency and reliability.

Much of the water distribution system is old and in poor condition. It experiences frequent and extensive failures. Repairs are complicated by the contaminated soil and secondary breakage. It is not feasible to just continue to patch and repair broken and leaking lines. This project will upgrade ORNL's water distribution system piping. It will take into consideration the planned final disposition of Central Campus legacy facilities, structures, and contaminated soils. It will provide a reliable distribution system to bring water to the West Campus and other mission critical facilities.

Table E.2. Project No. ORNL-002: Site Utility Modernization

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	-	-	15,000	25,000	20,000	20,000	-	-	-	-	-

Gross square footage	Added	Removed	Rehabilitated
	-	-	45,000

Estimated cost ($K)	80,000
Time frame	Near term
Deferred maintenance reduction ($K)	19,000
CAMP score	68.3
Principal driver	EN IN

ORNL's 4509 Building chilled water plant supplies 14 buildings, approximately 1.2 million sf. The facility's calculated peak load is 6,215 tons. The current configuration of the chilled water plant has an operational chiller capacity of 5800 tons. Therefore, the Building 4509 chiller plant is slightly undersized at this point. One of its three cooling towers is in extremely poor condition and has been taken out of service. The plant's current configuration results in higher chilled water circulation than needed which creates inefficient operations and wasted energy.

Project No. ORNL-003: Site Operations Facility

This project will construct a "first responder" facility to deliver emergency fire, security, and other services. It will be located on the east end of Bethel Valley at the new center of ORNL site operations. Co-locating “first responder” services will provide better integrated and coordinated emergency response. The new facility will accommodate the 12/7 schedules and provide specialty space such as storage for emergency response vehicles and equipment, a security vault, and a decontamination area.

Today these site services are housed in aged, poor condition facilities scattered around the main campus. Many of these facilities are slated for removal to aid in the final disposition of contaminated facilities and soils in the Central Campus.

Of considerable concern is ORNL’s fire station which was constructed in 1943. It is located on the west end of Bethel Valley. With the construction of the Spallation Neutron Source and the East Campus Complex, the fire station is no longer central to ORNL operations. Rather it sits within the boundaries of the proposed site clean up activities, which could further complicate response to emergencies. Due to its location, more than 20% of emergency response times exceed the regulatory threshold.

Table E.3. Project No. ORNL-003: Site Operations Facility

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	-	-	-	-	-	10,000	18,000	-	-	-	-

Gross square footage	Added	Removed	Rehabilitated
	75,000	46,000	-

Estimated cost ($K)	28,000
Time frame	Near term
Deferred maintenance reduction ($K)	3,300
CAMP score	67
Principal driver	HS CO

Project No. ORNL-004: Melton Valley Research Operations Facility(ies)

In the future Melton Valley will be the center of ORNL nuclear science operations. ORNL is consolidating its nuclear footprint and relocating nuclear science operations from Bethel to Melton Valley. This facility aids in the consolidation by providing general research operations support space. The space will supplement current Melton Valley maintenance and warehouse capability as well as providing permanent office space for some of the 100 staff currently housed in trailers.

Table E. 4. Project No. ORNL-004: Melton Valley Research Operations Facility(ies)

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	-	-	-	-	-	-	10,000	10,000	-	-	-

Gross square footage	Added	Removed	Rehabilitated
	80,000	-	-

Estimated cost ($K)	20,000
Time frame	Near term
Deferred maintenance reduction ($K)	0
CAMP score	52
Principal driver	MI AS

Project No. ORNL-005: 7000 Area Maintenance and Fabrication Replacement Facility(ies)

The 7000 Area houses the centralized component of ORNL maintenance, shipping and receiving, and fabrication shops. It has 51 structures. Thirty-two of those structures have a footprint that is less than 1,500 gsf. Eight structures are trailers. The average age of these facilities is 46 years; they have an asset condition index of .77 (poor) and represent a deferred maintenance backlog of more than $7M.

ORNL maintenance and fabrication activities are also housed in satellite shops in each geographic campus. ORNL plans to relocate all research operations out of the Central Campus except for those housed in facilities on the far northeast and southeast quadrants. The maintenance and fabrication services in Central Campus need to follow the research activities they support or be consolidated into the 7000 Area.

This project is the cornerstone of the 7000 Area modernization effort. Prior to design, LEAN or other process improvement methodologies will be used to redesign work flows and address space utilization in efforts to shrink the overall footprint of the 7000 Area and determine the right facility investments to deliver these services efficiently to the site.

Table E.5. Project No. ORNL-005: 7000 Area Maintenance and Fabrication Replacement Facility(ies)

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	-	-	-	-	-	-	-	-	10,000	15,000	8,000

Gross square footage	Added	Removed	Rehabilitated
	100,000	123,0000	-

Estimated cost ($K)	33,000
Time frame	Near term
Deferred maintenance reduction ($K)	5,200
CAMP score	60.1
Principal driver	HS IN

Project No. ORNL-006: Waste-Handling Systems

The ORNL Central Campus contains thousands of feet of underground waste collection and transfer piping, ductwork, and most of the treatment/discharge facilities for the hazardous and radioactive waste management systems. These active liquid and gaseous waste treatment facilities are contaminated, inefficient, and oversized for current and future Department missions. Removal of these contaminated facilities and systems provides final clean up of ORNL, addresses ES&H concerns, and opens the Central Campus for new missions. Oak Ridge Office has proposed an EM-funded Integrated Facility Disposition Program that will remove much of this waste handling infrastructure.

Waste treatment systems at the ORNL site are not configured to address the waste generated for future missions. Liquid and gaseous waste treatment facilities are aged, and capacity significantly exceeds SC mission requirements. Use of these systems as currently configured will result in approximately $10M/year excess operating cost, above that required for modernized, efficient facilities.

This project constructs the needed liquid and solid low-level waste and the RH solid waste handling facilities for newly generated waste.

Because EM owns the existing waste handling facilities, it is assumed that they, not this project, will be responsible for their final disposition.

Table E.6. Project No. ORNL-006: Waste-Handling Systems

Funding profile											
Fiscal year	09	10	11	12	13	14	15	16	17	18	19
Expenditure ($K)	-	-	-	-	-	-	-	-	10,000	20,000	6,000

Current waste-handling systems owned by EM			
Gross square footage	**Added**	**Removed**	**Rehabilitated**
	-	-	-

Estimated cost ($K)	36,000
Time frame	Near term
Deferred maintenance reduction ($K)	0
CAMP score	73.3
Principal driver	MI IN

Appendix F. Lists of Excess Facilities (Those Officially Excess and Those in Process)

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Table F.1. ORNL excess SC facilities

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
7020B	Temporary Waste Storage Facility	T	2006	2007	410	304	EFDP	19,952
7020C	Temporary Waste Storage Facility	T	2006	2007	410	304	EFDP	19,623
7020D	Office Trailer	T	2006	2007	801	160	EFDP	10,328
7020F	HP Office Trailer	T	2006	2007	101	256	EFDP	16,525
7074	Sentry Post #20C-PedGte 7012	T	2006	2007	641	16	EFDP	1,067
7953A	Trailer	T	2006	2007	101	1,416	EFDP	91,403
7953B	Research Reactors Storage Trailer	T	2006	2007	401	720	EFDP	70,163
4511	Cooling Tower for 4509	S	2003	2008	5769	-	EFDP	210,926
0934	Walker Branch Subsurface Weir Instr Tra	T	2004	2008	400	96	EFDP	6,095
0969	Airway Beacon Light House	B	2005	2008	683	152	EFDP	4,000
7635	7600 Weir and Monitoring Building	S	2005	2008	2009	-	EFDP	10,000
2009	Cafeteria Warehouse	B	2006	2008	400	4,231	SLI-EFDP	565,043
2010	ORNL Cafeteria	B	2006	2008	291	12,946	SLI-EFDP	1,862,928
7848	Epicore II Storage Building	T	2006	2008	400	100	EFDP	6,995
2061	Stack Smoke	S	2003	2009	6007	-	EFDP	171,223
2000	Solid St. Lab & Qual Assur/Ins	B	2002	2010	751	24,148	IFDP	4,310,304
2001	Information Center Complex	B	2002	2010	101	25,925	IFDP	2,300,123
2017	East Research Service Shop	B	2002	2010	601	228	EFDP	17,122
2087	Storage I-E	B	2002	2010	400	191	IFDP	18,264
2088	Emerg Generator Building for 2000	B	2002	2010	694	161	IFDP	11,415
2092	Storage	B	2002	2010	401	115	IFDP	12,557
2011	Electric & AC Service Center	B	2003	2010	759	6,636	IFDP	739,692
2024	Quality Assurance & Inspect	B	2003	2010	101	10,296	IFDP	1,265,924
7600	EGCR Containment Building	B	2003	2010	769	107,922	IFDP	4,972,829
7610	Energetic Systems Area Storage Building	B	2003	2010	400	378	IFDP	17,010
3503A	Building 3503 Storage Pad	S	2004	2010	4010	-	IFDP	TBD
2653	Coal Yard Building	B	2007	2010	694	88	IFDP	7,991
3503	High Rad Lvl Chm Eng Lab	B	2007	2010	782	12,798	IFDP	5,040,864
3084	Neutron Spectrometer Station 2	B	1996	2011	703	392	IFDP	37,670
XG1404	Freels Bend, Var Dose Irradiation Facili	B	1996	2011	765	3,623	EFDP	245,000
XG1410	Freels Bend, Shielding Wall Donkey Arena	S	1996	2011	4010	-	EFDP	118,000
XG1414	Freels Bend, Outhouse	B	1996	2011	299	168	EFDP	10,000
XG1415	Freels Bend, Arena Observation Shield	S	1996	2011	2009	-	EFDP	10,000

Table F.1. (Continued)

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
XH1403	Freels Bend, Lagoon 2	S	1996	2011	5770	-	EFDP	168,000
XH1406	Freels Bend, Farm Pump House	S	1996	2011	8171	-	EFDP	6,000
3541	MSR Process Dev. Lab.	B	2002	2011	711	842	IFDP	142,688
0822	ESD/NOAA USAF Instrument Trailer	T	2004	2011	400	200	EFDP	12,910
3111	Sentry Post No 8b	B	2006	2011	641	149	IFDP	15,981
3550	Research Lab Annex	B	2002	2012	101	12,743	IFDP	1,731,656
XF1304	Silo E - Deer Checking Station	S	2004	2012	6008	-	EFDP	50,000
7607	EGCR River Pump Station	B	2005	2012	694	344	IFDP	24,063
7608	Component Dev-R&Ps	B	2005	2012	703	533	IFDP	37,283
3550T	Trailer, Van Type (Itercomparison SDL)	T	2002	2013	709	314	IFDP	134,697
3592	Coal Conversion Facility	B	2002	2013	711	1,280	IFDP	208,895
2528A	MVST Demonstration Facility	S	2003	2013	4431	-	IFDP	45,660
2521F	Sewage Digester Building	S	1995	2014	5539	-	IFDP	192,914
2636	West Precipitator	S	2003	2014	5809	-	IFDP	TBD
2637	East Precipitator	S	2003	2014	5809	-	IFDP	TBD
2517	HR&Diversity Programs / Training	B	2007	2014	101	2,922	IFDP	327,611
3508	High Level Alpha Radiation Laboratory	B	2007	2014	731	13,442	IFDP	3,457,604
7000	Septic Tank for 7000 Area	S	2003	2016	4521	-	EFDP	TBD
2630	Cask Component Drop Test	S	2007	2017	4010	-	IFDP	11,415
5500-3MEV-ACCEL	Accelerator SN#60- 5500, 112	S	2001	TBD	3251	-	EFDP	TBD
5500-5MEV-ACCEL	Accelerator Vandeg-5500,211	S	2001	TBD	3251	-	EFDP	TBD
X187772	Ash Conditioner	S	2003	TBD	5159	-	EFDP	TBD
X187778	Ash Conditioner	S	2003	TBD	5159	-	EFDP	TBD
0824	Septic Tank	S	2007	TBD	5569	-	EFDP	TBD
0970	Guard Tower, 0907	S	2007	TBD	2439	-	EFDP	TBD
0971	Septic Tank, Katy's Kitchen (Original)	S	2007	TBD	5569	-	EFDP	TBD
X173841	Aboveground Storage Tank	S	2007	TBD	4431	-	EFDP	TBD

Legend:
EFDP - Excess Facilities Disposition Program (Laboratory Overheads)
IFDP - Integrated Facility Disposition Project
SLI-EFDP – Science Laboratories Infrastructure - Excess Facilities Disposition Program

Table F.2. ORNL SC excess facilities in process

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
0824	Septic Tank	S	2007	TBD	5569	-	EFDP	TBD
0970	Guard Tower, 0907	S	2007	TBD	2439	-	EFDP	TBD
0971	Septic Tank, Katy's Kitchen (Original)	S	2007	TBD	5569	-	EFDP	TBD
2517	HR&Diversity Programs / Training	B	2007	2014	101	2,922	IFDP	327,611
2630	Cask Component Drop Test	S	2007	2017	4010	-	IFDP	11,415
2653	Coal Yard Building	B	2007	2010	694	88	IFDP	7,991
3003	Solid State Accel. Fac.	B	2007	2011	785	12,104	IFDP	1,933,701
3080	Reactor Exper Control Room	B	2007	2011	791	1,915	IFDP	561,618
3503	High Rad Lvl Chm Eng Lab	B	2007	2010	782	12,798	IFDP	5,040,864
3508	High Level Alpha Radiation Laboratory	B	2007	2014	731	13,442	IFDP	3,457,604
7083	ESD Model Airplane Shop	T	2007	2013	769	288	EFDP	20,768
7090	Electrical Storage West	T	2007	2013	401	288	EFDP	21,079
7091	Electrical Storage East	T	2007	2013	401	288	EFDP	21,079
7093	Physics Division Storage 1	T	2007	2019	401	190	EFDP	13,291
7095	Physics Division Storage 3	T	2007	2019	401	190	EFDP	13,291
7096	Environmental Protection Storage	T	2007	2019	401	190	EFDP	13,291
7964G	Office Trailer, Triplewide	T	2007	2007	101	1,440	EFDP	105,394
7964H	Solid State Office Trailer, Neut Scat	T	2007	2007	101	2,016	EFDP	132,310
7964I	Solid State Office Trailer, Neut Scat	T	2007	2007	101	2,016	EFDP	132,310
X173841	Aboveground Storage Tank	S	2007	TBD	4431	-	EFDP	TBD
2018	Elect & Air Cond Service Ctr	B	2008	2008	601	7,817	IFDP	960,993
2019	Solar Energy Lab/Laser Lab	B	2008	2008	751	878	EFDP	163,917
2033	Measurements & Controls Fac	B	2008	2008	101	31,710	IFDP	TBD
2652A	2652A Office Trailer	T	2008	2014	101	1,728	IFDP	224,876
3012	Rolling Mill	B	2008	2013	751	10,160	IFDP	2,817,222
3017	Quality Services Division Building	B	2008	2013	101	10,021	IFDP	2,184,831
3115	Solid State Off.	B	2008	2011	101	2,782	IFDP	568,467
7020E	Trailer, Temp Waste Storage Facility	T	2008	2013	410	230	EFDP	14,847
7060	Steel Yard Office	B	2008	2013	101	100	EFDP	6,455
7061	Hlth.Phys. Envrn. Stg.	B	2008	2013	400	1,060	EFDP	69,568
7964A	Triple Wide Office Trailer	T	2008	2010	101	2,115	EFDP	164,797
7964C	TRAILER, OFFICE	T	2008	2010	101	2,124	EFDP	155,456
7964E	7964E Conference Trailer	T	2008	2010	233	2,490	EFDP	160,730

Table F.2. (Continued)

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost FY09 $)
7965A	Trailer, Office	T	2008	2008	101	1,620	EFDP	106,321
7965B	7965B Office Trailer	T	2008	2008	101	1,620	EFDP	106,321
7965C	7965C Office Trailer	T	2008	2008	101	1,620	EFDP	106,321
7968	Trailer	T	2008	2013	401	192	EFDP	12,601
9999-03	Chemical Super Market	B	2008	2015	694	2,447	Y-12 IFDP	126,565
XC1405	Office Trailer (12x46)	T	2008	2011	101	552	EFDP	35,632
2003	Process Water Cont Station	B	2009	2010	694	269	IFDP	25,113
2026	Radioactive Materials Analytical Lab	B	2009	2011	782	26,641	IFDP	23,260,346
2026-CT	2026 Cooling Tower (X185479)	S	2009	2011	5769	-	IFDP	TBD
2521D	Aerators and Shed, East and West Lagoons	S	2009	2014	6007	-	IFDP	37,670
2523A	Decontamination Laundry Annex	T	2009	2014	400	300	IFDP	TBD
2536	Coal Sample Preparation Bldg.	B	2009	2015	694	576	IFDP	TBD
2548	Sludge Drying Facility	B	2009	2015	450	1,600	IFDP	TBD
2621	Waste Operations Support Shop	B	2009	2014	400	5,385	IFDP	598,146
2638	Steam Plant Scale House	B	2009	2014	599	640	IFDP	73,056
2643	Chlorinator Building	B	2009	2014	400	117	IFDP	13,698
2664	Sodium Metabisulfie Building	B	2009	2015	410	80	IFDP	TBD
3010A	BSR Facility Building	B	2009	2012	101	2,132	IFDP	TBD
3044	West Complex Field Shop	B	2009	2012	601	5,952	IFDP	955,436
3047-CT	3047 Cooling Tower (X185557)	S	2009	2012	5769	-	IFDP	TBD
3047-GEN	3047 Emergency Generator	S	2009	2012	5906	-	IFDP	TBD
3047-TK	3047 Diesel Fuel Storage Tank (X188085)	S	2009	2012	4221	-	IFDP	TBD
3095	Reac Area Equip Bldg	B	2009	2011	401	7,008	IFDP	1,133,510
3112	Misc. Storage Building	B	2009	2012	401	182	IFDP	19,406
3129	Personnel Monitoring Station	B	2009	2013	769	408	IFDP	37,670
3137	Surface Science Lab	B	2009	2013	751	6,806	IFDP	1,138,076
3150	Solid State Research Facility	B	2009	2013	791	11,929	IFDP	2,714,487
3163	West WeatherPort	T	2009	2014	401	360	IFDP	20,547
3164	East WeatherPort	T	2009	2014	401	360	IFDP	20,547
3532	Container, Paint Storage	T	2009	2014	410	96	IFDP	9,132
3543	Msr Dev Lab	B	2009	2014	400	612	IFDP	81,047
3544A	ORNL Waste Water Treatment Facility	T	2009	2015	801	450	IFDP	91,320
3610	Storage Building	B	2009	2014	400	197	IFDP	21,689

Table F.2. (Continued)

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
3621	Tent, Spill Response Vehicle Shelter	T	2009	2014	694	3,869	IFDP	168,942
7001	General Stores	B	2009	TBD	400	33,446	EFDP	3,495,273
7005	Lead Shop	B	2009	TBD	607	5,406	EFDP	2,028,051
7020A	HVAC Decontamination Facility	B	2009	2014	606	1,178	EFDP	133,556
7057	Sandblast Cleaning Fac	B	2009	2019	694	504	EFDP	39,222
7058	Machine Auxiliaries Strg	B	2009	2015	400	1,008	EFDP	50,000
7065	Rigger Equip Storage	B	2009	2013	400	1,008	EFDP	66,155
7066	Grounds Maint.Storage	B	2009	2013	400	1,008	EFDP	66,155
7075	Waste Storage Building	B	2009	2014	411	475	EFDP	43,377
7077A	Reservation Services Offices	T	2009	2013	101	288	EFDP	20,768
7079	Bottle Storage Building	T	2009	2013	400	192	EFDP	12,808
7081	Portable Generator Storage Shed	B	2009	2016	450	960	EFDP	63,675
7085	90-Day Waste Storage	B	2009	2014	401	600	EFDP	57,075
7094	Physics Division Storage 2	T	2009	2014	401	190	EFDP	21,689
7709	Health Physics Research Reactor (HPRR)	B	2009	2010	783	3,698	IFDP	637,661
7710	Dosimetry Applications Research Facility	B	2009	2010	792	9,356	IFDP	1,650,609
7712	DOSAR Low-Energy Accelerator	B	2009	2010	704	1,025	IFDP	179,216
7735	Radiation Calibration Laboratory	B	2009	2010	704	2,800	IFDP	428,063
9201-2	Fusion Energy Building	B	2009	2015	785	324,448	Y-12 IFDP	102,863,990
9204-1	Fusion Energy-Eng Tech	B	2009	2015	712	210,491	Y-12 IFDP	68,913,795
9401-1	Maintenance/Recycle Storage	B	2009	2015	694	13,227	Y-12 IFDP	1,364,092
9743-2	Pigeon Quarters	B	2009	2015	745	2,371	Y-12 IFDP	113,009
9983-FX	FRC Field Support Trailer	T	2009	2015	761	680	Y-12 IFDP	106,643
X910029	Billboard Highway 95	S	2009	TBD	2309	-	EFDP	TBD
2523	Decontamination Laundry	B	2010	2014	692	7,384	IFDP	1,798,932
2528	Coal Research Lab	B	2010	2013	791	4,105	IFDP	791,061
3034	Radioisotope Area Services	B	2010	2013	621	1,129	IFDP	140,756
3104	West Complex Maintenance Shop	B	2010	2012	601	7,410	IFDP	1,312,575
7000A	Sewage Pumping Station Equipment Storage	B	2010	2019	400	76	EFDP	4,940
7033	Electrical Material Strg.	B	2010	2015	400	5,500	EFDP	396,605
7062	Storage-Miscel Materials	B	2010	2013	601	372	EFDP	22,498
7070	Storage Shed	B	2010	2018	400	6,700	EFDP	483,137
7097	Crane and Elevator Crew Office Trailer	T	2010	2019	101	800	EFDP	58,552

Table F.2. (Continued)

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
7098	Transportation Services Office Trailer	T	2010	2013	101	160	EFDP	11,538
7964F	Reactor Control Room Mock Training Fac.	T	2010	2010	101	1,638	EFDP	88,207
XF1301	Barn D	B	2010	2012	450	8,025	EFDP	35,000
XF1302	Shed D Butler	B	2010	2012	450	2,000	EFDP	50,000
XF1303	Barn E - Deer Checking Station	B	2010	2012	450	8,025	EFDP	397,639
XG1402	Freels Bend, Machine Storage Shed	B	2010	2012	450	245	EFDP	11,875
2008	ORNL Whole Body Counter	B	2011	2012	212	4,726	IFDP	2,090,745
2652C	2652C Office Trailer	T	2011	2014	101	1,464	IFDP	222,669
3008	Source & Spec Mat Vault	B	2011	2011	401	563	IFDP	63,285
3025M	Solid State Office & Laboratory Building	B	2011	2013	793	33,840	IFDP	7,564,888
3132	Emergency Generator for 3127, 3129, 3027	S	2011	2011	5906	-	IFDP	TBD
3161	QSD Storage Building	T	2011	2011	410	72	IFDP	TBD
3162	QSD Storage Building	T	2011	2011	410	72	IFDP	TBD
3504	Geosciences Lab	B	2011	2014	101	7,557	IFDP	1,843,465
7080	Cardboard Compressor	S	2011	2019	6008	-	EFDP	TBD
2007	Calibration Lab	B	2012	2012	614	6,780	IFDP	788,810
2547	General Machine Shop	B	2012	2014	601	9,369	IFDP	1,762,120
3036	Isotope Area Storage & Service Building	B	2012	2012	591	2,198	IFDP	651,600
3074	Interim Manipulator Repair Fac	B	2012	2012	601	3,529	IFDP	660,976
3502	East Res Service Ctr	B	2012	2014	601	12,439	IFDP	3,084,552
3523	Electronic Fabrication Shop	B	2012	2014	601	1,176	IFDP	270,719
3602	Cylinder Tank Stor Bldg 3525	B	2012	2012	450	122	IFDP	TBD
3605	TSD Storage Building	B	2012	2013	607	387	IFDP	72,660
3607	Cask Tool Stor	B	2012	2012	400	612	IFDP	TBD
7015	Metal Storage & Cut Fac.	B	2012	2023	601	1,995	EFDP	573,878
2518	Support Services Building	B	2013	2014	101	13,399	IFDP	2,139,172
3025E	IMET Hot Cell Facility	B	2013	2015	782	16,741	IFDP	16,641,582
3027	Dispatch Center	B	2013	2013	296	3,542	IFDP	637,537
3027A	Dispatch Center Emergency Generator	S	2013	2013	5906	-	IFDP	TBD
3538	Cooling Tower (For 3525)	S	2013	2015	5769	-	IFDP	TBD
3587	Mail Services Building	B	2013	2014	694	3,421	IFDP	830,907
6556-ST2	ER Field Operations	T	2013	TBD	401	320	EFDP	22,384
7003	Welding & Brazing Shop	B	2013	2021	601	5,149	EFDP	416,347

Table F.2. (Continued)

Property ID	Property Name	Property Type	Exc Year	Est Disp Year	Usage Code	GSF	Funding Program	Expected Disposition Cost (FY09 $)
7006	Paint Stores	B	2013	2020	410	2,520	EFDP	176,274
7007	Paint Shop	B	2013	2020	601	3,461	EFDP	294,315
7009	Carpenter Shop	B	2013	2022	601	9,300	EFDP	465,000
7020	Interim Grnds Equip Stg	B	2013	2013	400	1,056	EFDP	63,005
7035C	Equipment Storage	B	2013	2013	400	589	EFDP	43,466
2500	Guard & Fire Headquarters	B	2014	2014	693	10,912	IFDP	2,245,125
2525	Fabrication Department Shop A	B	2014	2014	607	27,149	IFDP	7,720,034
2628	Fire Protect Maint & Storage	B	2014	2015	400	1,081	IFDP	114,850
2652B	2652B Office Trailer	T	2014	2014	101	1,728	IFDP	230,873
3037	Chemical Technology Offices	B	2014	2014	101	7,679	IFDP	1,959,488
3546	CCSD Office Building	B	2014	2014	101	7,344	IFDP	1,018,418
3606	Instrumentation Development Facility	B	2014	2014	101	7,843	IFDP	1,034,825
7021	Fab Equip Storage	B	2014	2016	400	1,464	EFDP	108,089
7026	M&C Storage	B	2014	2016	401	1,120	EFDP	78,344
7030	Heavy Equipment Storage Shelter	B	2014	2017	450	4,998	EFDP	360,550
7031	Fabrication Storage Shed	B	2014	2019	400	1,152	EFDP	84,315
7035A	Paint Mix Building	B	2014	2016	400	620	EFDP	44,039
7035B	Paint Storage	B	2014	2016	400	651	EFDP	46,241
7035D	Can Drying Facility	B	2014	2017	400	268	EFDP	19,325
7035E	Utility Mechanics Storage	B	2014	2016	401	620	EFDP	44,708
7035F	Shed Storage Facility	B	2014	2017	450	589	EFDP	42,473
7082	Salt Storage Building	B	2014	2019	400	1,491	EFDP	109,126
7092	Hustler Mower Storage	T	2014	2016	401	1,040	EFDP	74,994
7758	HFIR Parts Storage	B	2014	TBD	400	400	EFDP	30,440
2521	Sewage Treatment Plant Control Building	S	2015	2015	5529	-	IFDP	TBD
2521C	Sludge Drying Beds	S	2015	2015	4409	-	IFDP	TBD
2521E	Calgon Tank for 2521A Sewage Treatment	S	2015	2015	4431	-	IFDP	TBD
2521-FS	Sewage Trt. Plant Filter Sys. (X189189)	S	2015	2015	5549	-	IFDP	TBD
2572	Emergency Generator for 2500	S	2015	2015	5906	-	IFDP	TBD
2648	Fire Training Facility	B	2015	2015	231	1,042	IFDP	122,402
3525	High-Rad Level Exam Lab.	B	2015	2015	782	26,332	IFDP	28,607,113
3078	Septic Tank for 3000 Pump Sta.	S	2016	TBD	5569	-	EFDP	TBD

Legend:
EFDP - Excess Facilities Disposition Program (Laboratory Overheads)
IFDP = Integrated Facility Disposition Project