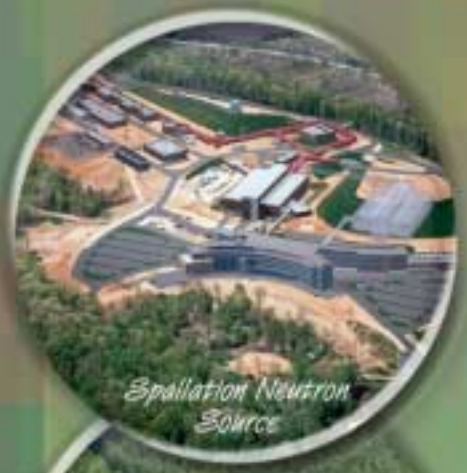
ORNL/TM-2004/131/R1

UT-BATTELLE

OAK RIDGE NATIONAL LABORATORY

Year Site Plan

November 2004



ORNL/TM-2004/131

Oak Ridge National Laboratory
Ten-Year Site Plan

November 2004

Prepared by
OAK RIDGE NATIONAL LABORATORY
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managed by
UT-BATTELLE, LLC
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-00OR22725

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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http://www.ornl.gov/~dmsi/siteplan/

Front cover designed by LeJean Hardin, ORNL Communications and Community Outreach Directorate

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Acronyms and Abbreviations

ACI	Asset Condition Index
ADS	Activity Data Sheet
ATDD	Atmospheric Turbulence Diffusion Division
AUI	Asset Utilization Index
BER	Biological and Environmental Research
BJC	Bechtel Jacobs Company
BMAP	Biological Monitoring and Abatement Program
CAIS	Condition Assessment Information System
CBRNE	Chemical-Biological-Radiation-Nuclear-Explosive
CFC	chlorofluorocarbon
CSD	Chemical Sciences Division
CLO	Central Laboratory and Office
CNMS	Center for Nanophase Materials Sciences
CNS	Center for Neutron Scattering
CO_2	carbon dioxide
CROET	Community Reuse Organization of East Tennessee
D&D	decontamination and decommissioning
DM	deferred maintenance
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOE-EM	U.S. Department of Energy Environmental Management
DOE-NE	U.S. Department of Energy Nuclear Energy
DOE-SC	U.S. Department of Energy Office of Science
EPA	U.S. Environmental Protection Agency
EREL	Energy Reliability and Efficiency Laboratory
ES&H	environment, safety, and health
ESD	Environmental Sciences Division
ESPC	Energy Savings Performance Contracting
ETTP	East Tennessee Technology Park
FACE	Free Air CO_2 Enrichment
FCI	Facility Condition Index
FIMS	Facility Information Management System
FRP	Facilities Revitalization Project
FY	fiscal year
G&A	general and administrative
GAAT	Gunite and Associated Tank
GPE	general-purpose equipment
GPP	general plant project
GTL	Genomes to Life

HFIR	High Flux Isotope Reactor
HRIBF	Holifield Radioactive Ion Beam Facility
HVAC	heating, ventilation, air conditioning
IGPP	institutional general plant project
IT	information technology
IT&M	Inspection, Testing, and Maintenance
JIBS	Joint Institute for Biological Sciences
JICS	Joint Institute for Computational Sciences
JINS	Joint Institute for Neutron Sciences
LCFG	Laboratory for Comparative and Functional Genomics
LI	Line Item
M&C	Metals and Ceramics
M&I	management and integration
MOU	Memorandum of Understanding
MRF	Multiprogram Research Facility
NABIR	Natural and Accelerated Bioremediation Research
NEON	National Ecological Observation Network
NNFD	Nonreactor Nuclear Facilities Division
NNSA	National Nuclear Security Administration
NOAA	National Oceanic and Atmospheric Administration
NSTD	Nuclear Science and Technology Division
NTRC	National Transportation Research Center
NTTRC	National Transmission Technology Research Center
OETD	Office of Electricity, Transmission, and Distribution
ORAU	Oak Ridge Associated Universities
ORCAS	Oak Ridge Center for Advanced Studies
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations Office (DOE)
ORR	Oak Ridge Reservation
OSF	other structures and facilities
OSHA	Occupational Safety and Health Administration
OST	Office of Secure Transportation
PCAT	Powerline Conductor Accelerated Testing
PCOT	Powerline Conductor Operational and Test Facility
R&D	research and development
REDC	Radiochemical Engineering Development Center
RIC	rehabilitation and improvement cost
ROI	Return on Investment
RPM	Risk-Based Priority Model
RPV	replacement plant value
RSC	Research Support Center

SANS	Small-Angle Neutron Scattering
SIOU	Surface Impoundments Operable Unit
SLI	Science Laboratories Infrastructure
SNM	special nuclear materials
SNS	Spallation Neutron Source
TDEC	Tennessee Department of Environment and Conservation
TPET	Transmission Power Electronics Test
TSCI	Total Summary Condition Index
TVA	Tennessee Valley Authority
TWRA	Tennessee Wildlife Resources Agency
TYSP	Ten-Year Site Plan
USDA	U.S. Department of Agriculture
UT	University of Tennessee
UXO	unexploded ordinance
VLI	Very Low Impedance
WAG	Waste Area Grouping
WMD	weapons of mass destruction

1. Executive Summary

1.1 ORNL Mission and Laboratory Agenda

Oak Ridge National Laboratory (ORNL) is the nation's largest and most diverse energy research and development (R&D) institution in the U.S. Department of Energy (DOE) laboratory complex, providing distinctive capabilities in materials science and engineering, neutron science, computational science, energy technology, mammalian genetics, environmental science, and nuclear science and technology. ORNL is managed for DOE by UT-Battelle, LLC, a partnership between the University of Tennessee (UT) and Battelle Corporation.

To accomplish its mission of scientific research, ORNL staff are dependent upon the availability of a wide variety of buildings and equipment, including specialized experimental laboratories, user facilities, hot cells and nuclear reactors, and a large complement of office space and associated utility systems. ORNL is home to 18 designated national user facilities (more than any other national laboratory) that are available to national/international laboratory, industrial, and academic users. ORNL's physical facilities are, in general, quite old, and many have reached the end of their safe operating lives. The poor condition of facilities is a key environmental, safety, and health (ES&H) concern; adds considerably to overhead costs in terms of energy consumption, increased maintenance costs, and research inefficiencies; and reduces ORNL's ability to attract and retain world-class scientific talent. Revitalization of the ORNL campus has been a key initiative of UT-Battelle and DOE over the past three years, with a number of upgrade projects completed or well under way. Continued emphasis on that revitalization initiative forms the underlying basis for ORNL's site planning process as presented in this *Ten-Year Site Plan* (TYSP).

To extend the nation's capabilities in key areas of science and technology, ORNL is pursuing major research initiatives in nine critical areas, the majority of which are dependent on the success of the modernization initiative. These areas make up the Laboratory Agenda for Excellence in Science and Technology outlined as follows:

- Neutron Sciences – ORNL will become the world's foremost center for neutron sciences;
- Complex Biological Systems – ORNL will be a leading center and vital resource for understanding complex biological systems;
- Terascale Computing and Simulation Science – ORNL will become a world leader in harnessing unprecedented computing power as tools of scientific discovery;
- Science and Technology for a Hydrogen Economy – ORNL will be a recognized leader in the development of technologies for hydrogen generation, delivery, and efficient use;
- Grid Modernization – ORNL will ensure a robust, reliable, and secure national electric grid;
- Fission to Fusion – ORNL will be a main supplier of new technologies for advanced fission and fusion power generation;
- Advanced Materials – ORNL will sustain its position as a leader in advanced materials science;
- National Security – ORNL will be nationally recognized as a leading provider of technologies and expertise critical to national/homeland security; and
- University Partnerships – ORNL will strengthen its role in the nation’s research enterprise, increase the quality and impact of its user facilities and science and technology programs, and enhance its contributions to science.

1.2 Vision of the 21st Century ORNL

The main ORNL site encompasses facilities in two valleys (Bethel and Melton) concentrated on approximately 4,250 acres of land on the larger DOE Oak Ridge Reservation (ORR), comprised of approximately 34,000 acres of federally owned lands within Anderson and Roane Counties of Tennessee. Within those areas, ORNL staff occupy approximately 3.6 million gross square feet (gsf) of space in 272 buildings, as well as almost 115,000 gsf of off-site leased space. The surrounding land area includes the DOE Oak Ridge National Environmental Research Park, a 20,000-acre outdoor laboratory that supports DOE Office of Science (DOE-SC) research and education initiatives. Similar to other DOE-SC laboratories, a significant portion of ORNL facility space is over 40 years old. The condition of this space reflects its age, with only about 40% of the available research and support space rated as Good or Excellent, based on DOE's condition assessment data for FY 2004.

Transforming this large amount of aging space into a modernized 21st Century ORNL has been UT-Battelle's key focus since becoming the operating contractor for DOE. A Facilities Revitalization Program was launched in FY 2000 to upgrade ORNL's infrastructure, and great progress has been made since that time. However, much remains to be done.

The revitalized ORNL research campus outlined in this TYSP has been designed to provide the following key goals:

- consolidated research and support facilities at the ORNL main campus to fulfill the Laboratory Agenda, including fully developed Spallation Neutron Source (SNS) and High Flux Isotope Reactor (HFIR) complexes;
- staff and research equipment housed in new, refurbished, and/or well-maintained existing space that is safe, secure, sustainable in design, and energy and space efficient;
- a planned mix of DOE, State, and private sector–owned buildings appropriate to ORNL's research and support mission;
- establishment of a research campus atmosphere, including architectural consistency within each campus area and open campus vehicle- and pedestrian-friendly flow patterns;
- utilities and infrastructure sized and maintained to meet program needs, with low-maintenance, native species landscaping approaches employed site-wide;
- nonreactor nuclear facilities and radiological laboratories consolidation implemented to maintain program functionality in a much-reduced, more cost-effective footprint;
- waste management support systems right-sized to accommodate research needs on schedules compatible with the proposed DOE Environmental Management (DOE-EM) Program scope transition to DOE-SC;
- legacy materials, waste, and facilities managed to ensure regulatory compliance, health and safety risk reduction, and minimized operating costs;
- excess facilities demolition 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; and
- provision of sophisticated R&D facilities for national and international users while delivering the highest standards of safeguards and security for classified information and materials experimentation and development.

1.3 ORNL Master Plan

To accomplish these revitalization goals and the science and technology objectives of the Laboratory Agenda, a number of new research facilities and supporting infrastructure have been proposed in the TYSP. A list of key research facilities by each of the primary Laboratory Science Initiatives is provided in Table 1.1.

Table 1.1. Laboratory Agenda for Excellence in Science and Technology with associated facility and infrastructure needs

Strategic Objectives	Excellence in Science and Technology	Key Research Facilities Needs for Ten-Year Site Planning
Critical Outcomes	Deliver scientific advances and technological innovations that support DOE missions, apply expertise and capabilities to the needs of other customers, and sustain and enhance ORNL's distinctive capabilities	Modernization of the Laboratory-wide science infrastructure, including East Campus Completion 4500N/S Upgrades Nuclear Facility Consolidation West Campus Development
Laboratory Initiatives	Neutron Sciences	SNS Completion SNS Power Upgrades HFIR and HRIBF Upgrades
	Complex Biological Systems	Genomes to Life Facility National Environmental Research Park
	Terascale Computing and Simulation Science	Center for Computational Sciences Expansion
	Science and Technology for a Hydrogen Economy	Energy Reliability and Efficiency Laboratory NTRC Expansion
	Grid Modernization	Energy Reliability and Efficiency Laboratory
	Fission to Fusion	7625 Multiprogram Highbay
	Advanced Materials	Center for Nanophase Materials Sciences 4508 Highbay AML Expansion
	National Security	Multiprogram Research Facility
	University Partnerships	JICS/ORCAS Completion Joint Institute for Neutron Sciences Joint Institute for Biological Sciences

A site-wide representation of the fully developed ORNL incorporating those new facilities is shown in Fig. 1.1. Further details of these proposed plans are provided in the report sections that follow, including identification of ORR resource requirements and plans.

In addition to the facilities revitalization previously described, the current ORNL strategic intent includes three key initiatives. The first is the Nuclear Facilities Consolidation Plan, which outlines a multiyear effort to reduce the number of Category 2 and 3 nuclear facilities operating at ORNL and to consolidate the nuclear research efforts in a few key strategic facilities for the long term. Under this proposed plan, the number of nonreactor nuclear facilities would be reduced from ten to four by FY 2008. A comprehensive schedule of program relocations and downgrading of facilities to radiological levels (or permanent shutdown) has been developed, which will require DOE approval and support to accomplish in the next several years.

Similarly, a consolidation and re-engineering of ORNL waste management systems must be conducted within the TYSP planning period in order to be ready to accommodate the proposed return of waste management responsibilities from EM to SC. A Strategic Plan for waste management systems has been prepared that outlines a series of capital and expense projects required to (1) reduce waste generation, (2) upgrade process and sanitary waste collection and treatment systems for expanded uses in ORNL waste management, (3) reduce the number of facilities utilizing the central gaseous waste system by providing new local treatment and exhaust, and (4) provide ultimate treatment for our high-activity liquid low-level and remote-handled solid waste

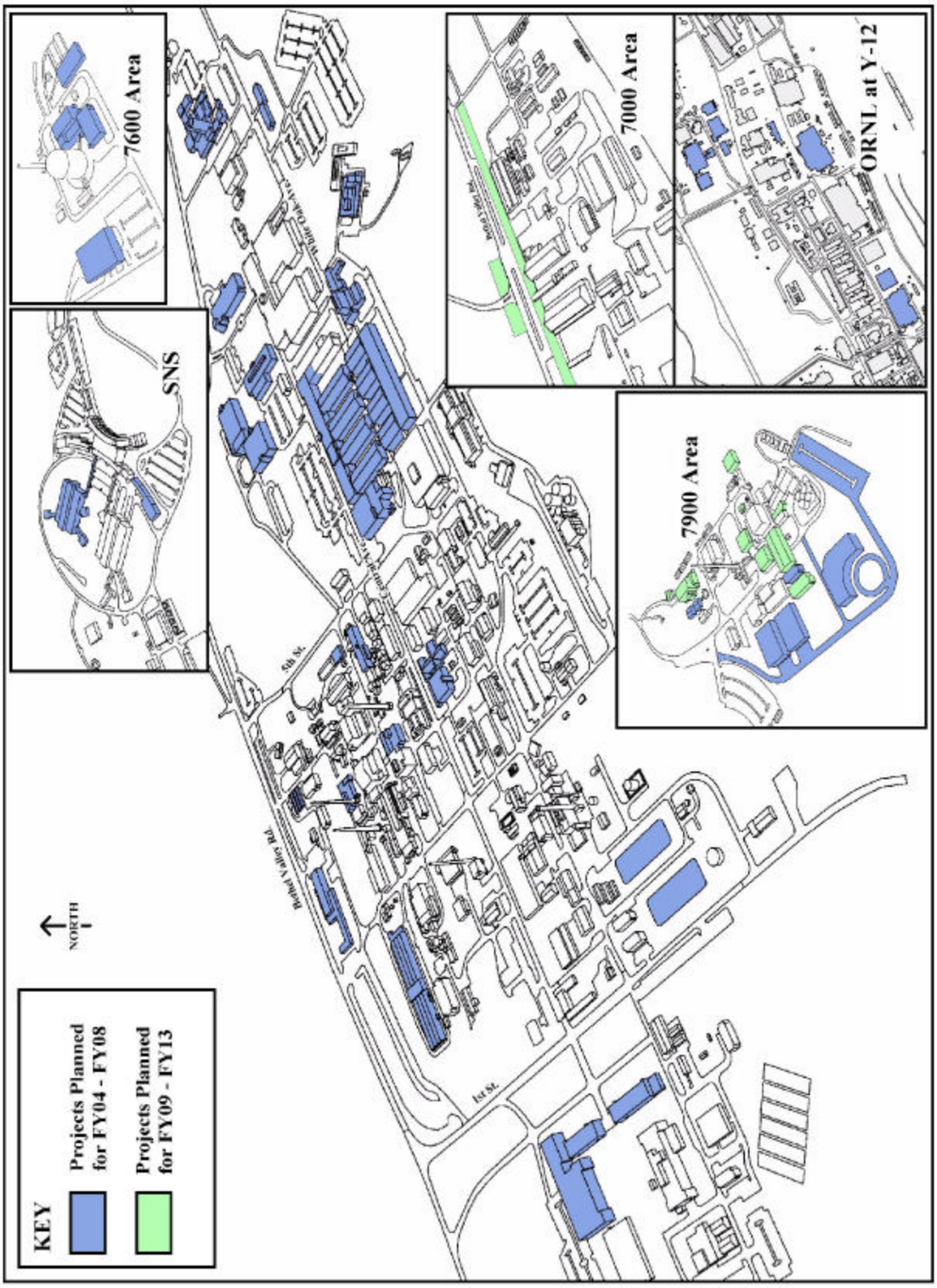

Fig. 1.1. Ten-year site plan for ORNL modernization.

streams from nuclear research. In total, these projects will right-size the ORNL waste system needs such that the burden of the existing large, expensive EM waste collection and treatment systems will not be placed on the shoulders of the SC mission programs.

Finally, in order to break the cycle of degradation of DOE facilities in the future, significant increases in facility recapitalization are needed. Without recapitalization, the expense-funded maintenance that is increasing on a per-square-foot basis (see Sect. 5.3) will continue to spiral upward resulting in financial burdens on programs and in unplanned system outages that will impact those same programs.

ORNL has long recognized the gap between available resources and needs, but that gap will increase as budget constraints keep recapitalization from proceeding at needed levels over the next five years. As shown in Fig. 1.2, the currently documented difference in capital resource needs versus the constrained case funding levels provided by DOE for the baseline of this TYSP shows a huge gap in the early years of the planning cycle. In particular, the lack of SC support for the 4500N/S Line Item projects makes continued safe operations of that critical research complex a huge challenge. Without Line Item funds available, and with limited general plant project (GPP) funds provided in the Science Laboratories Infrastructure (SLI) budget, operating systems failures are expected.

The establishment of the space cost charge-back system has motivated operating programs to consolidate activities into a smaller footprint within the best conditioned facilities. The institution of the ORNL "landlord-tenant" facilities management model has created a centralized corporate focus on the stewardship of real property assets and a systematic approach to maintenance and recapitalization. But much remains to be done to make the ORNL maintenance and recapitalization program completely functional. Performance measures at the DOE Site Office level and tracking of progress by SC Headquarters will keep the focus on making this important aspect of infrastructure management successful over the long term.

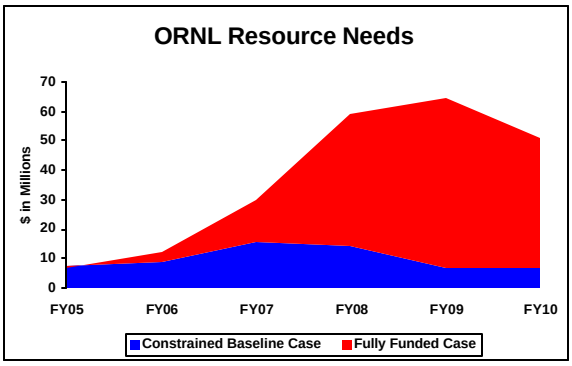

Fig. 1.2. Projected resource needs for ORNL revitalization far exceed the constrained baseline case.

2. Introduction to the ORNL Site Planning Process

ORNL is the largest and most diverse energy R&D institution in the DOE nationwide complex. It is an Office of Science multiprogram laboratory, providing broad support to the Department's overarching national security mission. ORNL provides distinctive capabilities in materials science and engineering, neutron science, computational science, energy technology, mammalian genetics, environmental science, and nuclear science and technology. ORNL is managed for DOE by UT-Battelle, LLC, a partnership between UT and the Battelle Corporation.

Critical components of DOE's national goals are to provide the scientific research capacity needed to ensure the success of Department missions, to advance the frontiers of scientific knowledge, and to provide world-class facilities for conduct of missions. ORNL has two broad roles in support of these goals: operation of major research facilities on behalf of the nation's scientific community and conduct of basic research, primarily in the materials and chemical sciences, the life and environmental sciences, fusion energy, computational science, and nuclear physics. ORNL is home to 18 designated national user facilities (more than any other national laboratory) that are available to national/international laboratory, industrial, and academic users.

To accomplish its mission of scientific research, ORNL staff are dependent upon the availability of a variety of buildings, equipment, and the ORR land area. These facilities and equipment include specialized experimental laboratories, user facilities, hot cells and nuclear reactors, and a large complement of office space and associated utility systems in the DOE complex. ORNL's physical facilities and utility systems are, in general, quite old, and many have reached the end of their safe operating lives. The poor condition of facilities and utility systems is a key ES&H concern; adds considerably to overhead costs in terms of energy consumption, increased maintenance costs, and research inefficiencies; and reduces ORNL's ability to attract and retain world-class scientific talent. Revitalization of the ORNL campus has been a key initiative of UT-Battelle and DOE over the past three years, with a number of upgrade projects completed or well under way (Fig. 2.1). Continued emphasis on that revitalization goal forms the underlying basis for ORNL's site planning process.

Fig. 2.1. Ongoing construction of the Research Support Center in the new ORNL East Campus.

The main ORNL site encompasses facilities in primarily two valleys (Bethel and Melton), concentrated on approximately 4250 acres of land. ORNL sits in the southwest corner of the larger DOE ORR, a reserve of approximately 34,000 acres of federally owned lands within Anderson and Roane Counties of Tennessee (see Fig. 2.2). Within those areas, ORNL staff occupy approximately 3.6 million gsf of space in approximately 272 buildings. The ORR includes the Oak Ridge National Environmental Research Park, a 20,000-acre outdoor laboratory. The Research Park supports major DOE-sponsored research in carbon cycling, ecosystem dynamics, global climate change, and remediation studies. As a national user facility, it also provides access for research use by numerous colleges, universities, and other State and federal agencies.

ORNL maintains an active site and facilities planning program, which documents the key issues and current/future plans for facilities management and improvement. With issuance of DOE Order 430.1B, "Real Property Asset Management," in September 2003, new requirements were established for development and maintenance of a TYSP for all DOE sites. Those requirements define the comprehensive nature of the planning process requested by DOE, with the TYSP required to provide (1) an assessment of the current status of the site's real property assets, (2) an explanation of how those assets will be used to support the Department's strategic goals, (3) the priorities of projects and activities required to meet mission needs, (4) cost projections for the prior year plus ten additional fiscal years for the site's proposed land and facilities management plan, and (5) identification of critical real property asset issues affecting the site's ability to complete its mission. The TYSP replaces the annual *ORNL Land and Facilities Plan*.

The following report sections meet the requirements of the TYSP through a brief summary of ORNL research program descriptions and needs, as defined in the Laboratory Agenda (Sect. 3), a discussion of ORNL Land Use planning needs (Sect. 4), an assessment of ORNL Facilities and Infrastructure (Sect. 5), and, finally, the integration of all planning efforts into the TYSP for ORNL Modernization (Sect. 6).

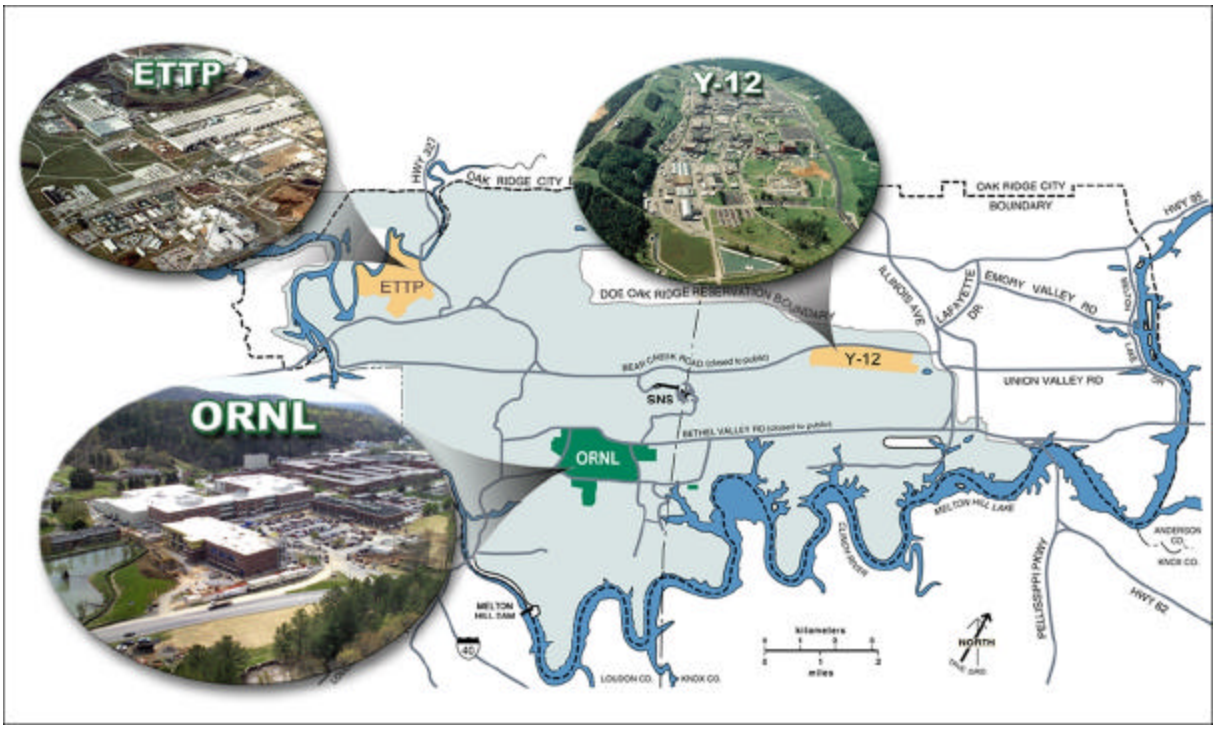

Fig. 2.2. Location of ORNL within the ORR and its relationship to other local DOE facilities.

3. The Laboratory Agenda

The ORNL Laboratory Agenda for Excellence in Science and Technology provides a structured framework for the long-term initiatives, critical outcomes, and near-term actions through which ORNL will deliver on its commitment to DOE programs. The agenda describes the actions necessary to deliver scientific advances and technological innovations in support of DOE's mission and to sustain and extend ORNL's distinctive capabilities that will address the nation's future science and technology needs. The Laboratory Agenda is described as follows with special emphasis on current and future facility and infrastructure needs (Table 3.1).

Neutron Sciences – *ORNL will become the world's foremost center for neutron sciences by enhancing its capabilities and applying them to deliver new insights into the nature, structure, and behavior of materials.* To accomplish this intent, ORNL will design, construct, and continue to operate world-class neutron science facilities that support Laboratory staff and an international user community. Within these facilities, ORNL staff will develop and apply advanced neutron scattering techniques and instrumentation to enable leading-edge research in the fields of materials, chemistry, life sciences, physics, and applied engineering (Fig. 3.1).

Table 3.1. Laboratory Agenda for Excellence in Science and Technology with associated facility and infrastructure needs

Strategic Objectives	Excellence in Science and Technology	Key Research Facilities Needs for Ten-Year Site Planning
Critical Outcomes	Deliver scientific advances and technological innovations that support DOE missions, apply expertise and capabilities to the needs of other customers, and sustain and enhance ORNL's distinctive capabilities	Modernization of the Laboratory-wide science infrastructure, including East Campus Completion 4500N/S Upgrades Nuclear Facility Consolidation West Campus Development
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Fig. 3.1. Aerial view of the construction of the Spallation Neutron Source, ORNL's newest neutron science facility.

Complex Biological Systems – *ORNL will be a leading center and vital resource for understanding complex biological systems, from the molecular level to the level of the organism, as well as the interactions of organisms with their environment.* ORNL will meet this objective by applying unique ORR natural resources, ORNL facility capabilities, and staff knowledge to meet DOE's needs in systems biology, climate change, carbon management, renewable energy, and environmental quality. An example of use of the ORR for large-scale research on global climate change is shown in Fig. 3.2. A key scientific focus will be in support of DOE's new Genomes to Life (GTL) program, the purpose of which is to provide new national user community tools and resources for new discovery approaches in systems biology.

Fig. 3.2. Climate change research at the Walker Branch Watershed Research Area.

Terascale Computing and Simulation Science – *ORNL will become a world leader in harnessing unprecedented computing power as tools of scientific discovery to deliver new insights and achieve breakthrough with broad impact in U.S. scientific leadership.* ORNL's performance plan involves developing computer architectures and simulation codes to dramatically improve hardware performance and fully exploit the capabilities of terascale computers for scientific problems of importance to DOE. Specific program areas of focus for ORNL include biology, climate, energy infrastructure assurance, fusion, materials, and national security (Fig. 3.3).

Fig. 3.3. Cray X1 supercomputer installed in the new Computational Sciences Building.

Science and Technology for a Hydrogen Economy – *ORNL will be a recognized leader in the development of technologies for hydrogen generation and delivery, in the development of technology for hydrogen storage, and in hydrogen-fueled engine efficiency research.* ORNL intends to deliver new knowledge and technology to overcome the substantial scientific and technological challenges that limit the widespread use of hydrogen as an energy source. Staff and facilities support will be provided for DOE's Hydrogen, Fuel Cell, and Infrastructure Program and the FreedomCAR and Vehicle Technology Programs.

Grid Modernization – *ORNL will ensure a robust and reliable electric grid that is secure from physical and cyber threats, fully integrates expanded central generation with distributed energy resources, manages power flows to and*

from customers, and meets the nation's need for increasing power quality. ORNL's work is intended to create (1) new materials for components and devices that revolutionize the performance, reliability, and maintainability of the power grid; (2) new low-cost grid sensor and communications technologies; (3) improved "super capacitors," flywheels, and other forms of bulk energy storage; (4) fast-responding, distributed-generation and responsive-load technologies; and (5) new high-performance modeling and performance measurement tools for planning and real-time grid operation and control.

Fission to Fusion – *ORNL will be a main supplier of new technologies to support the expanded use of advanced nuclear fission and, eventually, fusion generation to supply the power needs of the world.* To accomplish this, ORNL will provide the nuclear and fusion energy communities with scientific and technological advances that will enable cheaper, safer, enhanced proliferation-resistant, and environmentally acceptable use of nuclear energy, including commercialization of fusion energy. ORNL will build and operate world-class experimental facilities to support these missions, with access provided to an international user support community.

Advanced Materials – *ORNL will sustain its position as a leader in advanced materials science and technology underpinning DOE's energy resources mission.* ORNL will continue the advancement of the Center for Nanophase Materials Sciences as a collaborative research center and the development of state-of-the-art tools for materials synthesis, characterization, and theory/modeling studies in support of a new generation of advanced materials. ORNL will also extend the Laboratory's synthesis and characterization capabilities in soft materials and materials integration to enable research leading to revolutionary new technologies, including securing the next-generation Advanced Microscopy Laboratory in atomic-scale imaging and spectroscopy.

National Security – *ORNL will be nationally recognized as a leading provider of technologies and expertise critical to national/homeland security, law enforcement, and public safety.* ORNL's role in homeland security is to work collaboratively with other national laboratories to provide the science, technology, and expertise required to detect, prepare for, prevent, protect against, respond to, and recover from terrorist attacks within the United States. ORNL is also positioned to play a major role in defense nuclear nonproliferation work for DOE through enhancing the capability to detect weapons of mass destruction (WMD), prevent and reverse proliferation of WMD, protect or eliminate weapons, and reduce accident risks in worldwide nuclear fuel cycle facilities. ORNL will extend its security infrastructure to protect customers' classified and sensitive information and materials.

University Partnerships – *ORNL will strengthen its role in the nation's research enterprise, increase the quality and impact of our user facilities and science and technology programs, and enhance our contributions to science education by building broad partnerships with the nation's research universities.* ORNL is committed to developing the partner-university model to strengthen Laboratory programs, create major research initiatives, and attract outstanding researchers. With the University of Tennessee and our university partners, ORNL will construct and operate Joint Institutes to stimulate new research collaborations (Fig. 3.4).

Fig. 3.4. The recently completed Joint Institute for Computational Sciences/Oak Ridge Center for Advanced Studies (JICS/ORCAS) at ORNL.

4. ORNL Land Use

Uses of the ORR by ORNL for programs and operational needs to accomplish DOE missions extend across the entire reservation and move across boundaries of the National Nuclear Security Administration (NNSA), the East Tennessee Technology Park (ETTP), the Tennessee Wildlife Resources Agency (TWRA), Oak Ridge Associated Universities (ORAU), and additional sites under the management responsibility of others (Fig. 4.1).

4.1 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

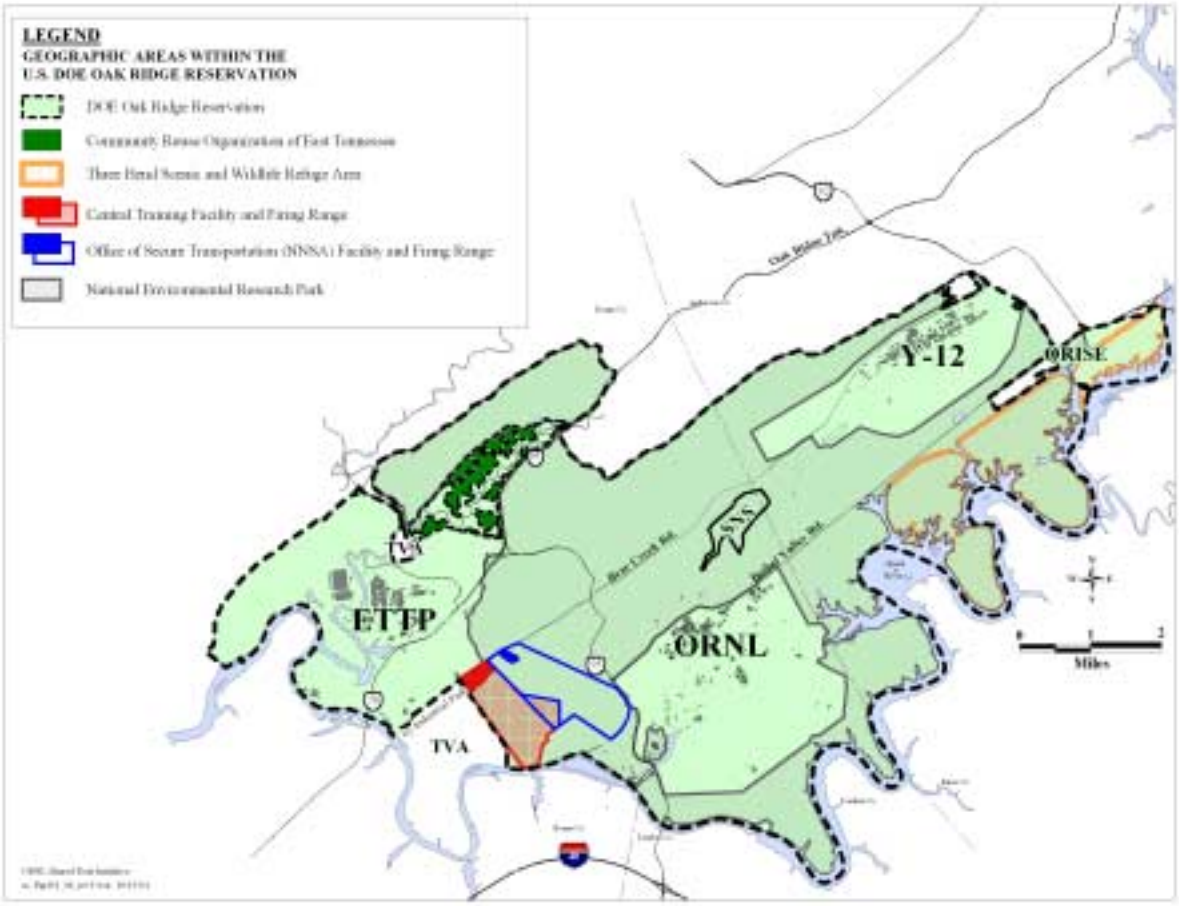

Fig. 4.1. Geographic areas within the U.S. DOE Oak Ridge Reservation.

competing uses may or may not be compatible. The following priorities for land use guide the ORNL Land and Facilities Use 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.

4.2 Current Land Use on the Oak Ridge Reservation

4.2.1 National Environmental Research Park

Major DOE-SC scientific research programs use ORR land to meet mission objectives. In FY 2004, almost $13 million will be spent on DOE-supported environmental field-based research directly dependent on the ORR land base. This is independent of construction of new facilities such as the SNS. DOE-SC considers the research and science values of the ORR to be critical and provides its primary operations funding. In 1980, DOE established the Oak Ridge National Environmental Research Park. Consisting of approximately 20,000 acres, the Research Park serves as an outdoor laboratory for studying the nature of present and future environmental consequences from energy-related issues such as global and regional change, environmental stresses, and resource use. The Oak Ridge National Environmental Research Park is one of the few sites in the nation where large-scale ecological research, environmental technology, and measurement science are integrated with 40 years of environmental monitoring and research.

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

The National Environmental Research Park is an ORNL user facility with more than 900 users from 120 different colleges, universities, industries, ORNL, and other State and federal government agencies over the past five years. The 228 users during FY 2003 represented 44 different organizations, including educational institutions, State and federal agencies, and other users (Fig. 4.2).

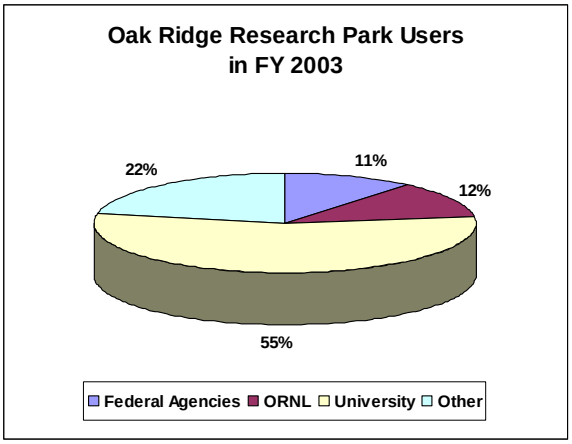

Fig. 4.2. The Oak Ridge National Environmental Research Park had 228 users in FY 2003.

4.2.2 Field Research Areas

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 (ozone, carbon dioxide), 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. Areas with active research have been 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.

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 37-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

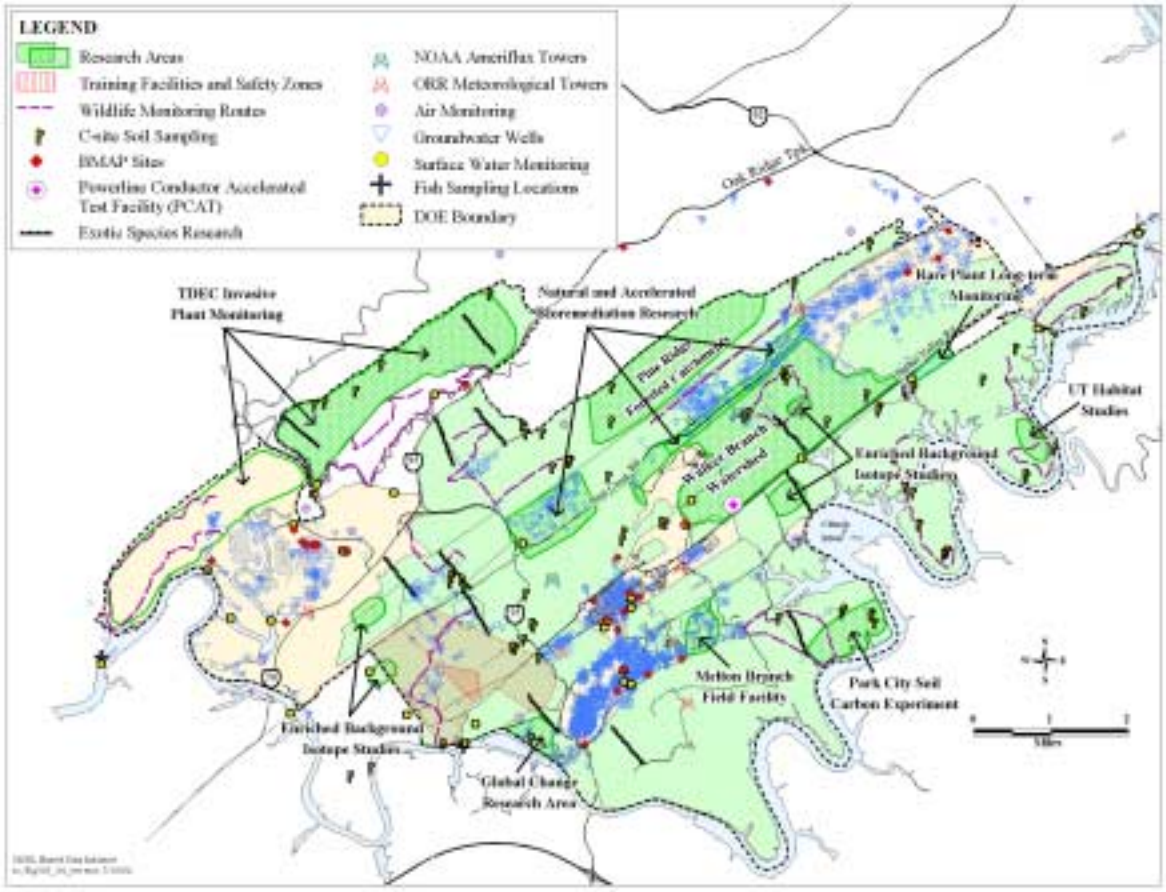

Fig. 4.3. Research areas on the Oak Ridge Reservation.

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. 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.

Three field facilities located at Source Area A in Waste Area Group 5 (WAG 5), West Bear Creek Valley, and Melton Branch Subwatershed are extensively instrumented to monitor storm-driven unsaturated flow and saturated groundwater flow. 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.

The Natural and Accelerated Bioremediation Research (NABIR) is a DOE Field Research Center located in Bear Creek Valley with research that will lead to new methods of reducing and understanding risks associated with DOE's metals and radiological legacy. NABIR includes field plots in a contaminated area near the Y-12 facility along with an instrumented background area to the west (Fig. 4.4). 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 currently not in active use, these lysimeters provide a unique facility for safely evaluating the efficacy of such organisms.

Fig. 4.4. Geoprobe in use at the NABIR DOE Field Research Center.

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 Free Air CO_2 Enrichment (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 U.S. 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. 4.5).

Fig. 4.5. Experimental towers of DOE FACE Facility from the air.

The Tennessee Department of Environment and Conservation (TDEC) has established approximately 250 invasive plant field survey stations on Blackoak Ridge. These are in a portion of the area designated for conservation easement, and detailed data on invasive species, density, and other characteristics are recorded.

Research use on the reservation has been categorized into one of four main types. Fig. 4.6 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 4.1 lists the FY 2004 funding for each category of field research utilizing the reservation.

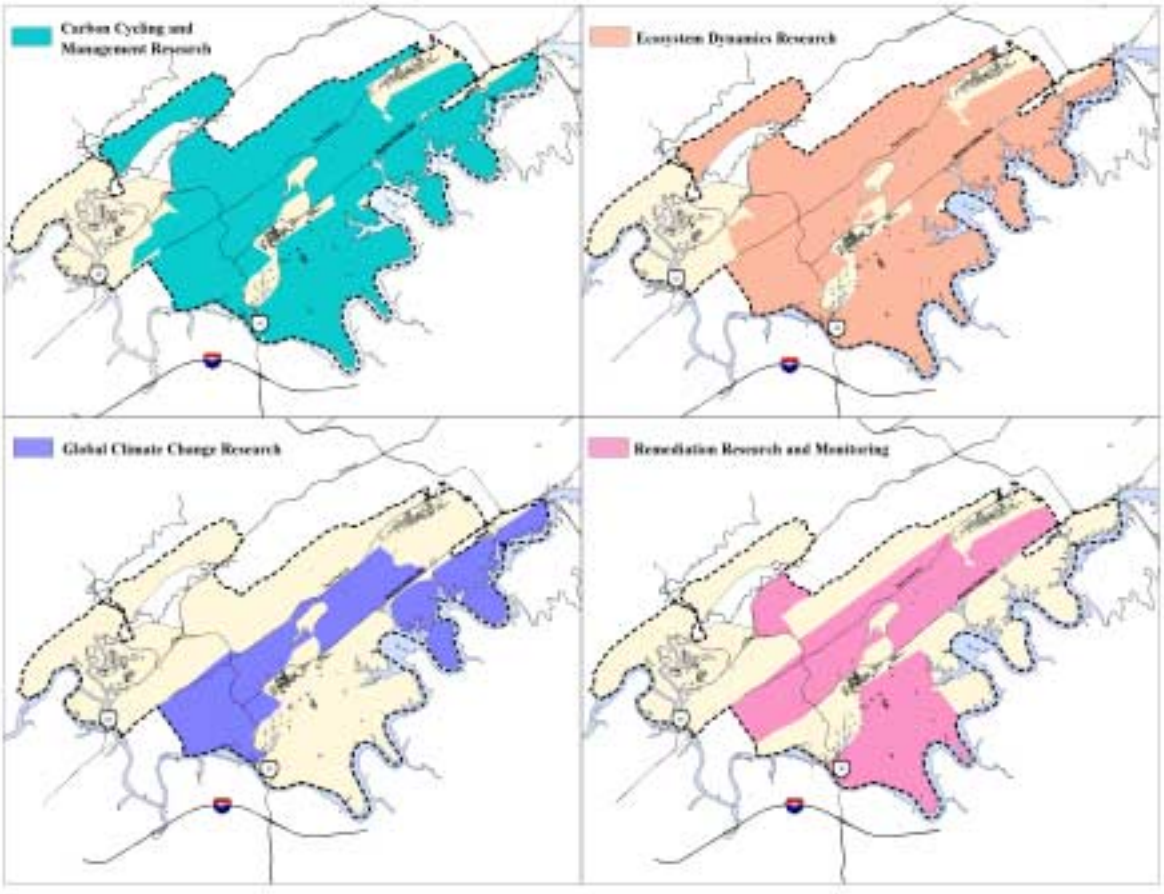

Fig. 4.6. Use of DOE lands for specific types of research.

Table 4.1. Current field-based research funding dependent on ORR land base

Program	Research Type	FY 2004 ($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	7,000

More detailed information on environmental research is found in *Environmental Sciences: Research, Assessment, and Technology to Understand and Meet the Challenges of the Future* (Environmental Sciences Division 1998) and on the Environmental Sciences Division (ESD) 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 (DoD), the U.S. Environmental Protection Agency (EPA), the U.S. Department of Agriculture (USDA), 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).

Energy Research

At the National Transmission Technology Research Center (NTTRC) Powerline Conductor Accelerated Testing (PCAT) facility on Old Bethel Valley Road, operated by ORNL in partnership with TVA, advanced overhead transmission composite conductors are subjected to thermal, electrical, mechanical, and environmental "stress" tests to simulate 20 to 30 years of field operation in just a few months of testing. This research is sponsored by DOE's Office of Electricity, Transmission, and Distribution (OETD) in partnership with industry as part of DOE's emphasis on transmission system R&D (Fig. 4.7).

Fig. 4.7. Aerial view of the PCAT Facility.

Geophysical Testing

Beginning in 1997, ORNL developed a methodology based on helicopter-borne geophysics to quantitatively evaluate the presence (or absence) of unexploded ordnance (UXO) on large tracts of land and shallow waters in a rapid and accurate fashion. This methodology involves the deployment of magnetic and active electromagnetic systems on rigid booms mounted to the airframe of a helicopter, thus enabling operations at low altitudes. These altitudes, ranging from 1 to 3 meters above ground level, enable detection of UXO items from an airborne platform with an accuracy that approaches the capability of

ground-based systems (Fig. 4.8). In August 2004, the Freels Bend area of the ORR was used to successfully demonstrate the ORNL-developed airborne system. Because of the success of this method, the DoD is interested in ORNL development of a national calibration site, preferably in the Freels Bend area.

Fig. 4.8. An ORNL-developed helicopter-borne geophysics testing system was successfully demonstrated at Freels Bend in 2004.

4.3 Future ORNL Land Use on the Oak Ridge Reservation

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

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.

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:

- Ecosystem and Global Studies Research Area
- Ecosystem Response Detection and Forecasting
- Homeland Security Field Facilities
- National Ecological Observation Network (NEON)
- NTTRC Facilities
- SensorNet Nodes
- National Calibration Site for Geophysical System Testing

Ecosystem and Global Studies Research

The Ecosystem and Global Studies Research Initiative, a collaboration among ORNL, UT, and TWRA, will support education and research on responses of important ecological communities to global change factors through the establishment of a field research station at the Three Bend Scenic and Wildlife Refuge. The research center will develop facilities for altering precipitation input across an environmental gradient, testing ongoing development of genomic approaches for ecological research, conducting experiments on the control of biological invasions, and expanding the scale and scope of an ongoing multifactor manipulation of an old-field ecosystem.

Ecosystem Response Detection and Forecasting

The ORR will be an important component of the Ecosystem Response Detection and Forecasting Initiative, which is also part of the ORNL 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 allow for insights into ways to detect potential changes early enough so that mitigation plans can be implemented before permanent, irreversible, system-level changes occur.

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.

National Ecological Observation Network

ORNL is taking a leadership role in the southeast consortium of research institutions involved in the development and ultimate implementation of the National Science Foundation's NEON program. This program is a continental-scale research instrument to enable studies on major environmental challenges at regional to continental scales. The ORR will be a key component of the region from the Southern Appalachians to the Ozarks (see Fig. 4.9).

National Transmission Technology Research Center

Testing capabilities of the NTTRC will be expanded to include at-voltage testing of overhead conductors, indoor testing of advanced conductors to provide a more controlled environment, 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 (such as American Superconductor and Southwire) and utilities (such as TVA and Duke) on proposals that would significantly expand the role of the NTTRC at ORNL. These proposed projects include:

- Powerline Conductor Operational Test (PCOT) Facility
- Very Low Impedance (VLI) Cable Project
- Indoor Powerline Conductor Accelerated Test (PCAT) Facility
- Transmission Power Electronics Test (TPET) Facility

SensorNet

SensorNet's objective 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 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 to include, but not be limited to, Chemical-Biological-Radiation-Nuclear-Explosive (CBRNE) sensors, meteorological instruments, and other sensors (e.g., video cameras, air quality, environmental, and disease tracking). Potential locations for future ORR SensorNet nodes include HFIR, Clinch River, Y-12, ORNL, and reservation meteorological towers.

National Calibration Site for Geophysical System Testing

Cost-effective survey methods are needed to identify bombing targets, impact areas, and other UXO-laden areas that occur within larger uncharacterized areas, often ranging into the millions of acres. As a result of an August 2004 demonstration for the DoD of an ORNL-developed airborne system at the Freels Bend area, the DoD has recommended that ORNL develop a national calibration test site at Freels Bend and has committed FY 2005 funding to ORNL for geophysical system testing and evaluation at this site.

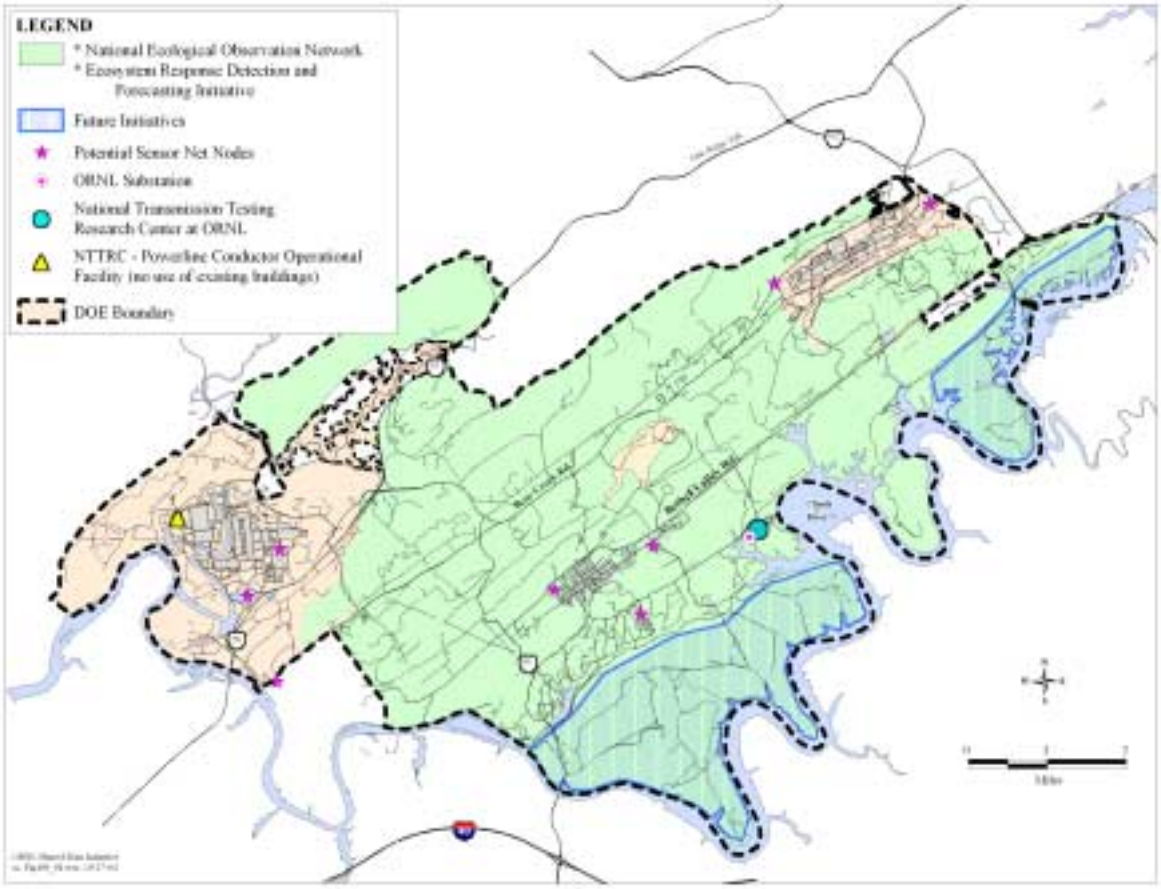

Fig. 4.9. Future ORNL uses of the Oak Ridge Reservation.

The Freels Bend area offers diverse topographic, vegetative, and geologic conditions, as well as terrestrial and potential aquatic areas for target emplacement. ORNL's past testing of airborne geophysical systems has been performed at sites in South Dakota, New Mexico, and Maryland as part of larger airborne survey projects. As development efforts accelerate, it will be desirable to establish a comprehensive test site closer to system development initiatives currently under way. This test site would contain a significant number of inert targets as well as surrogates and related geometric shapes representing UXO and caches of buried weapons. Other targets of interest, including small buried structures, infrastructure, and karst features, would be created as part of this test site.

These conditions, coupled with the diverse target types, will provide researchers the opportunity to test the capabilities of a variety of sensor systems against targets of national interest. With the close proximity of the Freels Bend area to ORNL, system and sensor testing can be accomplished on a more real-time basis, providing rapid results in a more cost-effective fashion than is currently feasible at the ORNL-developed test site in South Dakota.

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, pre-impact wetland mitigation, wildlife enhancement, and habitat characterization. Some of the areas with opportunities for collaboration are shown in the 2004 *Oak Ridge Reservation Ten-Year Site Plan*.

4.3.3 Future Initiatives

Land for future initiatives may not have specific projects associated with it. 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. 4.9.

5. ORNL Facilities and Infrastructure

Research programs at ORNL require a variety of buildings and equipment, including specialized experimental laboratories, a large complement of office space, and major utility and waste management facilities. To accommodate the approximately 3500 staff and $680 million in operating budget, the ORNL site has many functions and requirements similar to those of a small city. It is supported by a dedicated fire department, a medical center, a security force, a steam plant, and a sewage treatment plant. Included in this small city are 37 miles of paved roads, 180 miles of unpaved roads, and 115 acres of maintained grounds.

Complementary to the R&D initiatives, UT-Battelle has established a Strategic Objective to provide Excellence in Laboratory Operations and ES&H (Table 5.1). This objective is to be met in part through Laboratory initiatives in:

- Facilities Modernization (Fig. 5.1),
- Enhanced Operational Discipline,
- Maximizing Research Productivity,
- Consolidation of Nuclear Capabilities,
- Resolve Legacy Issues, and
- Workforce Planning and Development

Table 5.1. Laboratory Agenda

Strategic Objectives	**Excellence in Science and Technology**	**Excellence in Laboratory Operations and ES&H**
Critical Outcomes	**Deliver scientific advances and technological innovations that support DOE missions, apply expertise and capabilities to the needs of other customers, and sustain and enhance ORNL's distinctive capabilities**	**Sustain and improve ORNL's ability to serve the needs of DOE and the nation through responsible stewardship**
Laboratory Initiatives	**Neutron Sciences** **Complex Biological Systems** **Terascale Computing and Simulation Science** **Science and Technology for a Hydrogen Economy** **Grid Modernization** **Fission to Fusion** **Advanced Materials** **National Security** **University Partnerships**	**Facilities Modernization** **Enhanced Operational Discipline** **Maximizing Research Productivity** **Consolidation of Nuclear Capabilities** **Resolve Legacy Issues** **Workforce Planning and Development**

In the following plan sections, each of these initiatives is described, including identification of issues related to ORNL's facilities and infrastructure, and the ten-year site planning process.

5.1 Facilities Modernization

The DOE-SC laboratories, including ORNL, are facing increasingly difficult challenges due to old, expensive to maintain, and inefficient facilities. The existing facilities are in many cases incapable of meeting functional requirements necessary to support state-of-the-art science, present significant hazards to the Laboratory staff, account for a large percentage of ES&H events, and consume significantly more energy than current generation facilities. In addition, the quality of the work environment is not competitive with the private sector. UT-Battelle recognized the magnitude of this problem at the outset of its responsibility for management of ORNL in FY 2000 and immediately launched a Facilities Modernization Initiative to upgrade the Laboratory's infrastructure. Great progress has been made over the past three years, but much remains to be done.

Fig. 5.1. New East Campus upgrades as part of the ORNL Facilities Modernization Initiative.

Currently, ORNL occupies a total of about 272 buildings and 35 trailers at the main Laboratory campus (see Fig. 5.2 for identification of primary programmatic facility locations). This space consists of approximately 3.6 million gsf of active research and support facilities at the main campus, 1.3 million gsf of mostly inactive space at the Y-12 National Security Complex, and almost 115,000 gsf of off-site leased space (see Appendix A for additional detailed data). For all but three of these facilities (3019A and 3047B at the main ORNL campus and 9204-3 at the Y-12 Complex), DOE-SC is the responsible DOE mission organization. The Nuclear Energy Program is the DOE Headquarters sponsor for the other three buildings. Pertinent data for each are integrated into this TYSP where appropriate. Similar to other DOE-SC laboratories, a significant portion of space is over 40 years old (Fig. 5.3). While progress has been made in reducing the average age of the Laboratory's facilities, as part of UT-Battelle's Modernization Initiative, much work remains.

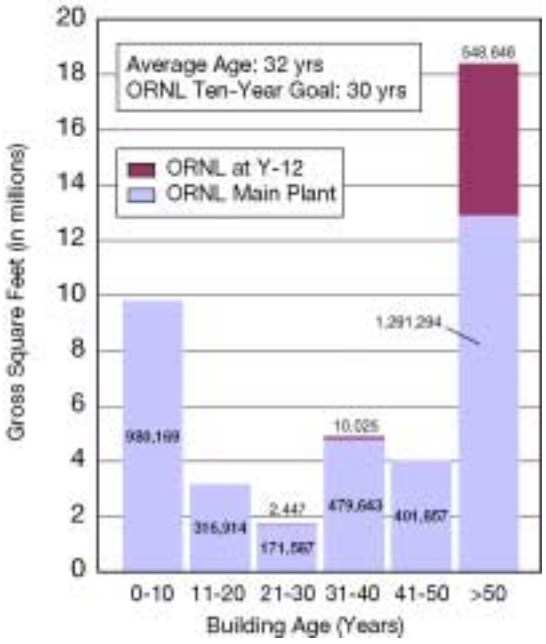

Fig. 5.3. Age of ORNL operating buildings.

As shown in Fig. 5.4, the condition of this space reflects its age as a ratio of deferred maintenance to replacement plant value (RPV), with only about 40% of the available research and support space rated as Good or Excellent, based on DOE's condition assessment data for FY 2004. ORNL performs regular condition assessments of its assigned assets with all assets inspected at least once during any four-year period. Results of all inspections are currently

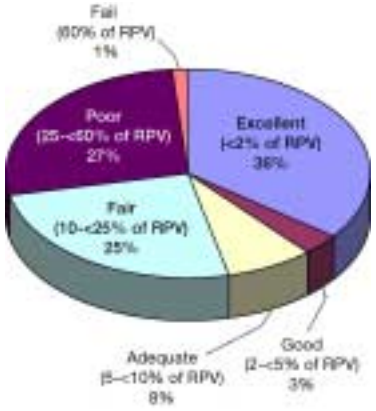

Fig. 5.4. Condition of space at ORNL DOE-owned and leased on-site buildings.

reported in the Condition Assessment Information System (CAIS) data base and are included in ORNL deferred maintenance reports. Deferred maintenance data completeness has been lacking; however, it is improving as the Complex Facility Managers (see Sect. 5.2) continue to become engaged in their stewardship role. This is evident as the Complex Facility Managers, and/or their assigned building engineers, are more involved not only in the condition assessments, but in preparation of an annual work plan (the basis for their five-year maintenance sustainment information), which is the avenue to express their facility-by-facility needs, priorities, and expectations to ORNL management. As can be expected with buildings as old as ORNL's, particularly without significant capital renewal or revitalization funding, minor Occupational Safety and Health Administration (OSHA) noncompliances with current standards abound.

ORNL identifies mission-essential facilities though a selection process based on long-term mission and viability studies. For those facilities deemed excess in the ten-year planning horizon, plans are in progress to vacate personnel, remove the facilities from the active facilities

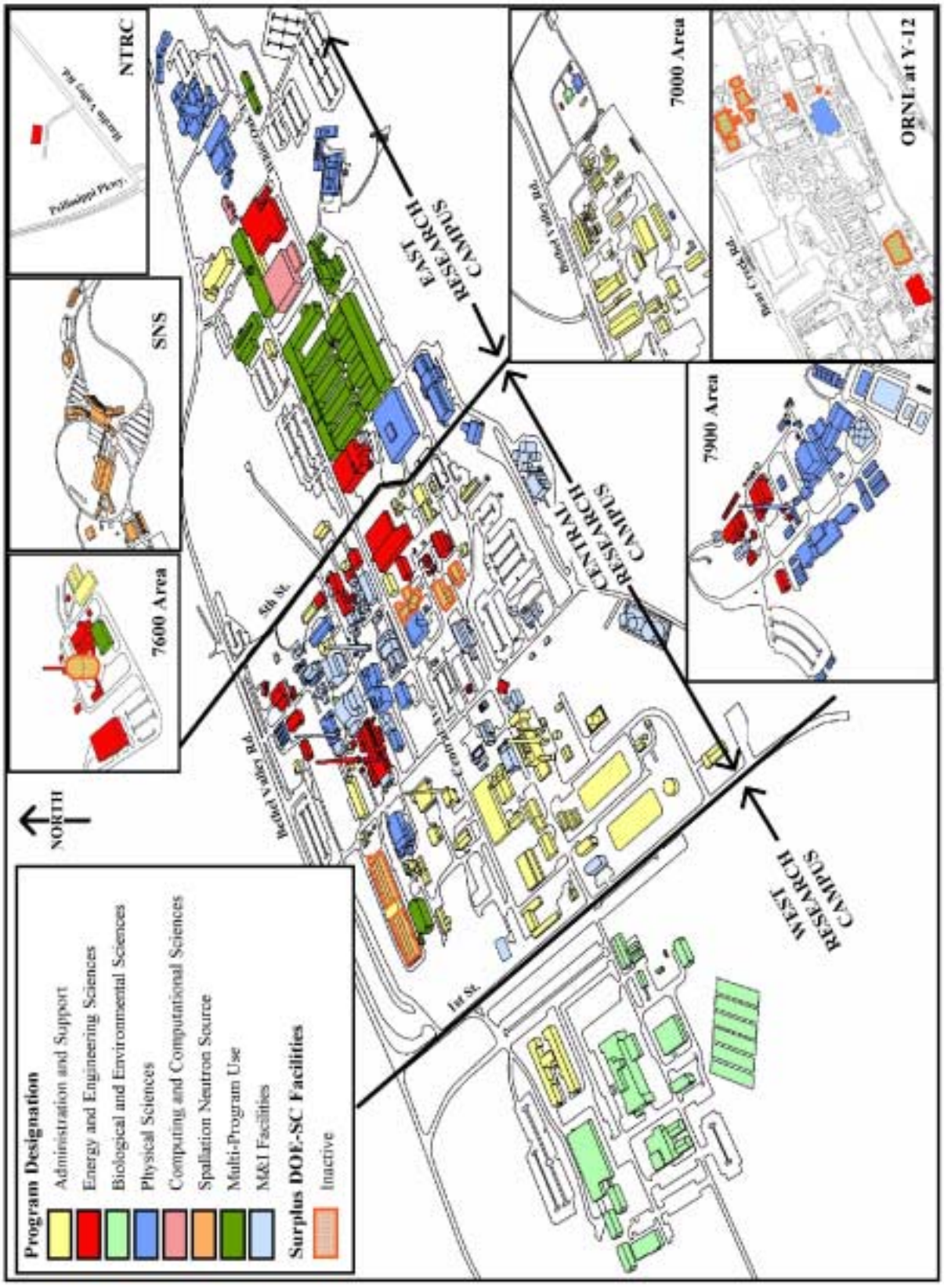

Fig. 5.2. Facility Use Index for ORNL's primary research facilities.

list, and transfer contaminated facilities to EM programs (or, for conventional facilities, demolish them as funding becomes available). Table B.1 (Appendix B) provides a listing of the mission-essential facilities at ORNL, complete with Facility Condition Index (FCI) summary condition data as well as actual maintenance, required maintenance, and deferred maintenance data for each facility.

ORNL utilities and infrastructure systems are generally of a vintage and condition similar to the original ORNL campus buildings, although some upgrades have occurred for portions of these systems in the areas where site modernization has been under way (the ORNL East Campus and the SNS site in particular). New potable and fire protection water lines have been installed in the main plant area, as well as new natural gas and sanitary/storm sewer lines in the East Campus. New and expanded parking lots and road repairs have also been completed within the main plant and on Bethel Valley Road to accommodate the significant changes in traffic patterns resulting from the modernization initiatives. However, many systems still await needed renewal or upgrades, particularly for the main electrical distribution, process water, chilled water, and steam production and distribution systems. Similarly, the site's extensive telecommunications and information technologies infrastructure must be maintained and routinely upgraded to meet the rapidly advancing needs of this important aspect of scientific research and administrative operations. Further, the liquid and gaseous effluent systems serving ORNL SC facilities and the site environmental clean-up contractor facilities are cost prohibitive to operate solely for ORNL needs (see Sect. 5.5); thus, ORNL's systems will require significant upgrades to assure environmental compliance, worker safety and health, and control of research operating costs.

In support of ORNL's facilities operations, the Laboratory's In-House Energy Management program is focused on reducing energy consumption and costs, as well as enhancing the workplace environment, improving facility operations, and providing leadership in the adoption of new energy technologies. The program has yielded greater than 25% reduction in energy use per square foot of occupied space since 1985. Key areas of program focus include:

- replacement of chlorofluorocarbon (CFC) chillers with high-efficiency non-CFC chillers (over $350K/year savings),
- installation of state-of-the-art energy management control systems in 13 buildings,
- replacement of inefficient fluorescent lamps and ballasts and installation of room occupancy sensors (up to 70% cost reduction), and
- upgrade of steam generation and distribution systems.

ORNL is participating in the Energy Savings Performance Contracting (ESPC) approach to energy projects implementation, has one building already designated as an EPA Energy Star (with several more submitted), and was the first industrial participant in the Green Power Switch program established by TVA. The potential for significant improvement in energy savings from ongoing facilities modernization activities is reflected by the 30% reduction in energy use per square foot for the new private sector buildings compared to the ORNL average.

5.2 Enhanced Operational Discipline

The Enhanced Operational Discipline initiative is designed to improve operational performance in the existing ORNL facilities as well as increase the scope, quality, and effectiveness of our maintenance support services. Such improvements are to be accomplished through full implementation of UT-Battelle's Facility "Landlord-Tenant" Operations Model, where ownership, operation, and maintenance of both conventional and nuclear facilities are provided through Complex Manager teams dedicated to operational excellence. Program users become tenants within those building, with performance expectations and operational constraints established through formal Facility Use Agreements. Facilities needs and priorities are

established by Complex Managers, in consultation with the program occupants, for allocation of available maintenance and capital improvements funds. Annual work plans by facility complex and long-range operations and infrastructure systems improvement plans form the basis for budget requests. Space charges to building occupants (both programmatic and overhead organizations) provide the baseline annual operating funds, with standard rates applied for conditioned and unconditioned space. The space charge rates include (1) all routine janitorial and structural/mechanical/ electrical maintenance for the buildings; (2) routine roads and grounds maintenance for areas outside the building footprint; (3) repair/replacement of major systems components less than the capitalizable criteria; and (4) miscellaneous space management and utilization costs. For FY 2004, the rates charged for ORNL main plant facilities were $21.60 per square foot per year for conditioned space and $7.20 per square foot per year for unconditioned space, with a five-year trend of past and projected rates provided in Fig. 5.5. As a result of space charge implementation and the desire to eliminate marginal or excess space, over 800,000 gsf of space has been vacated in the past three years. The net reduction of footprint (new space less vacated space) has ensured a high asset utilization rate for all ORNL facilities. ORNL's current Asset Utilization Index is 0.98 (Excellent).

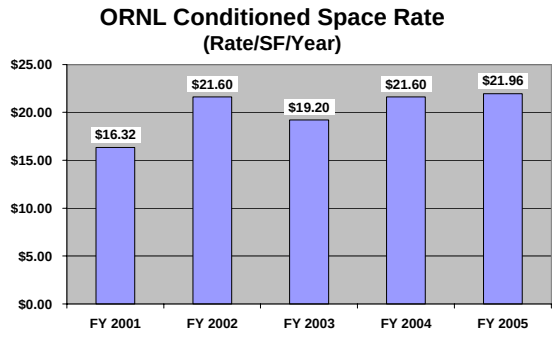

Fig. 5.5. Space rate trend.

Due to the previous ORNL approach to facilities management (decentralized facility management), ORNL has not historically accurately tracked and trended actual maintenance investments. With the implementation of the UT-Battelle Facility "Landlord-Tenant" Operations Model, building maintenance is performed by a centralized organization. Actual maintenance investments (as defined in DOE Order 430.1B, "Real Property Asset Management") from all funding sources are tracked. It is clear that the Laboratory is spending over 2% of its RPV on maintenance (i.e., ORNL is achieving SC's expense-funded objective for maintenance). It is probable that the Laboratory has spent similar amounts during its history. As there have been limited capital renewal programs at ORNL, it would be unlikely that buildings with typical design lives of 20–30 years could be functionally operational today if this were not the case. The UT-Battelle Facility "Landlord-Tenant" Operations Model is designed to improve maintenance effectiveness by placing greater emphasis on efficient maintenance operations, as well as reducing the overall amount of maintained space. Complex Facility Managers (the primary day-to-day managers accountable for the operations model) not only are accountable for the facility maintenance but are stewards of deferred maintenance as well. As stewards of deferred maintenance, the Complex Facility Managers are finding that, like actual maintenance investment data, the current inventory of deferred maintenance is less than adequate. They are changing processes so that a more realistic picture is available—an FY 2005 initiative for key facilities. Without capital renewal, however, their ability to manage the increasing backlog will be limited.

5.3 Maximizing Research Productivity

The primary focus of this Laboratory Agenda objective is to constrain growth in the cost of doing business at ORNL, while leveraging our people, processes, and new infrastructure to increase overall productivity. Achieving this goal will involve reduction in the general and administrative (G&A) overhead rates, improvement in business systems, and demonstrable improvements in staff satisfaction

with internal support services. From a facilities infrastructure perspective, productivity will also be significantly improved by the consolidation of research staff from off-site locations into new or upgraded space at the main ORNL campus.

Since the initiation of the facilities modernization efforts at ORNL in FY 2000, over 600 research staff and their associated laboratories have been moved from substandard, inefficient space at Y-12 and expensive leased off-site space back to the main Bethel Valley ORNL campus (see Fig. 5.6). Consolidation of the rest of ORNL's off-site staff is proposed to occur over the next two years, as the next stage of facilities construction is completed.

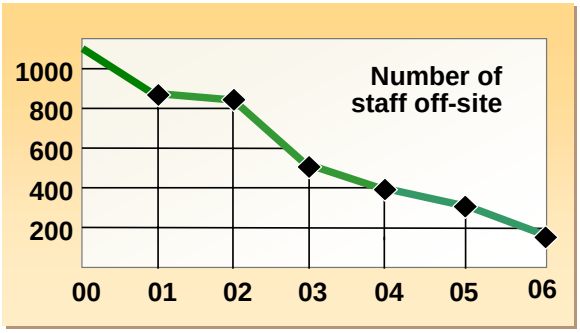

Fig. 5.6. The number of off-site staff is decreasing.

At the conclusion of this staff consolidation, the only significant off-site population of ORNL researchers will be those at the recently constructed National Transportation Research Center (NTRC), an ORNL-UT cooperative research facility located along the Pellissippi Parkway, equidistant between ORNL and UT. ORNL expects that leased facility to continue to be operated through the ten-year planning period of this TYSP.

In addition to allowing the removal of almost 1.8 million gsf of substandard and/or expensive space from the ORNL operating inventory, this consolidation strategy allows for improved research productivity across the remaining facilities. Research divisions will now have their staff within easy collaboration and management distance, laboratory optimization and shared common spaces can more easily occur, and multidisciplinary teaming can be much more effective. By keeping the facilities maintenance investment constant through these years of consolidation, the effective cost per square foot of maintenance cost will increase by almost 25%, resulting in better maintained space and improved customer satisfaction, a key goal of this productivity objective. In addition, as noted earlier, this also results in high asset utilization—another SC objective.

5.4 Consolidation of Nuclear Capabilities

Since its beginning in 1943, ORNL has been instrumental in developing fundamental and applied nuclear science and technology for the nation's peaceful use of nuclear energy, including nuclear power, nuclear propulsion, the nuclear fuel cycle, and beneficial use of nuclear isotopes. Today, ORNL operates the world-class HFIR, a Category 1 research reactor nuclear facility, as well as the Holifield Radioactive Ion Beam Facility (HRIBF) and ten Category 2 and 3 nonreactor nuclear facilities (see Fig. 5.7).

ORNL has just completed a strategic planning effort for its inventory of nonreactor nuclear facilities in an attempt to match the projected nuclear research requirements to the facility assets that will be required to carry out projected ORNL missions. This plan identified four nonreactor nuclear facilities considered essential to the ORNL nuclear research programs for the next 40 years: Buildings 7920, 7930, 3525, and 3025E. These buildings need to be retained and upgraded as necessary to meet mission requirements because they contain the core capabilities to meet nearly all projected nuclear program needs. In addition, two buildings (4501 and 5505) are recommended for downgrading from nuclear status to radiological status for consolidation of radiological laboratory work within the main ORNL campus.

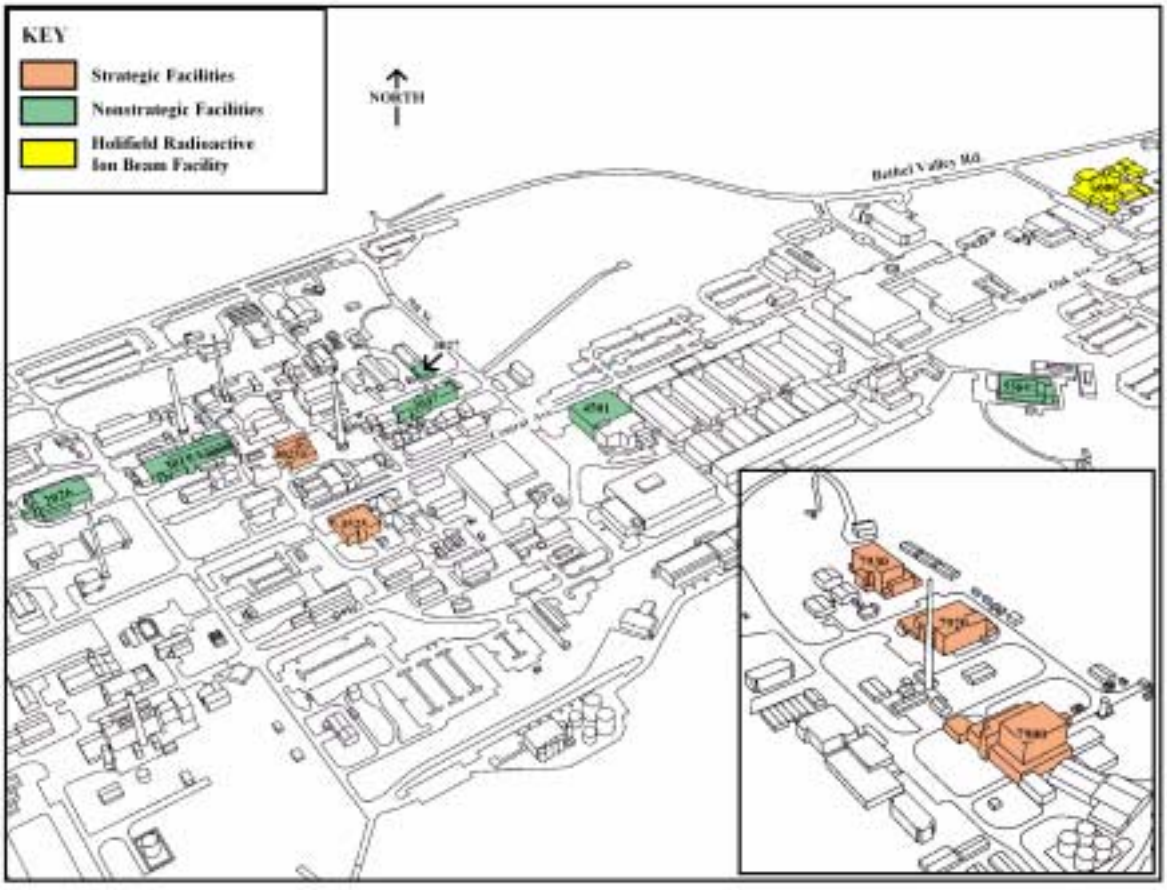

Fig. 5.7. Central Campus facility layout identifying key and nonstrategic nuclear facilities.

Building 3019A will be transferred to Isotek Systems, LLC, in FY 2005 (see Fig. 5.8). Isotek will process stored nuclear materials, recovering potentially valuable isotopes. The remaining material will be downblended and stabilized for storage. The remaining three nonreactor nuclear facilities should be operated in the near-term to accommodate current critical mission needs, followed by deactivation or transfer over the next several years.

Facility	FY 2003	FY 2004	FY 2005	FY 2006	FY 2007	FY 2008
4501	Operate as Cat 2		Downgrade to Radiological Status			
3027	Deinventory		Deinventory, Reclassify as Non-Nuclear			
3019A	Operate as Cat 2		Transfer to Isotek Systems, LLC, for continued operations			
5505	Operate as Cat 3			Downgrade to Radiological Status		
2026	Operate as Cat 3			Shutdown		
3047	Operate as Cat 2		Operate as Cat 3		Commercialize	Shutdown
3025E	Operate as Cat 3					
3525	Operate as Cat 2					
7920	Operate as Cat 2					
7930	Operate as Cat 2					

Fig. 5.8. Timetable for hot cell consolidation.

For the facilities identified for long-term missions, significant infrastructure systems upgrades will be needed, including general HVAC improvements, shield window refurbishment, cell decontamination and upgrades, and the potential for installation of new modular hot cells to quickly and cost-effectively allow mission programs to be moved.

Multiple funding sources will be required to accomplish this consolidation effort over the next several years, while maintaining safe operations and completing ongoing critical research program activities.

ORNL has now implemented the UT-Battelle Facility "Landlord-Tenant" Operations Model for nonreactor nuclear facilities management through the establishment of the Nonreactor Nuclear Facilities Division (NNFD). That organization will be responsible for the ongoing operations, maintenance, and planned consolidation activities. The HFIR operations are currently managed by a stand-alone organization whose mission is to operate their facility in accordance with DOE requirements. Their primary mission objectives have been outlined in Sect. 3, and their future facilities expansion needs are described fully in Sect. 6.

5.5 Resolve Legacy Issues

One of the most significant, long-term vulnerabilities for ORNL is the management of legacy issues that have emerged over 60 years of Laboratory operations. Such issues include disposition of surplus facilities, elimination of legacy materials, and mitigation of impacts resulting from environmental legacies and waste management facilities operations. As described below, ORNL is committed to resolving these issues through partnerships with the DOE responsible programs, but the scope of the task is enormous and increased DOE-SC support will be critical to making real progress in these areas.

Disposition of Surplus Facilities: In parallel with the creation of new or refurbished research and support facilities and consolidation of staff to the main ORNL campus, over 600,000 gsf of substandard space has been deactivated and placed in standby status awaiting transfer or final disposition. Many of these facilities are quite large and complex, and some contain multiple hazards. Facilities that are not contaminated are not currently eligible for transfer to the EM Program and must be managed as landlord facilities until final disposition is funded. While limited SC funds have been made available over the past few years to support facilities demolition (Fig. 5.9), the cost of the growing inventory (over $150 million in basic minimal maintenance, surveillance, and demolition costs for the current list) will result in most actual decontamination and decommissioning (D&D) being delayed well beyond the ten-year planning period (see Tables C.1 and C.2 in Appendix C). This backlog increases annual operating costs and inhibits ORNL's facilities revitalization efforts.

Fig. 5.9. Demolition of Building 2013.

Another critical aspect of the surplus facilities disposition issue is the current congressional mandate that requires the elimination of space equivalent to that being newly constructed. Only 30,000 gsf of space has been physically demolished to date, due to demolition budget constraints, but over 400,000 gsf of space has been transferred to Y-12 for use by its current programs (which has allowed Y-12 to eliminate older space). ORNL is preparing another 500,000 gsf for potential transfer to Y-12 or demolition, but ultimate elimination of that space will depend directly on demolition funding availability and/or Y-12 acceptance of this space for reuse. Constraints on new construction may ultimately result from DOE's inability to finally disposition this significant excess space.

Elimination of Legacy Materials: UT-Battelle conducted a Facility Environmental Vulnerability Assessment at ORNL in FY 2002 that identified a large inventory of legacy

materials stored in and around the hundreds of active and inactive ORNL facilities. This buildup of legacy materials is the result of 60 years of ORNL operations and represents over 100,000 ft^3 of hazardous, radioactive, and mixed wastes, as well as thousands of tons of miscellaneous stored materials that are no longer needed for ORNL's research mission. These stored materials can represent a significant health and safety risk and environmental vulnerability and can impede ORNL's facilities revitalization efforts. They also represent a financial legacy of an estimated $80 million in disposition costs.

Significant progress is being made in elimination of this legacy with over 650 tons of scrap metal recycled, 1160 gas cylinders removed, 1900 pumps and motors disposed of, 4100 excess chemical items dispositioned, and 25,000 ft^3 of low-level waste shipped for disposal since the inception of the Legacy Materials Disposition Initiative in FY 2002. But much more remains to be done, and limited annual legacy tax funds obtained from Laboratory overhead will not eliminate the backlog of material disposition needs within the ten-year planning horizon.

Mitigation of Impacts Resulting from Environmental Legacies and Waste Management Facilities Operations: Due to historical Laboratory operations, a number of legacy vulnerabilities have developed that are associated with past contaminant releases to the environment, contaminated facilities, excess materials, and waste generation (Fig. 5.10). The EM Program is planning to spend over $1 billion between now and FY 2015 to address the majority of these problems. The accelerated closure schedule being implemented by EM has remediation in Melton Valley completed by the end of FY 2006, Bethel Valley completed by FY 2013, and only long-term groundwater issues remaining to be addressed. However, these interim actions will leave significant amounts of contaminated media and facilities, excess materials, and outdated waste treatment systems in place. It is estimated that in excess of $40 million per year could be required by the end of this ten-year planning period to address these problems. Early scoping of these longer-term cleanup costs has been done as part of the now defunct Future Liabilities (FL) program initiative at DOE-HQ. Estimates of that program need have been included in the ORNL Summary of Resource Needs (Sect. 6.5).

Fig. 5.10. EM gaseous waste treatment and release point at the 3039 area.

The majority of projected near-term costs result from the proposed transfer of EM Program responsibilities for the collection, treatment, and disposal of all newly generated wastes from Laboratory operations by FY 2008. Some portions of this transfer are already under way (e.g., off-site hazardous waste), but the major facilities transfers associated with radioactive liquid and gaseous waste treatment, as well as high-activity solid radioactive waste storage and disposal, are proposed for completion in a phased manner by 2015. Simple transfer of all existing EM Waste Management facilities to ORNL, however, would result in systems with much greater capacity and annual operating costs than are needed for routine management of ORNL's research waste streams. In addition, a significant D&D legacy associated with the large interconnecting network of underground piping, ductwork, and waste treatment systems would be transferred with those facilities, and DOE-SC has no desire to inherit these legacy costs.

To address this waste management systems concern, an *ORNL Liquid and Gaseous Waste Treatment System Strategic Plan* has been prepared that outlines a multiyear, $74 million capital upgrades program over the period of FY 2004–FY 2012. This plan defines Expense,

GPP, and Line Item projects sequenced to support the ORNL research operations needs, be consistent with the planned EM remediation schedules, and minimize the operating cost burden for ORNL. The planned approach, which is integrated into this TYSP, results in (1) near-term upgrades to the sanitary sewer system and sewage treatment plant, (2) elimination of process waste effluents to allow more cost-effective treatment, (3) installation of new gaseous waste treatment systems for nuclear facilities planned to be operated well into the future, and (4) construction of liquid low-level waste source treatment systems and a centralized solidification facility for Bethel Valley, Melton Valley, and SNS generators. Various waste handling buildings in the 7600 area could be of long-term use for processing newly generated waste. The overall schedule for the planned components of this strategy is shown in Fig. 5.11.

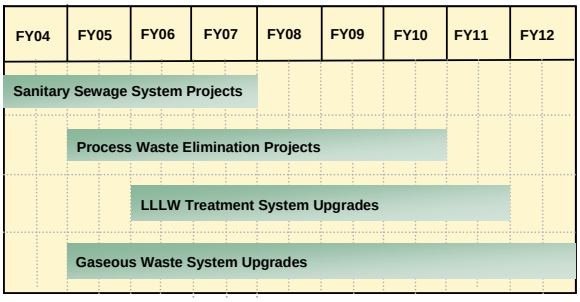

Fig. 5.11. Preliminary schedule for implementing the ORNL Liquid and Gaseous Waste Treatment System Strategic Plan.

5.6 Workforce Planning and Development

In the area of workforce planning and development, ORNL has established a key goal of attracting and retaining a diverse workforce of outstanding research and support professionals. Initiatives are under way to accomplish this goal through enhancing the diversity programs, the recruiting and staff development programs, the employee benefits package, and the human resources service delivery approach. Underlying these personnel systems improvements is the rehabilitation, construction, and efficient operation of ORNL facilities and infrastructure to make ORNL an attractive and safe laboratory. One of the drivers for UT-Battelle in launching the ORNL facilities revitalization initiative in FY 2000 was to provide a staff-friendly, 21st Century research campus environment in which to work. The facilities development and improvement plans laid out in this TYSP reflect ORNL's commitment to attract and retain the Laboratory's most important resource for conducting world-class research—our staff.

6. The Ten-Year Site Plan for ORNL Modernization

The vision for ORNL modernization over the next ten-year planning period is outlined below. This vision has been developed through a Laboratory-wide planning process over the past 11 months that included workshops with the ORNL Leadership Team, planning meetings with every research division director and key support organization, and guidance from DOE-SC, the Oak Ridge Site Office manager and his staff. The resulting plan, presented in the following report sections, has been organized to provide (1) an overall vision of the 21st Century ORNL; (2) a summary discussion of the mission drivers and constraints that established the baseline for planning; and (3) the ORNL Master Plan for each of the major ORNL development areas, the research needs on the surrounding ORR, and the site-wide utility/infrastructure systems. Included in the Master Plan presentation are summary-level cost and schedule projections associated with the plan. Additional project-level details are provided in Appendix D.

6.1 Vision of the 21st Century Laboratory

The revitalized ORNL research campus outlined in this TYSP has been designed to provide:

- consolidated research and support facilities at the ORNL main campus to fulfill the Laboratory Agenda, including fully developed SNS and HFIR complexes;
- staff and research equipment housed in new, refurbished, and/or well-maintained existing space that is safe, secure, sustainable in design, and energy and space efficient;
- a planned mix of DOE, State, and private sector–owned buildings appropriate to ORNL's research and support mission;
- establishment of a research campus atmosphere, including architectural consistency within each campus area and open campus vehicle- and pedestrian-friendly flow patterns;
- utilities and infrastructure sized and maintained to meet program needs, with low-maintenance, native species landscaping approaches employed site-wide;
- nonreactor nuclear facilities and radiological laboratories consolidation implemented to maintain program functionality in a much-reduced, more cost-effective footprint;
- waste management support systems 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 managed to ensure regulatory compliance, health and safety risk reduction, and minimized operating costs;
- excess facilities demolition 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; and
- provision of sophisticated R&D facilities for national and international users while delivering the highest standards of safeguards and security for classified information and materials experimentation and development.

A site-wide representation of these ORNL plans for facilities modernization is shown in Fig. 6.1. Details of this plan, organized by area of the Laboratory, are provided in the following sections of this report.

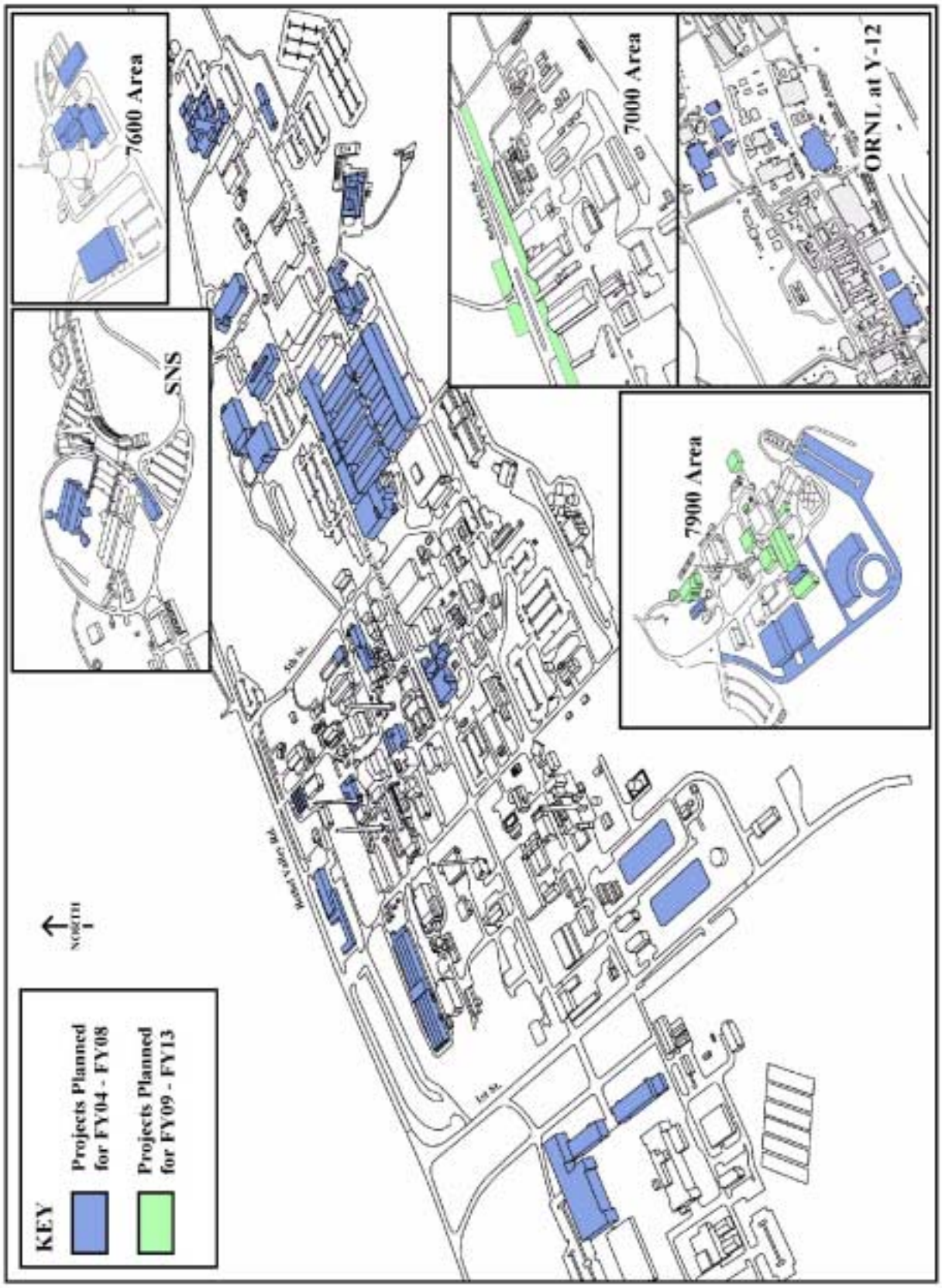

Fig. 6.1. Ten-year site plan for ORNL modernization.

6.2 Mission Drivers and Constraints

As detailed in Sect. 3, ORNL's Laboratory Agenda has defined key areas of research program focus for the next five-year DOE planning cycle. The primary program areas where major facilities construction will be necessary to accommodate expected growth include:

- Neutron Sciences ─ particular emphasis at the HFIR complex, SNS site, and Hollifield Heavy Ion facilities;
- Complex Biological Systems ─ facilities associated with DOE's GTL initiatives;
- Terascale Computing and Simulation Science ─ staff and equipment growth into newly constructed facilities;
- Science and Technology for a Hydrogen Economy and Grid Modernization ─ requirement for laboratory expansion at the NTRC and construction of the Energy Reliability and Efficiency Laboratory (EREL);
- Fission to Fusion ─ new experimental facilities for fission and fusion;
- Advanced Materials ─ new national user facilities for nanophase materials development, atomic-scale imaging, and advanced materials manufacturing;
- National Security ─ major increase in secured research and pilot-scale manufacturing space; and
- University Partnerships ─ completion of the State of Tennessee commitments for development of four Joint Institutes.

Other than these expanding research areas, the TYSP is based on a nominal rate of inflation increase in program growth or staffing increases.

Facilities development at ORNL is constrained physically by the ridge and valley topography of the East Tennessee region and the existence of a significant legacy of contaminated soils and inactive buildings that limit use of land for new construction. The TYSP assumes that the EM accelerated closure approach is implemented on schedule for both the Bethel and Melton Valley areas, that no additional contaminated buildings are accepted by EM for demolition, and that transfer of waste management responsibilities occurs within the ten-year planning period. While it is recognized that the Congressional mandate that construction of new DOE facilities must be offset by equivalent elimination of substandard/excess space, this TYSP assumes that DOE-SC will address this requirement at a national level and through establishment of space bank allocations or funding to support excess facilities demolition consistent with ORNL's planned construction schedules.

Fiscal constraints were applied to TYSP development for the first five years of the planning cycle. Beyond that, a reasonable growth in capital funds has been projected to support the modernization efforts. The plan assumes no constraints on the availability of manpower for construction projects and has outlined an infrastructure capital improvements program that shows the increases necessary to comply with the new DOE percentage of RPV maintenance requirements.

6.3 Process for ORNL Facilities Resource Allocation and Performance Tracking

ORNL maintains a very structured decision-making process for capital and ES&H project identification, prioritization, management review/approval, and funding allocation. This process, as outlined in Fig. 6.2, begins with the establishment of the Laboratory Agenda covering all key aspects of the ORNL missions in Science and Technology, Laboratory Operations/ES&H, and Community Service. That agenda and associated mission-essential facilities are documented in the annual *ORNL Institutional Plan* and form the basis for all facilities management and improvements planning for the covered time frame. A list of the current mission-essential facilities for ORNL, along with their pertinent data, is provided in

Appendix B. From this established baseline, several process steps are then implemented:

1. *Needs Assessment* – The ORNL inventory of facilities and capabilities is reviewed to determine gaps in research and support facilities and/or ES&H compliance requirements.

2. *Activity Data Sheet (ADS) Development* – Project scope, schedule, cost, and justification information is documented on ADSs and entered into a Laboratory-wide data base for management review and decision making.

3. *Risk Ranking* – A Risk-Based Priority Model (RPM) is utilized by a formal Risk Ranking Board to evaluate/score all ADSs.

4. *Determination of Funding Source* – DOE Real Property Management and site-specific criteria are used to determine the appropriate funding type [i.e., expense, GPP, institutional general plant project (IGPP), general-purpose equipment (GPE), Line Item] and funding source (DOE landlord, DOE programmatic, alternative financing) for proposed project execution, with life-cycle economic analyses performed, as required, for critical large project decisions.

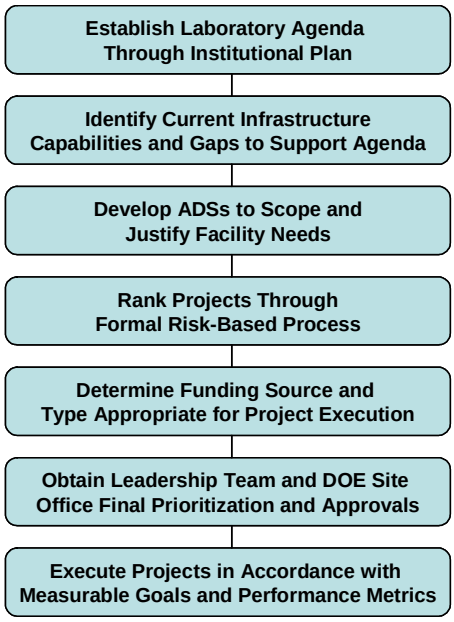

Fig. 6.2. ORNL site planning methodology.

Once funding types and sources are defined for projects, the ORNL executive management Leadership Team (the Level One senior management forum for identifying and resolving all significant UT-Battelle policy or resource issues) evaluates the risk ranking, modifies the ranking (if required) based on other management factors, and makes the final recommendations to DOE for funds allocation. The DOE Site Office, with appropriate Field Office concurrence, then formally approves the ORNL budgets for the fiscal year. Those approved budget levels form the baseline for development of the TYSP and for execution of all projects. Depending upon project site and funding type, specific project plans are developed, as required, including implementation of Value Engineering techniques, where appropriate. At ORNL, Value Engineering is conducted internally for most expense, maintenance, and small capital projects (less than $5M), with experienced consultants used for the more complex Line Item scale projects. Value Engineering was successfully used on the recent Research Support Center (RSC) with the goals of maintaining a world-class facility, discerning between wants and requirements, and reducing overall cost of project to match established budget project scope.

DOE tracking of ORNL performance in executing approved infrastructure-related projects is accomplished in a formal sense through the annual establishment of contract performance measures and the routine review of progress against those measures throughout the year. For FY 2004, the facilities management-specific performance measures are listed as follows:

Critical Outcome 2 – Modernize ORNL facilities and infrastructure to implement the *ORNL Institutional Plan*

- ***Objective 1*** – Effectively manage ORNL property and facility protection.
  - ***Measure*** – Maintain on-time delivery of scheduled inspection, testing, and maintenance (IT&M) services for fixed fire alarm and fire suppression systems in all ORNL

facilities. Incorporate fire protection systems for new facilities and replace/upgrade fire protection systems into the Fire Department's IT&M Program.

- ***Objective 2*** – We will modernize ORNL facilities and infrastructure to support world-class research.
  - ***Measure*** – Continue or complete construction of the following key facilities: Advanced Microscopy Laboratory, RSC, 7625 Highbay Facility, ORCAS, EREL, and the Center for Nanophase Materials Sciences (CNMS).
  - ***Measure*** – Complete readiness to support request of Earned Value System validation.

- ***Objective 3*** – We will facilitate the efficient startup of new facilities.
  - ***Measure*** – Complete planned laboratory and personnel moves into the private sector facilities.

- ***Objective 4*** – We will continue the disposition of excess facilities.
  - ***Measure*** – Vacate 100,000 ft^2 of excess facilities.

- ***Objective 5*** – We will have a cost-effective waste management infrastructure.
  - ***Measure*** – Complete preliminary proposals for the Sanitary System Treatment Capacity Increase and Bethel Valley Process Waste Cooling Water Elimination GPPs and the Justification of Mission Need documents for the ORNL Gaseous Waste System Upgrade and ORNL Liquid Low-Level Waste Treatment Line Items.

Critical Outcome 3 – Deliver enhanced operational discipline and customer satisfaction.

- ***Objective 1*** – The Facilities Management Model for both balance of plant and nonreactor nuclear facilities will be fully implemented.
  - ***Measure*** – Achieve Maintenance Investment Index for balance of plant.

Negotiations over the FY 2005 performance measures were not finalized at the time the TYSP went to press. Proposed measures address revitalization through building new facilities, disposing of excess facilities, completing personnel and equipment moves, and modernizing ORNL's waste system infrastructure.

6.4 ORNL Master Plan for Site Development

As depicted in Fig. 6.1, 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/Radiochemical Engineering Development Center (REDC) Complex, Fusion/Robotics Complex
- **Chestnut Ridge**: SNS site
- **Off-Site Locations**: NTRC, ORNL at Y-12
- **Oak Ridge Reservation**: Research locations throughout
- **Site-Wide Utilities and Infrastructure**: Systems supporting all locations

In the following discussions of each of these areas, the ORNL TYSP is divided into Near-Term Actions, Plans for the Next Five Years, and Outyear Plans. Overall cost and schedule details are provided in Sect. 6.5.

6.4.1 Bethel Valley (Main Plant)

As the primary location for the majority of the ORNL staff and research facilities, the main plant area 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.

East Campus

The East Campus contains the highest population density of the Laboratory, with 70% of ORNL's scientific support staff housed in an adjacent five-building complex (4500N, 4500S, and the new three-building private sector facilities). This area also serves as the main entry point for visitors to the Laboratory and contains one of ORNL's premier neutron science facilities, the HRIBF.

Near-Term Actions: Primary facilities development activities in the East Campus for FY 2004 and FY 2005 are the completion of construction and operational startup of the DOE-funded RSC and the State-funded JICS/ORCAS. The RSC will house the visitor reception and badging areas, the ORNL cafeteria, and a full-service conference center. The JICS/ORCAS facility will be the first two of four Joint Institutes committed by the State of Tennessee as part of the UT-Battelle Facilities Revitalization initiative and will contain state-of-the-art distance learning capabilities, as well as offices and team/incubator suites for cross-discipline university and industry collaboration on an international scale. In the open space between these buildings, a new landscaped entryway, parking area, and quadrangle will be completed to tie the new East Campus facilities together through a pedestrian-friendly environment (see Fig. 6.3). Also in the near term for the East Campus will be (1) completion of security upgrades for Buildings 6011 and 5800 for new National Security Programs initiatives, (2) a High Power Target Laboratory upgrade and addition for the HRIBF (Building 6000), (3) refurbishment of laboratory and office space in Buildings 5500 and 5510 to accommodate transfer of the ORNL commercial isotopes program operations from their ORNL at Y-12 facilities, and (4) demolition of the original ORNL Visitor Center (Building 5000).

Fig. 6.3. New East Campus upgrades.

Plans for the Next Five Years: As outlined in Fig. 6.4, the focus of facilities development in the East Campus over the next five years will be on construction or renovation of two primary research facilities and on critical hazardous/radioactive waste systems improvements. Completion of a Multiprogram Research Facility (MRF) using an alternate financing approach is currently scheduled for early FY 2006. This facility will allow secure consolidation of existing national security programs work, allow significant expansion in the areas of prototype systems development and testing, and provide additional research space for energy, material sciences, and computational science initiatives. Also scheduled for startup and completion is the crucial first Line Item renovation project for 4500N, Wing 4. Through that project, over 10,000 ft^2 of administrative office area will be converted back to state-of-the-art wet chemistry laboratories to allow new program developments in chemical catalysis research areas. This renovation project will be the first of several for the 1950s-vintage 4500N/S complex that will ultimately provide key 21st Century wet and dry nonradioactive laboratory capabilities for the future of ORNL. This multiphase project will also ultimately provide complete refurbishment of the old utility and HVAC infrastructure for that 350,000-ft^2 laboratory and office complex.

The Transuranium Research Laboratory (Building 5505) is situated on the south side of the East Campus and has been included in the ORNL nonreactor nuclear facilities consolidation efforts. That facility is slated to be downgraded to a Category 3 nuclear facility in the near term and will then be refurbished to allow

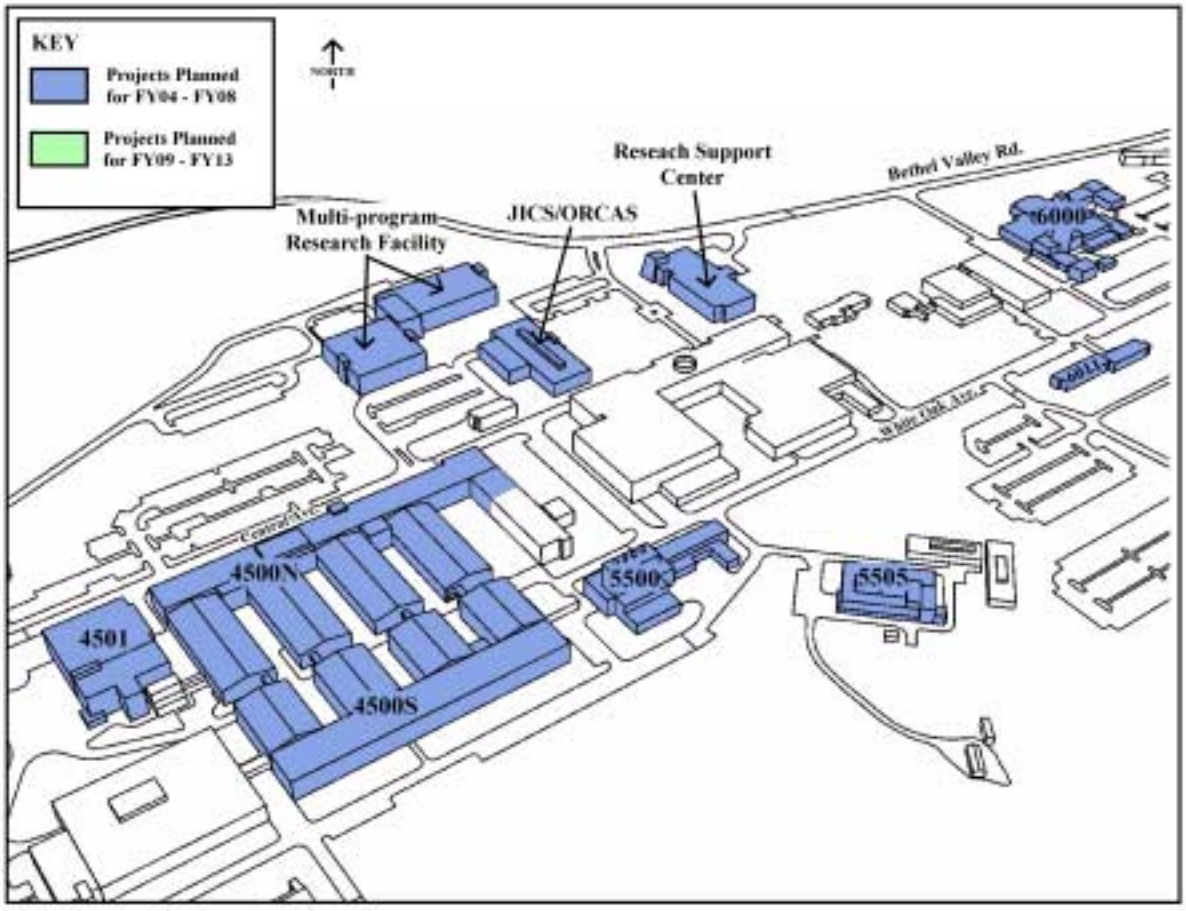

Fig. 6.4. East Campus Master Plan.

its long-term use as a radiological laboratory where low-level radioactive research can be consolidated from across the Laboratory. That refurbishment is projected to occur in the five-year planning horizon. Also included in that time frame are significant process waste system improvements for the primary generators of that liquid waste stream─laboratories in the 4500N/S complex. As part of this planned GPP, once-through cooling water processes will be reconfigured, process improvements will be made to eliminate waste generation, and hazardous/nonhazardous piping cross-connects will be eliminated to significantly reduce the overall volume of process wastes required for treatment by ORNL systems.

Outyear Plans: The outyear plans for the East Campus area are primarily centered on the multiphase Line Item upgrades to the 4500N/S Complex. As currently envisioned, that upgrade would take place through a series of eight individual projects, spanning a construction schedule through FY 2017. Wings would be renovated on a priority-need basis, alternating between 4500N and 4500S, and including the main headhouse structures and utilities in both buildings. At the end of this significant investment phase, however, would be the core wet and dry chemistry, materials, and energy research laboratories for the next 50 years of ORNL mission execution.

Central Campus

In contrast to the high level of new facilities development in the East Campus area, the main focus of facilities work in the Central Campus over the next ten 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, hot cell facilities, and major staff and laboratory locations for Condensed Matter, Metals and Ceramics, and Engineering Science and Technology Divisions), this area is the oldest part of the ORNL campus and is the primary location of the EM Program cleanup activities in Bethel Valley (Fig. 6.5). Over 50 facilities are on the EM inventory for remediation and/or demolition, including several inactive nuclear reactors and major radionuclide processing facilities. The Central Campus also contains the vast majority of the underground waste collection and transfer piping, ductwork, tanks, and treatment/discharge facilities for the hazardous and radioactive waste management systems.

Fig. 6.5. SC facilities in the Central Campus.

Because of the history of past operations in the Central Campus, a significant legacy of contaminated facilities, soil, and underlying groundwater exists and is being managed by the EM Program. Under an Accelerated Cleanup initiative, the EM Program is scheduled to complete its cleanup activities in Bethel Valley by FY 2015. Also under way in the Central Campus is a new DOE-funded commercial isotope recovery contractor effort in Building 3019A. The 3019A facility responsibilities and continued operations are being reassigned by DOE to Isotek Systems, LLC, with anticipated completion of this initiative in 2011 when the facility will be shut down and readied for decontamination and decommissioning. Until these EM and isotope recovery efforts are completed, there will be significant operational interfaces between UT-Battelle and the Isotek and EM contractors, and only a moderate number of facilities improvements or new facilities investments proposed for the Central Campus.

Near-Term Actions: In the near term, the primary ORNL-led facilities efforts in the Central Campus will involve nuclear facilities consolidation. As discussed in Sect. 5.4, two Central Campus hot cell facilities (Buildings 3025E and 3525) are considered strategic for the long-term mission of the Laboratory, and activities are under way to upgrade these facilities and consolidate nuclear operations there. In parallel, five nonreactor nuclear facilities (Buildings 2026, 3027, 3047, 4501, and 4505) will either be placed in standby mode or modified for continued radiological facility use after their viable program functions are transferred to the strategic nuclear facilities. An important infrastructure development activity occurring in the Central Campus in the near term is the completion and occupation of new parking lots at two former EM remediation sites: the Gunite and Associated Tanks (GAAT) and Surface Impoundments Operable Unit (SIOU). The GAAT and SIOU lots are providing over 450 additional parking spaces to this critically short resource in the Central/East Campus areas. As these lots become available, ORNL will implement an Open Campus concept, where staff will be allowed to park on a first-come basis in designated areas throughout the Laboratory.

Plans for the Next Five Years: While there is limited new facilities development planned for the heart of the Central Campus area, there are three key facilities scheduled for construction

along the perimeter of this campus. On the northern perimeter along Bethel Valley Road, a new EREL Line Item is planned to be sited adjacent to the existing energy research complex and will form a new main user facility and entryway into ORNL's energy programs area (Fig. 6.6).

Fig. 6.6. Artist's conception of the Energy Reliability and Efficiency Laboratory.

On the southeast perimeter of the campus, a highbay expansion to Building 4508 is scheduled for completion by FY 2010 and will house new program initiatives in advanced materials research. Finally, in support of the plans for EM transition of waste management responsibilities to DOE-SC, GPP and private sector upgrades are planned for the existing sewage treatment plant on the southwest corner of the Central Complex. These upgrades will increase the capacity for treatment of both sanitary and uncontaminated process wastes and, in combination with the process waste system improvements in the East Campus, could eliminate the need for ORNL to take ownership of the EM process waste and nonradiological wastewater treatment plants.

Outyear Plans: Over the long term, the Central Campus offers great opportunity for consolidation of Laboratory support operations from the 7000 Area and expansion and upgrade of existing facilities for baseline ORNL energy, materials, and nuclear program growth. Space and timing for new construction is dependent upon completion of the EM Accelerated Cleanup campaign and ORNL's efforts at demolition of non-EM excess facilities; however, refurbishment and expansion of existing buildings can be accomplished regardless of the demolition schedules. Such upgrades are currently projected for the Building 3500 laboratories, 4501 and 4505 radiological capabilities, and an expansion of next-generation electron microscope laboratories at the new Advanced Microscopy Laboratory. Also in support of the consolidated nuclear facilities operations, new right-sized gaseous waste treatment and discharge systems are proposed for construction at each of the long-term strategic hot cell facilities (Buildings 3025E and 3525).

West Campus

The West Campus area has historically been the primary home to the ORNL Environmental Sciences Division, housed in a complex of seven laboratory and office buildings that were built during 1970–2000. In addition, the West Campus contains Building 1000, one of the original Manhattan District office buildings that houses ORNL engineering and other administrative staff. Recent developments in the West Campus have focused on consolidation of a significant portion of Life Sciences Division research staff into a grouping of four office/laboratory buildings and the construction of the Laboratory for Comparative and Functional Genomics (LCFG) to allow the transfer of ORNL's mouse colony from old research facilities at Y-12 to this new state-of-the-art vivarium (Fig. 6.7).

Fig. 6.7. Existing West Campus buildings.

The ultimate goal for the West Campus area is to develop it into a fully integrated and landscaped office and laboratory complex for conducting primarily environmental and life sciences research, similar in look, feel, and functionality to the new ORNL East Campus area. That goal will take several years to be realized.

Near-Term Actions: Several projects are under way for FY 2004 and early FY 2005 to begin the transformation of the existing complex of west-end buildings into an identifiable West Campus. The first project is refurbishment of the laboratories and greenhouses at Building 1506 to allow reuse of these underutilized assets. Following completion of this first project, another IGPP effort will provide the Bethel Valley Road limestone monolithic wayfinding sign that formally defines the West Campus as the Environmental and Life Sciences Complex. The final near-term action will be completion of design for the State-funded Joint Institute for Biological Sciences (JIBS), which is to become one of the key new West Campus facilities.

Plans for the Next Five Years: Within the next five years, planned major new construction and facility demolition will provide the critical next steps to West Campus development. 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 construction, Building 1000 demolition will be accomplished in preparation for the development of West Campus office and laboratory space for full Life Sciences Division consolidation into the West Campus.

Outyear Plans: As shown in Fig. 6.8, long-term development plans for the West Campus will consist of siting one key DOE Line Item research facility, establishing a landscaped quadrangle to tie the campus together, and appropriately expanding the parking lots to accommodate the population. The West Campus is a prime location for the DOE GTL Line Item, as well as other future life sciences or environmental initiatives.

The Office of Science GTL initiative is the Biological and Environmental Research (BER) program's major scientific thrust for the next 20 years. The GTL goals are to expand biological research into the next generation, focusing on understanding gene networks in complex molecules and microbial communities. To accomplish this goal, DOE intends to build four user facilities across the country, one of which (Facility III – Characterization and Imaging of Molecular Machines Facility) is being considered for siting at ORNL. The planning and competition for this $250M facility is just getting under way, with decisions expected to be made within this next five-year period. ORNL has prepared an initial conceptual design and siting study that shows a site in the West Campus near JIBS and the LCFG. The GTL facility is expected to be an approximately 100,000-ft^2 research laboratory and office complex for molecular biology, bio-physical characterization, bio-informatics, and mass spectrometry evaluation.

Fig. 6.8. Planned development for the ORNL West Campus.

The environmental setting for the West Campus facilities is expected to be greatly enhanced by a conscious decision to restore the stream-bank riparian zone along First Creek and emphasize native plantings throughout the landscaped quadrangle area.

7000 Area

The 7000 Area is the primary location for maintenance and logistics support services for operations at ORNL. The facilities in this area are generally more than 40 years old and house

key service locations for shipping/receiving new materials stores, vehicle fueling and maintenance, waste/chemical recycling, and a variety of carpentry and fabrication services shops. In addition, there are several warehouse buildings used for materials storage. Due to the service nature of these facilities and operations and their inefficient location far from the base of the ORNL research activities in the East/ Central/West Campuses, the long-term desire is to relocate the majority of these needed facilities into the Central Campus.

Near-Term Actions: The main actions in the near term are to consolidate operations from two buildings (7010 and 7055) into existing space, followed by demolition of these uncontaminated facilities using DOE SLI funds. This demolition effort will add 4800 ft^2 to the ORNL Space Bank in support of future construction activities.

Plans for the Next Five Years: In the five-year timeframe, one additional contaminated facility (7005) would be demolished, resulting in a 5400-ft^2 increase in the Space Bank. Also, depending on the rate of development of facilities and new staff additions at the SNS site, a new ORNL fire station would be sited near the 7000 Area in order to provide a more central location for emergency response to all ORNL facilities.

Outyear Plans: In the outyears, the TYSP for the 7000 Area will focus on consolidation of services into a smaller operating footprint and relocation of those services into the Central Campus. The timing and layout for such a move will be dependent upon the progress made by the EM Program in the demolition of inactive facilities in the heart of the ORNL Bethel Valley area. Once the 7000 Area is abandoned, but before demolition can be funded (expected to take 10–15 years), ORNL plans to construct a landscaped entryway at the 7000 Area along Bethel Valley Road that will hide that decaying industrial site from staff and visitors traveling this road. This entryway would consist of a raised berm between the road and the fence line, with fast-growing native plant and tree species to visually cover those old buildings rapidly.

6.4.2 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 some 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 eight- to ten-year scope of the accelerated cleanup campaign there. As discussed in Sect. 6.5, the long-term stewardship commitment by DOE-SC for those closure sites represents a significant legacy cost for ORNL.

HFIR/REDC Complex

As home to HFIR and the REDC, the HFIR/REDC complex is the most important of ORNL's current nuclear facility operations (Fig. 6.9). 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 used extensively by a wide variety of national laboratory, university, and industry staff on an annual basis for neutron scattering, isotope production, materials irradiation, and neutron activation analysis experiments. The REDC is a Category 2 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.

Fig. 6.9. Aerial photo of HFIR/REDC complex.

Near-Term Actions: In addition to the normal high-priority reactor and hot cell operations focus, several facilities upgrades and improvements are being funded in FY 2004. These include operational startup of the new Small-Angle Neutron Scattering (SANS) Guide Hall at HFIR, upgrades to the security entry point for the HFIR/TRU complex, and hot cell systems upgrades at Buildings 7920 and 7930. Numerous other expense-funded improvements to operating systems and deferred maintenance tasks are also under way.

Plans for the Next Five Years: The highest facilities development priorities for the next five years at HFIR are the construction of maintenance, warehouse, and reactor transition capabilities adjacent to the reactor building and the addition of research and support office space to replace existing temporary trailers. Similarly, the REDC needs in this five-year planning period also include the development of maintenance and warehouse space. Hence, combined multiprogram Maintenance and Warehouse Buildings are being proposed for a location compatible with the needs of both programs. 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 all Bethel Valley and SNS needs. Other improvements for the REDC in this five-year period would focus on nuclear consolidation activities from Bethel Valley facilities, as well as upgrades necessary to accommodate new program missions (e.g., the DOE Pu-238 Production Program).

Outyear Plans: Over the long term, the primary facilities needs for the HFIR/REDC complex center around four major areas: (1) establishment of a separate security entrance and research support building for the increasing national/international HFIR user community, (2) addition of a major new cold guide hall to the HFIR HB-2 beam line for expansion of research capabilities, (3) completion of hot cell consolidation upgrades at the REDC complex, and (4) development and construction of new liquid low-level waste and gaseous treatment capabilities for the HFIR/REDC facilities 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. 6.10.

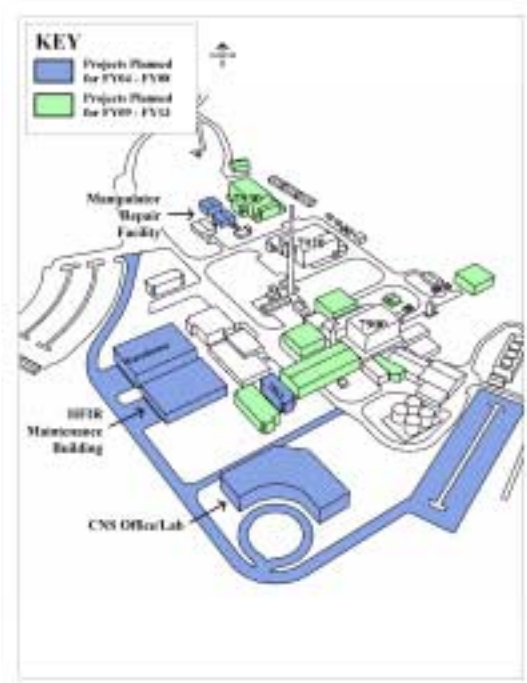

Fig. 6.10. Future site plan for the HFIR/ REDC complex.

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 ORNL's Robotics

Development Programs. In addition, warehouse space in the complex has housed the ORNL surplus sales operation for excess equipment and furniture release to the general public. As part of the UT-Battelle initiative to consolidate research operations at the main ORNL site, the decision has been made to transfer Fusion Energy Division staff and facilities from their current home at Y-12 into new and existing space in Bethel and Melton Valleys. In FY 2003, the majority of the Fusion Energy staff was moved into the Research Office Building in ORNL's East Campus. Completion of the program consolidation is dependent upon construction of new facilities and rehabilitation of existing space in the 7600 Area, resulting in this area becoming ORNL's Fusion/Robotics complex.

Near-Term Actions: In FY 2004, construction will be completed on a new multiprogram highbay facility (Building 7625) that will become the location for present and future fusion experiments and energy research experimental equipment (Fig. 6.11). Also occurring in FY 2004 is the relocation of surplus sales to a more publicly accessible off-site location and the rehabilitation of existing office and research support areas in Buildings 7601, 7602, and 7603 in preparation for future consolidation of Fusion Division staff.

Fig. 6.11. 7625 Highbay construction.

Outyear Plans: To meet the Laboratory Agenda long-term goals for Fusion Energy programs will require development of new experimental and pilot-scale facilities serving the international user community. The Fusion/Rebotics complex is being dedicated to providing the necessary infrastructure to support such a mission, however it may unfold in the ten-year planning period.

6.4.3 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. The SNS (Fig. 6.12) is 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 the top-priority science construction project within DOE-SC. At a total cost of $1.4 billion, construction began in FY 1999 and is scheduled for completion in FY 2006.

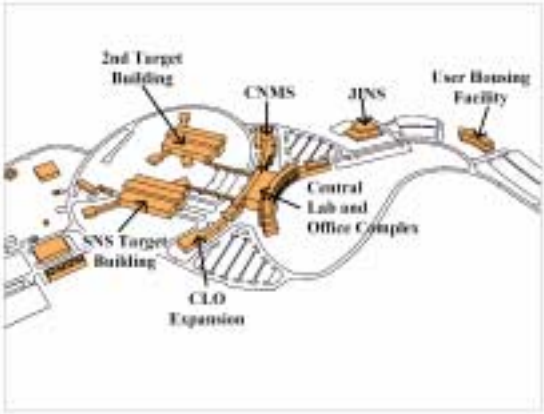

Fig. 6.12. SNS site layout and planned expansion of the Central Laboratory and Office (CLO) building and second target.

The SNS is scheduled to ramp up to high-power user operations by FY 2008, serving 1000–2000 users each year. Thus, its performance requirements, instrumentation needs, and supporting infrastructure are being determined in close collaboration with the scientific user community, including the five other collaborating national laboratories (Argonne, Brookhaven, Jefferson, Lawrence Berkley, and Los Alamos).

The location of the SNS on an expandable 80-acre Chestnut Ridge site and its great

capabilities as a flexible, high-energy scientific machine for materials investigation make this an attractive site for other ORNL science programs and facilities consolidation. Initiatives in advanced materials and biological research are currently being planned and implemented for the Chestnut Ridge site.

Near-Term Actions: Certainly, the primary activities on Chestnut Ridge are the construction of the SNS facilities, the installation of associated complex equipment, and activities associated with the experimental checkout and startup of the systems. At this time, construction is approximately 80% complete, and early linac and companion system tests are proceeding on schedule. In addition, the CNMS, a $65M FY 2002 Line Item for construction of a national user facility for nanoscale materials research, is being built adjacent to the central laboratory and office complex of the SNS (Fig. 6.13). This 80,000-ft^2 laboratory and office building will leverage the neutron investigative capabilities at the SNS, as well as the two other nearby ORNL world-class neutron science facilities at the HFIR and HRIBF. The CNMS is scheduled for construction completion in FY 2005.

Fig. 6.13. Aerial view of the Center for Nanophase Materials Sciences construction.

Plans for the Next Five Years: Expansion of research and support capabilities on Chestnut Ridge in the next five years is expected to focus on development of user support facilities for the operating SNS and CNMS. In support of the anticipated need for large external user community access to the SNS and CNMS facilities, two alternative-financed facilities are planned for construction completion by FY 2007. An $8M State of Tennessee funded Joint Institute for Neutron Sciences (JINS) is being designed for construction in close proximity to the SNS CLO Building and will provide researcher collaboration space, team suites, offices, and small classroom/lecture space for interaction with the wide variety of university and industry participants in research at the site. Similarly, to provide on-site ready access to round-the-clock experiments, a limited-scope User Housing Facility is being proposed for private sector financing and development. 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.

Outyear Plans: 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, with a beam power in the 3- to 4-MW range. To accommodate this projected need, Power Upgrade and Long Wave Length Target Station projects are being proposed for design start in the FY 2007 time frame, with completion of full capacity by FY 2013.

6.4.4 Off-Site Locations

Now that the first phase of ORNL staff consolidation has been accomplished, there are very few locations off the main ORNL site where research and support staff still reside. There is only one leased office building (1060 Commerce Park) in Oak Ridge, housing some 130 Life Sciences researchers and ORNL administrative staff. These staff members are expected to be brought back to the ORNL site within two years and that lease arrangement discontinued. At this point, there will be only two permanent off-site locations of significant ORNL operations or responsibility: the NTRC and the ORNL facilities of the Y-12 site, both described as follows.

National Transportation Research Center

The NTRC (Fig. 6.14) is a joint venture of ORNL, the 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. The NTRC programs are housed in a recently constructed, leased, 85,000-ft^2 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.

Fig. 6.14. The proposed expansion at the National Transportation Research Center.

Near-Term Actions: Due to expanding research missions, plans are under way to expand the research laboratory capabilities at the NTRC. A request for lease expansion is being issued by DOE to the current landlord (Pellissippi Investors) asking them to construct and lease back these new facilities for ORNL use. The NTRC annex would include up to four additional engine test cells, other support laboratories and control rooms, and office space, within a 40,000-ft^2 structure. The current schedule has the design being initiated in FY 2005, with occupancy in early FY 2007.

Outyear Plans: 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 ten-year planning horizon.

ORNL Facilities at the Y-12 Site

At the beginning of the ORNL Facilities Modernization Initiative in FY 2000, four research divisions were occupying over 1 million square feet of space at the Y-12 site (Fig. 6.15). Since that time, essentially all of the staff of those divisions have been consolidated at the main ORNL site and NTRC, so that only the Fusion Energy main research laboratories remain to be moved. This consolidation effort has been a huge undertaking, involving over $20M in ORNL investments to relocate staff and equipment, as well as place excess facilities in safe shutdown mode to allow for disconnecting utilities or transferring facilities to NNSA for their use.

Since FY 2002, 224,000 ft^2 of space has been transferred to NNSA, 225,000 ft^2 of space has been transferred operationally to NNSA, and 445,000 ft^2 placed in cheap-to-keep mode awaiting final remediation. The only facilities remaining as operating buildings under ORNL control are Alpha-2 (9201-2), where Fusion Energy experiments reside, and Beta-3 (9204-3), where Nuclear Energy remains as landlord for that standby calutron facility.

Near-Term Actions: Actions at Y-12 in FY 2004 include completion of the final moves of Life Sciences staff and equipment from the original Mouse House (Buildings 9210 and 9224) and disconnection of these facilities from all utilities. Also completed was the operational transfer of Beta 1 (9204-1) and Building 9401-1 to BWXT/NNSA for their mission use. ORNL and DOE-SC still retain ownership of these buildings, but all operational costs, utilities, and maintenance are borne by BWXT. Conditions for return of these building to DOE-SC are defined in a formal Memorandum of Understanding (MOU).

Fig. 6.15. Many ORNL facilities at Y-12 have been demolished or vacated.

Plans for the Next Five Years: The primary focus at Y-12 in the next few years is to complete all Fusion Energy Division moves to the main ORNL site and to place the Alpha-2 building in a safe standby mode. At that point, there will be no active ORNL research presence at the Y-12 site, and disposition of the inventory of remaining facilities becomes a long-term DOE-SC, NNSA, and U.S. Department of Energy Nuclear Energy (DOE-NE) programmatic decision. ORNL does not plan to expend funds beyond the five-year period in support of these buildings.

6.4.5 Oak Ridge Reservation

The ORR offers unparalleled resources for ecosystem-level and large-scale research within a 20,000-acre outdoor laboratory. The large, fairly undisturbed land area, existing road and utility infrastructure, and restricted access that protects field equipment provide critical field research components. Locations of future field research areas and facilities are shown in Fig. 4.9.

Future field research areas and facilities include:

- Ecosystem and Global Studies Research Area
- Ecosystem Response Detection and Forecasting
- Homeland Security Field Facilities
- National Ecological Observation Network
- National Transmission Technology Research Center Facilities
- SensorNet Nodes
- National Calibration Site for Geophysical System Testing

Ecosystem and Global Studies Research

Experimental facilities will be developed to alter precipitation input across an environmental gradient, test ongoing development of genomic approaches for ecological research, conduct experiments on the control of biological invasions, and expand the scale and scope of an ongoing multifactor manipulation of an old-field ecosystem.

Near-Term Actions: The infrastructure support needed for this field research facility includes minor road improvements and maintenance, extension of electric power at least to the barn at the base of the Freels Bend loop road, and the capability to store field equipment and provide protection for researchers and students from storms, including installation of a lockable storage shed.

Ecosystem Response Detection and Forecasting

The ORR will be an important component of the Ecosystem Response Detection and Forecasting Initiative, which is also part of the ORNL agenda. New methods to detect changes in ecosystems at the physiological and genomic levels brought on by natural and human events will be developed.

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 two years.

Outyear Plans: Field research on the ORR is planned to begin within the next three years.

Homeland Security Field Facilities

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

National Ecological Observation Network

This program, sponsored by the National Science Foundation, is a continental scale research instrument to enable studies on major environmental challenges at regional to continental scales. ORNL, working with a consortium of southeastern research institutions and agencies, is providing leadership for a regional NEON from the Southern Appalachians to the Ozarks for which the ORR will be a key component.

Near-Term Actions: This initiative will need significant access to the entire ORR for research sites related to measurement systems. Utilities, roads, and the preservation of undisturbed areas will all be important.

Outyear Plans: This initiative is still in the planning stages. No field sites are anticipated for at least two years. However, within three to four years, initiation of field research on the ORR is planned.

National Transmission Technology Research Center

This project will expand testing capabilities of the NTTRC to include at-voltage testing of overhead conductors, indoor testing of advanced conductors to provide a more controlled environment, 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 (such as American Superconductor and Southwire) and utilities (such as TVA and Duke) on proposals that would significantly expand the role of the NTTRC at ORNL. These proposed projects include:

- PCOT Facility
- Very Low Impedance (VLI) Cable Project
- Indoor PCAT Facility
- TPET Facility

Near-Term Actions: The DOE OETD 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.

SensorNet

The SensorNet networking infrastructure will be a common data highway for the near-real-time intelligent collection, processing, and dissemination of sensor data to include, but not be limited to, CBRNE sensors, meteorological instruments, and other sensors (e.g., video cameras, air quality, environmental, and disease tracking).

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

National Calibration Site for Geophysical System Testing

As a result of an August 2004 demonstration for the DoD of an ORNL-developed airborne system at the Freels Bend area, the DoD has recommended that ORNL develop a national calibration test site at Freels Bend and has committed FY 2005 funding to ORNL for geophysical system testing and evaluation at this site.

Near-Term Actions: ORNL staff will continue to work with DOE, DoD, and TWRA in the use of the Freels Bend area as a national calibration test site. This will be done in a manner to minimize impact on TWRA wildlife management objectives for the area while ensuring calibration and testing needs are met.

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 the buffering areas around these sites, is essential (e.g., the land comprising and surrounding the Global Change Field Research Facility, Walker Branch Watershed, Melton Branch Field Facility, Park City Soil Carbon Experiment, Natural and Accelerated Bioremediation Research, and Enriched Background Isotope Study sites). Future research initiatives include those working with TWRA on global climate change research and geophysical system testing within the Three Bend Scenic and Wildlife Refuge, homeland security initiatives, and large blocks of land for the NEON and Ecosystem Response Detection and Forecasting 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 NOAA towers, eliminating access to research or monitoring areas, and fragmentation of forest blocks through widening roads or putting in new ones.

6.4.6 Site-Wide Utilities and Infrastructure

In addition to programmatic and landlord facility needs, site-wide utilities and infrastructure are also critical components of the operation of the Laboratory. This infrastructure includes standard industrial complex systems like electrical distribution; potable water, stormwater, and wastewater systems; chilled water and steam distribution systems; roads; and parking lots. For a high-tech research campus of ORNL's caliber, the information technology (IT) infrastructure is equally important, covering computing networks, communications systems, administrative/operating systems, and cyber security measures. Strategic planning in each of these primary infrastructure areas is being conducted, and maintenance/modernization activities are being planned during the TYSP period of performance as described below. Details of the large site-wide utilities systems are provided in the *ORNL Utilities Complex Ten-Year Management Plan*, including systems descriptions and network maps. Similarly, for the IT systems, a recent Strategic Plan has been completed and contains the details of the system needs.

Near-Term Actions: From a utilities and physical infrastructure perspective, the priorities in the near term are on (1) replacement of the primary electrical substation and 161-kV feeder lines into the main ORNL campus and (2) completion of parking lots, roads, and pedestrian walkways in support of the new East Campus facilities. Recent efforts in the East Campus area have provided basic improvements to natural gas, potable water, stormwater, and sanitary waste collection systems in that part of the site. The primary need now is to bring on line the final new parking lot at the SIOU site to alleviate the highly constrained parking capacity problems around the new buildings. This new lot will allow full implementation of the open campus parking strategy, with free and open access to lots "inside the fence" near ORNL research facilities. An ORNL electrical services capacity increase is being proposed that includes distribution lines and substation replacement. Planning is under way with TVA that utilizes the implementation model successfully followed at the SNS facility.

The IT Strategic Planning efforts over this past year have identified numerous software, hardware, and process improvements that need to be accomplished in the next few years to keep ORNL current with system advances throughout the world. Improvements are being planned in each of six critical focus areas:

- scientific and technical computing infrastructure,
- user facilities,
- IT support infrastructure,
- network and communications infrastructure,
- cyber security, and
- administrative and operations applications.

Some 25 technology or system-specific IT projects have been identified for implementation in the near term to be followed by sustained improvements in all other areas.

Plans for the Next Five Years: The focus of utilities and physical infrastructure improvements over the next five years will be on upgrades to the sewage treatment plant, the potable water reservoir, parking lots and roadway improvements to support continued modernization initiatives, and upgrades to chilled water distribution systems in priority areas. These projects are all slated for GPP/IGPP or private sector funding. In addition, priority information technology upgrades to operating systems, networks, and infrastructure will be accomplished, primarily through operating and GPE funds.

Outyear Plans: Outyear infrastructure needs will be highly dependent upon the scope of programmatic growth and new facilities development needs, but clearly the aging electrical and potable water distribution systems throughout the plant will require major upgrades within the ten-year planning horizon. Similar needs exist for steam condensate return systems, steam plant operational upgrades, Laboratory-wide cell ventilation systems improvements, and routine upgrades and investments in information technology.

6.5 Summary of Resource Needs

Achieving the vision of the fully revitalized 21st Century ORNL research campus outlined in Sect. 6.4 will require a significant investment of capital and operating funds over the TYSP planning period. Initial scoping of those resource needs was provided in the ORNL budget submittal for FY 2006–FY 2010 (see Table E.1 in Appendix E). However, as the resource baseline for this TYSP, DOE-SC guidance directed that a constrained baseline case be provided. That constrained baseline case is presented in Table E.2, Appendix E, and includes project-level budget detail by year for Capital Line Items (Landlord and Programmatic), GPPs (Landlord and Programmatic), IGPPs, and Operating Expense (Excess Space Elimination, Nuclear Facilities Consolidation, and the Future Liabilities program). This constrained baseline case responds to the DOE-SC requirement that GPP, SLI construction, and SLI Excess Facilities Disposition funding remain level at FY 2004 budget values through FY 2010. As would be expected, no-growth budget levels for the next five-year period do not support an aggressive facilities revitalization program. In fact, no-growth budgets would continue to allow the deferred maintenance backlogs to grow, excess space to remain a maintenance burden by preventing demolition, and existing research facilities and supporting utilities to age and become higher risks for ES&H compliance concerns. An order of magnitude picture of these needs versus the constrained baseline scenario is provided in Fig. 6.16.

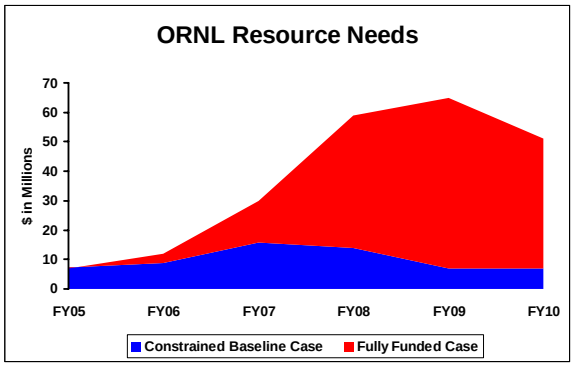

Fig. 6.16. Projected resource needs for ORNL revitalization far exceed the constrained baseline case.

While the ORNL Master Plan described in this TYSP provides the infrastructure the ORNL Leadership Team envisions to meet Laboratory Agenda objectives, this Master Plan is not realistic under DOE constrained budgets. ORNL has been quite successful in leveraging alternate funds (State of Tennessee and private sector) for implementation of the first phase of the Laboratory's revitalization efforts and plans two additional facilities for construction over the next few years using that innovative financing approach (Table 6.1). However, the many needed facility upgrades outlined as high-priority in the next five years are not appropriate for alternate financing due to their specific mission requirements, locations in secure or

Table 6.1. Alternative financed projects

Status	Project	Source Funding	Completion
Completed	Joint Institute for Computational Sciences and Oak Ridge Center for Advanced Studies	State	FY 2004
	Computational Sciences Building	Private	FY 2003
	Engineering Technology Facility	Private	FY 2003
	Research Office Building	Private	FY 2003
Planned	Multiprogram Research Facility	Private	FY 2006
	Joint Institute for Biological Sciences	State	FY 2006
	TVA Primary Substation	TVA	FY 2006
	User Housing Facility	Private	FY 2006
	Joint Institute for Neutron Sciences	State	FY 2007
Proposed	Chilled Water System Improvements and Sanitary Waste Treatment Plant	BPA	FY 2006

contaminated buildings, or other commercial financial constraints. Table 6.2 identifies the primary impacts on facility development plans resulting from the DOE-constrained budget case. As fiscal year budgets become firmly established, the impacts of delayed upgrades must be weighed against mission needs to determine what internal shifts or congressional priority changes must be implemented to meet those needs.

Table 6.2. Primary ten-year site plan facilities impacts from reduced baseline Landlord funding levels in FY 2006–FY 2010

Campus area	Project delayed
East Campus	4500 South, Wing 4, Research Lab Upgrade (LI) Building 5505 Upgrades for Rad Lab Consolidation (LI) Building 5500 Upgrades for ESH&Q Consolidation (GPP)
Central Campus	Liquid/Gaseous Waste Systems Upgrades to Support Nuclear Facilities Consolidation (LI) Building 4501 Upgrade for Rad Lab Consolidation (LI) Demolition of Buildings 2000/2001 Building 3500 Renovation (LI)
West Campus	No major impacts
7000 Area	New Fire Department Headquarters (GPP)
HFIR Area	7900 Complex Maintenance and Warehouse Building (GPP) Manipulator Repair Facility (GPP)
7600 Area	No major impacts
SNS Site	No major impacts
NTRC	No major impacts
ORNL at Y-12	No major impacts
ORR	No major impacts
Site-wide utilities/ infrastructure	Potable Water System Upgrades – Main Plant (LI) Laboratory Vent System Upgrades – Main Plant (LI) Upgrades of 3000/4000 Area Substations (GPP)

Appendix A: ORNL Facility Summary Overview

Table A.1. ORNL space distribution (operating facilities) FY 2004

Location	Buildings		Trailers		Total space, ft^2
	Number	Space, ft^2	Number	Space, ft^2	
ORNL main site					
UT-Battelle (SC)	255	2,786,752	28	25,706	2,812,458
UT-Battelle (SC-SNS)	11	380,757	6	8,640	389,397
UT-Battelle (NE)	2	62,726	–		62,726
Bechtel Jacobs (EM)	75	205,699	29	36,248	241,947
Leased on-site	4	417,401	1	5,500	422,901
Subtotal, ORNL main site	**347**	**3,853,335**	**64**	**76,094**	**3,929,429**
ORNL off-site					–
Museum (AMSE)	3	56,583	1	552	57,135
ORNL at Y-12	7	561,118	1	680	561,798
Leased off-site	3	114,894	–	–	114,894
Total	**360**	**4,585,930**	**66**	**77,326**	**4,663,256**

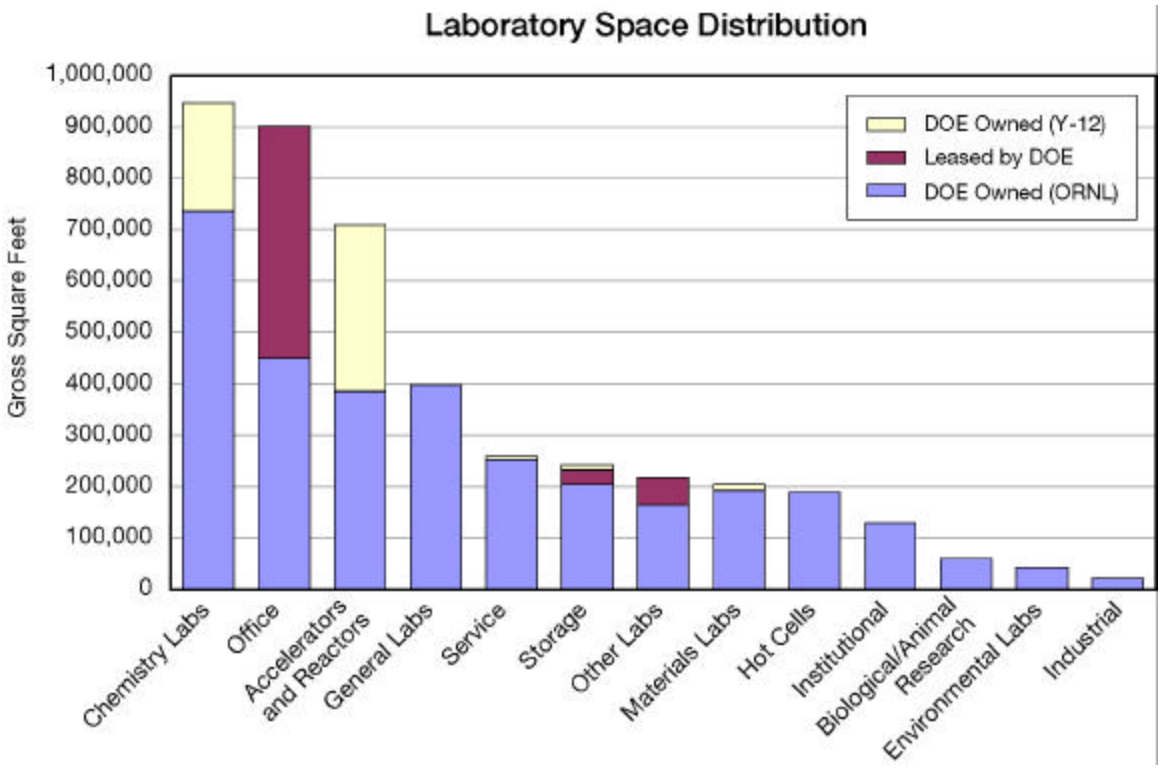

Fig. A.1. Laboratory space distribution by facility type.

Table A.2. ORNL statistical summary (SC only)

Description	ORNL (X-10)	ORNL (Y-12)
Total Building Space (gross ft^2)	3,224,092	561,118
Buildings:	269	7
Largest Occupied Building (gross ft^2): 4500N	342,812	324,448
Trailers, number of:		
Real Property	0	
Personal Property	36	1
Wooden Buildings	15	1
Excess Facilities:		
Uncontaminated	25	5
Contaminated	17	8
Excess Building Space Removed in FY04 (gsf)	23,999	1202
Replacement Plant Value (RPV): Current Total *	$3,307,802,774	
Programmatic (OSF 3000 category)	$2,093,526,430	
Non-Programmatic (used for calculating Indices)	$1,214,276,344	
Buildings	$624,470,435	
OSF	$589,805,909	
* excludes personal property trailers and excess facilities FY06 or earlier		
Landlord Program	Office of Science	Office of Science
Age of Buildings: Average	32 years	59 years
% of space older than 40 years	45.10%	94.4%
% of space 30 years or younger	42.20%	0.57%
Maintenance Investment & Maintenance Investment Index (MII)	(Buildings Only)	
FY 04 (projected)	$19.1M (3.05%)	
FY 05 (based on maint in FY 06 IFI Submission)	$19.6M (3.14%)	
FY 06 (based on maint in FY 06 IFI Submission)	$20.2M (3.23%)	
FY 07 (based on maint in FY 06 IFI Submission)	$20.8M (3.33%)	
Deferred Maintenance (DM) Trend *		
DM 2003	$124,137,958	
DM 2004	$159,147,854	
DM 2005 (estimate)	$163,922,290	
DM 2006 (estimate)	$168,839,958	
* includes bldgs & non-programmatic OSF and excludes excess facilities FY06 or earlier		

(continued on the following page)

Table A.2. ORNL statistical summary (SC only) (continued)

Description	ORNL (X-10)	ORNL (Y-12)
Total Summary Condition (DM+RIC) *	$190,979,854	
Deferred Maintenance (DM)	$159,147,854	
Rehab and Improvement Cost (RIC)	$31,832,000	
* includes bldgs & non-programmatic OSF and excludes excess facilities FY06 or earlier		
Total Summary Condition Index (TSCI): (percent of Total RPV)	0.16	
Facility Condition Index (FCI): (Based on DM)	0.13	
Rehab & Improvement Cost Index (Based on RIC)	0.03	
ACI (Asset Condition Index from RPAM Order) (1-FCI)	0.84 (Fair)	
AUI (Asset Utilization Index from RPAM Order)	0.98 (Excellent)	
Leased Building Space:		
Square footage: Total	532,295	
Number of Buildings	7	
Annual Lease Costs:	$9,064,912	
All data values are for operating buildings marked with a "1" in the FIMS status field unless otherwise noted.		

Table A.3. Estimated replacement plant value (RPV) for ORNL main site (SC only)
(in millions of dollars)

Facility type	Replacement cost
Buildings and trailers	628
Utilities, transportation, and communications systems	558
Programmatic science facilities	2,095
All other	37
Total	**3,318**

Summary of RPV Activity for FY 2004
ORNL Main Site Only

	Date of FIMS data used for calculations			
	11/5/2003	[1]5/17/2004	[2]8/5/2004	[3]9/30/2004
Building RPV *	$ 645,794,775	$ 523,453,532	$ 523,453,532	$ 624,470,435
OSF RPV *	$ 433,738,149	$ 433,738,149	$ 525,738,149	$ 589,805,909
Total	$ 1,079,532,924	$ 957,191,681	$ 1,049,191,681	$ 1,214,276,344

FY 2004 Activity	
[1] Decrease in RPV resulting from RPV model update in May 2004	$ (122,341,243)
RPV for demolished buildings	$ (1,560,482)
RPV for new facilities added during the FY	$ 82,602,945
RPV increase for adjusting building excess year dates	$ 19,974,440
Net change in building RPV	$ (21,324,340)
Net increase in OSF RPV (OSF population initiative)	$ 156,067,760
Total RPV increase for building and OSF for FY04	**$ 134,743,420**

Assumptions:

* Excludes personal property trailers and excess buildings and excess OSF prior to FY 2006.

[1] Decrease in building RPV as a result of FIMS HQ administration updating the RS Means unit cost values for RPV Models on May 5, 2004.

[2] SC agreed to baseline Changes in Conventional Facilities RPV for FY06. Estimate for missing RPV in Other Structures. $92,000,000 was added to OSF RPV.

[3] Increase in RPV: Resulting from population of all OSF records and the addition of new building for SNS other ORNL buildings.

Appendix B: Mission-Essential Facilities

Table B.1. Mission-essential facilities*

Complex	ID	Name	Type	Exc	Exc Yr	Prog	Usage Code	St	GSF	RPV	Summary Cond	FY03 Act Maint	Req Maint	Def Maint	Year Built
Central	5500	High Voltage Accel Lab	B	N		SC	785	1	51,368	16,216,860	Poor	558,396	511,159	6,762,755	1952
Central	5002	Guest Users Facility	B	N		SC	101	1	7,075	646,852	Excellent	54,288	49,696	3,268	1993
Central	5000	Main Portal	B	Y	2004	SC	641	1	4,000	434,620	Excellent	54,450	49,844	4,333	1952
Central	4515	High Temp. Materials Lab	B	N		SC	751	1	67,395	27,106,396	Excellent	351,729	321,975	3,325	1987
Central	4512	Lab Emer. Response Center	B	N		SC	642	1	5,613	577,101	Excellent	88,402	80,924	6,120	1987
Central	4508	M&C Laboratory	B	N		SC	751	1	93,912	37,771,584	Fair	635,973	582,173	6,073,320	1962
Central	4505	Exper Eng	B	N		SC	711	1	37,440	11,544,544	Fair	118,182	108,184	2,783,618	1951
Central	4500S	Cen Res & Admin. South	B	N		SC	711	1	324,654	94,541,167	Fair	1,984,866	1,816,957	9,633,553	1953
Central	4500N	Cen Res & Admin. North	B	N		SC	711	1	342,812	28,634,192	Fail	2,285,486	2,092,146	18,727,995	1952
Central	4007	Security and Counter Intelligence Office	B	N		SC	101	1	6,924	633,046	Excellent	36,128	33,072		1994
Central	3012	Rolling Mill	B	Y	2009	SC	751	1	8,431	3,390,964	Poor	2,209	2,022	1,894,848	1947
East	7740	Radio Trans. Fac. (Melton	B	N		SC	694	1	543	31,234	Excellent	21,161	19,371		1964
East	7735	Rad Calibration Lab	B	Y	2011	SC	704	1	2,800	883,959	Excellent	728	666	11,148	1988
East	7712	Dosar Low-Eng Accelerator	B	Y	2011	SC	704	1	1,025	323,592	Good	728	666	15,740	1963
East	7710	Dosar Fac-Hprr	B	Y	2011	SC	101	1	8,432	770,919	Fail	107,783	98,665	841,940	1962
East	7709	Health Physics Research Reactor	B	Y	2011	SC	783	1	3,784	1,570,000	Fair	486	445	301,718	1962
East	7608	Component Dev-R&Ps	B	N		SC	703	1	533	168,268	Fail	2,105	1,927	852,915	1965
East	7606A	Robotics R&D Lab	B	N		SC	591	1	7,396	1,127,782	Good	223,145	204,268	34,320	1962
East	7605	Storage Building	B	N		SC	400	1	11,866	682,554	Adequate	10,564	9,670	52,010	1954
East	7604	Utility Building	B	N		SC	400	1	4,250	244,468	Adequate	1,820	1,666	19,758	1965
East	7603	Robotic Sys. Lab	B	N		SC	703	1	22,483	7,097,875	Poor	267,854	245,195	2,723,648	1965
East	7601	R&Ps Division Offices	B	N		SC	101	1	28,879	2,640,344	Adequate	322,472	295,193	210,618	1965
East	7077	Grounds & Laborers Building	B	N		SC	601	1	4,380	668,740	Excellent	71,981	65,892	68	1990
East	7069	Gas Service Facility	B	N		SC	694	1	102	5,867	Fail	4,615	4,225	7,378	1971
East	7067	Com Gas Hoses & Reg	B	N		SC	601	1	784	119,701	Excellent	30,059	27,516		1965
East	7058	Machine Auxiliaries Strg	B	Y	2005	SC	400	1	1,008	57,982	Fair	4,079	3,734	9,838	1959
East	7035	Vacuum Asbestos Equip. Cleaning Fac.	B	N		SC	400	1	558	32,097	Good	5,205	4,765	1,163	1977
East	7033	Electrical Material Strg.	B	Y	2005	SC	400	1	5,500	316,370	Adequate	243	222	26,533	1977
East	7022	Lamp Recycle Facility	B	N		SC	450	1	1,200	69,026	Fair	294	269	9,515	1965
East	7021	Fab Equip Storage	B	Y	2011	SC	400	1	1,464	84,212	Fail	3,522	3,224	58,700	1964
East	7018	Salvage & Reclam Fac	B	N		SC	400	1	22,600	1,299,994	Poor	80,254	73,465	424,808	1959
East	7015	Metal Storage & Cut Fac.	B	Y	2004	SC	601	1	7,480	1,142,050	Poor	13,472	12,332	378,728	1960
East	7013	Acid Chem & Flam Liq Stg	B	N		SC	410	1	7,296	2,248,283	Good	11,798	10,800	97,628	1954
East	7012	Central Mechanical Shops	B	N		SC	611	1	30,036	4,904,136	Fair	175,125	160,310	505,200	1953
East	7009	Carpenter Shop	B	Y	2004	SC	601	1	9,300	1,419,928	Good	62,842	57,526	47,523	1947
East	7007	Paint Shop	B	Y	2010	SC	601	1	3,461	528,427	Fair	40,759	37,311	71,843	1947
East	7005	Lead Shop	B	Y	2007	SC	607	1	5,406	825,390	Adequate	33,597	30,755	62,588	1947
East	7003	Welding & Brazing Shop	B	Y	2010	SC	601	1	5,433	829,513	Poor	31,987	29,281	349,685	1947
East	7002	Garage & Ironwrkg Shop	B	N		SC	621	1	28,139	2,257,062	Poor	220,275	201,641	677,568	1947
East	7001	General Stores	B	N		SC	400	1	37,144	2,136,592	Poor	172,110	157,550	736,120	1948
East	6025	Eng Physics Office Bldg	B	N		SC	101	1	19,998	1,828,373	Adequate	78,898	72,224	124,828	1967
East	6012	Computer Science Research Fac.	B	N		SC	101	1	9,063	828,610	Excellent	15,305	14,010	5,168	1990
East	6011	C&Td Office_Building	B	N		SC	101	1	16,410	1,500,330	Excellent	49,450	45,267	12,148	1989
East	6010	Orela	B	N		SC	785	1	52,432	16,552,764	Good	174,412	159,658	421,683	1969
East	6008	Joint Inst-Heavy Ion Res	B	N		SC	101	1	5,148	470,670	Adequate	364	333	43,878	1984
East	6007	Joint Institute For Hir	B	N		SC	300	1	4,290	479,468	Fair	850	778	55,050	1983
East	6000	Hhirf	B	N		SC	785	1	111,991	35,355,519	Good	553,588	506,757	1,026,283	1961
East	5510	Mass Spectrometry Laboratory	B	N		SC	711	1	6,164	1,900,656	Excellent	115,548	105,773	26,655	1989
East	5507A	RDTE Facility	T	N		SC	711	1	522	18,698	Excellent	243	222		1990
East	5507	Electron Spectrometer Fac	B	N		SC	711	1	2,352	725,234	Adequate	1,759	1,610	67,533	1969
Excess	7600	Containment Building	B	Y	2003	SC	769	C	107,922	41,327,492	Excellent	3,718	3,403		1960
Excess	3550	Research Lab Annex	B	Y	2002	SC	101	4	14,036	1,283,281	Applicable	194	178		1943
Excess	3508	Elect. Services	B	Y	2001	SC	731	4	13,863	4,376,544	Applicable	61	56		1951
Excess	2088	Emerg Generator B 2000	B	Y	2001	SC	694	4	161	9,261	Applicable	61	56		1948
Excess	2011	Electric & AC Service Center	B	Y	2003	SC	759	C	6,636	2,669,012	Fair	12,967	11,870	329,110	1943
Excess	2000	Solid St. Lab & Qual Assur/Ins	B	Y	2000	SC	751	4	22,660	9,113,895	Applicable	13,404	12,270		1948
Museum	4	Age of The Automobile Exhibit	B	N		SC	400	1	1,183	5,000	Excellent	257,834	3,000		1980
Museum	3	Solar Energy House	B	N		SC	292	1	1,200	94,381	Adequate	3,000	12,000	8,000	1981
NNFD	7936	Storage Bldg for REDC	B	N		SC	759	1	3,145	1,204,342	Excellent	1,271	1,163		1993
NNFD	7934	Volume Reduction Facility	B	N		SC	400	1	2,500	143,805	Excellent	4,922	732		1984
NNFD	7932	Waste Sample Bldg. (7930)	B	N		SC	571	1	162	24,703	Fail	3	3	15,290	1968
NNFD	7931	Emerg Gen Bldg For B7930	B	N		SC	694	1	330	18,982	Fair	22,889	20,953	3,993	1968
NNFD	7930	Thorium-U Recycle Fac	B	N		SC	782	1	67,188	38,015,396	Fair	323,668	340,000	6,304,275	1968
NNFD	7920	Transur. Proc. Facility	B	N		SC	782	1	34,820	19,701,377	Fair	354,142	1,230,000	3,542,015	1966
NNFD	7918	REDC Office & Training Facilit	B	N		SC	101	1	7,211	659,286	Excellent	66,857	61,201	240	1992
NNFD	5505	Transuranium Research Lab	B	N		SC	712	1	22,560	6,956,328	Adequate	402,891	217,000	501,475	1968
NNFD	4501	Radiochemistry Laboratory	B	N		SC	792	1	80,973	24,967,852	Fair	615,806	180,000	4,093,605	1951
NNFD	3525	High-Rad Level Exam Lab.	B	N		SC	782	1	27,000	15,276,771	Poor	233,019	790,000	6,097,170	1963
NNFD	3502	East Res Service Ctr	B	N		SC	601	1	11,144	1,701,471	Fair	122,868	120,000	346,060	1950
NNFD	3104	West Complex Maintenance Shop	B	N		SC	601	1	7,500	1,145,103	Fair	82,415	160,000	136,358	1961
NNFD	3074	Interim Manipulator Repair Fac	B	Y	2009	SC	601	1	3,760	574,078	Fair	55,251	85,000	60,548	1951
NNFD	3047	Isotope Technology Bldg	B	Y	2007	NE	782	1	25,535	14,447,865	Good	166,945	1,000,000	573,213	1962
NNFD	3037	Chemical Technology Offices	B	Y	2004	SC	101	1	8,008	732,154	Poor	127,914	117,093	187,840	1951
NNFD	3027	Safeguard (SMN) Vault	B	N		SC	412	1	3,478	765,346	Fair	7,880	12,000	84,245	1980

*Note: All facilities **not** intended to be removed from the active facilities list (by transfer, safe shutdown, or demolition) are designated as “Mission Essential” in this *Ten-Year Site Plan*.

Table B.1. Mission-essential facilities (continued)*

Complex	ID	Name	Type	Exc	Exc Yr	Prog	Usage Code	St	GSF	RPV	Summary Cond	FY03 Act Maint	Req Maint	Def Maint	Year Built
NNFD	3025E	Sol-State Lab & Hot Cells	B	N		SC	782	1	18,845	10,662,620	Adequate	28,036	775,000	799,560	1950
NNFD	3019A	Radiochemical Development Facility	B	N		A	782	1	37,191	21,042,903	Fair	404,086	760,000	2,390,000	1944
Nuclear	7962	Neutron Users Office	B	N		SC	101	1	6,850	626,280	Excellent	82,477	75,500		1988
Nuclear	7955	Sentry Post No. 19A	B	N		SC	641	1	42	4,564	Excellent	1,550	1,419	50	1981
Nuclear	7917	Research Reactors Office Bldg.	B	N		SC	101	1	14,667	1,340,972	Excellent	260,970	238,893	315	1990
Nuclear	7910	Office Bldg For 7900	B	N		SC	101	1	13,926	1,273,224	Excellent	300,363	274,954	24,735	1965
Nuclear	7903	Cooling Twr Equip Bldg	B	N		SC	694	1	640	36,814	Poor	61,454	56,255	21,090	1965
Nuclear	7901	Elec Bldg For 7900	B	N		SC	694	1	3,055	175,729	Fair	20,484	18,751	30,900	1965
Nuclear	7900	Hi Flux Isotope Reac Fac	B	N		SC	783	1	63,762	26,510,000	Adequate	131,155	120,060	2,029,043	1965
SNS	8300	Klystron Gallery - 8300KL	B	N		SC	785	1	35,000	11,049,488	Excellent	158,000	158,000		2002
SNS	8200	Linac Tunnel - 8200LN	B	N		SC	785	1	15,485	3,505,907	Excellent	158,000	158,000		2002
SNS	8100	Front End Building - 8100FE	B	N		SC	785	1	12,357	2,797,707	Excellent	159,000	159,000		2002
Utilities	7921	Emerg Gen Bldg (For B7920	B	N		SC	694	1	546	31,407	Fail	1,915	1,753	182,493	1966
West	3606	I&C Office Bldg	B	N		SC	101	1	5,261	481,002	Poor	45,637	41,776	162,050	1983
West	3587	Mail Services Building	B	Y	2007	SC	694	1	5,473	835,620	Poor	11,622	10,639	294,490	1950
West	3546	CCSD Office Building	B	N		SC	101	1	7,400	676,566	Fair	16,126	14,762	79,130	1976
West	3523	Expensed Bench Stock Building	B	Y	2005	SC	400	1	1,176	67,646	Poor	12,339	11,295	35,030	1954
West	3504	Geosciences Lab	B	Y	2005	SC	101	1	3,952	361,323	Poor	107,393	98,308	109,530	1951
West	3503	High Rad Lvl Chm Eng Lab	B	Y	2004	SC	782	1	13,716	7,760,600	Good	36,559	33,466	365,390	1948
West	3500	I&C Building	B	N		SC	731	1	72,068	22,751,842	Poor	437,438	400,433	11,364,953	1951
West	3156	Energy Office & Support Fac	B	N		SC	101	1	7,112	650,235	Excellent	28,719	26,290	1,685	1994
West	3150	Solid State Research Facility	B	N		SC	791	1	12,155	3,539,608	Excellent	140,251	128,387	7,555	1992
West	3147	Efficiency & Renewable Res.	B	N		SC	101	1	13,194	1,206,298	Excellent	62,749	57,441	2,995	1988
West	3144	Roof Test Center	B	N		SC	703	1	10,633	3,356,834	Good	143,114	131,007	102,338	1987
West	3138	Roof Thermal Test Fac	B	N		SC	703	1	271	85,555	Good	205	188	2,138	1983
West	3137	Surface Science Lab	B	N		SC	751	1	6,728	2,706,014	Excellent	34,634	31,704	15,538	1984
West	3129	Personnel Monitoring Station	B	N		SC	769	1	408	156,239	Fair	1,228	1,124	23,070	1976
West	3115	Solid State Off.	B	Y	2006	SC	101	1	2,782	254,352	Poor	25,252	23,116	82,538	1970
West	3114	Roof Test Development Lab	B	N		SC	703	1	1,901	600,145	Adequate	27,620	25,283	55,170	1963
West	3095	Reac Area Equip Bldg	B	Y	2006	SC	401	1	7,008	403,113	Poor	1,637	1,499	102,270	1959
West	3080	Reactor Exper Control Room	B	Y	2005	SC	791	1	1,872	545,137	Poor	5,118	4,685	191,495	1953
West	3044	West Complex Field Shop	B	N		SC	601	1	5,884	898,372	Poor	3,823	3,500	499,970	1955
West	3036	Isotope Area Stor & Servic Bld	B	Y	2005	SC	400	1	2,048	117,805	Adequate	4,978	4,557	10,320	1951
West	3034	Radioisotope Area Services	B	N		SC	621	1	1,092	87,591	Fail	4,401	4,029	388,865	1951
West	3025M	IMET Facility Hot Cells&Solid	B	N		SC	793	1	32,982	9,604,554	Poor	330,174	302,243	2,540,365	1950
West	3017	Quality Services Division Building	B	Y	2006	SC	101	1	10,140	927,078	Fail	77,985	71,388	875,915	1952
West	3010A	BSR Facility Building	B	N		SC	101	1	2,104	192,364	Fair	1,638	1,499	29,358	1954
West	3003	Solid State Accel. Fac.	B	Y	2004	SC	785	1	10,806	3,411,450	Excellent	25,185	23,054		1943
West	2661	ORNL Regional Science Ed Ctr	B	N		SC	101	1	6,969	637,160	Excellent	24,377	22,315		1994
West	2652C	2652C Office Trailer	T	Y	2005	SC	101	1	1,464	52,441	Excellent	10,297	9,426		1990
West	2652B	2652B Office Trailer	T	Y	2005	SC	101	1	1,728	61,897	Excellent	10,297	9,426		1990
West	2652A	2652A Office Trailer	T	Y	2005	SC	101	1	1,728	61,897	Excellent	10,297	9,426		1990
West	2621	Waste Operations Support Shop	B	N		SC	400	1	5,475	314,932	Poor	10,705	9,799	110,205	1961
West	2547	General Machine Shop	B	N		SC	601	1	9,390	1,433,669	Good	32,203	29,479	38,063	1987
West	2528	Coal Research Lab	B	N		SC	791	1	4,201	1,223,356	Good	36,595	33,499	53,033	1959
West	2525	Fabrication Department Shop A	B	N		SC	607	1	27,272	4,452,843	Fair	143,610	131,461	724,773	1957
West	2523	Decontamination Laundry	B	N		SC	692	1	6,978	1,098,924	Adequate	21,517	19,697	82,558	1955
West	2518	F&O Directorate Office Building	B	N		SC	101	1	13,371	1,222,481	Good	86,186	78,895	47,555	1951
West	2517	HR&Diversity Programs / Training	B	Y	2005	SC	101	1	2,922	267,152	Poor	11,666	10,679	91,530	1943
West	2500	Guard & Fire Headquarters	B	N		SC	693	1	10,768	1,033,857	Adequate	98,625	90,282	71,158	1943
West	2069	Change House	B	Y	2004	SC	631	1	7,386	802,527	Poor	51,237	46,903	203,198	1943
West	2033	Measurements & Controls Fac	B	N		SC	101	1	33,008	3,017,849	Excellent	235,247	215,346		1990
West	2024	Quality Assurance & Inspect	B	Y	2003	SC	101	C	10,300	941,706	Fail	6,384	5,844	665,083	1969
West	2019	Solar Energy Lab/Laser Lab	B	Y	2006	SC	751	1	800	321,762	Fair	16,892	15,463	71,728	1951
West	2018	Elect & Air Cond Service Ctr	B	Y	2005	SC	601	1	7,803	1,191,365	Fair	25,454	23,301	121,930	1943
West	2016	West Portal Security HQ Annex	B	Y	2004	SC	299	1	2,427	221,895	Poor	13,498	12,356	129,048	1945
West	2010	ORNL Cafeteria	B	Y	2005	SC	291	1	12,946	1,707,172	Poor	364,701	333,849	450,690	1951
West	2009	Cafeteria Warehouse	B	Y	2005	SC	400	1	4,368	251,255	Fail	2,047	1,874	179,275	1943
West	2008	ORNL Whole Body Counter	B	Y	2008	SC	212	1	4,886	719,190	Fair	24,485	22,414	141,120	1946
West	2007	Calibration Lab	B	N		SC	614	1	6,173	942,496	Fair	92,293	84,486	98,045	1951
West	1509	Environmental Engineering Faci	B	N		SC	101	1	7,008	640,726	Excellent	18,580	17,008	145	1993
West	1507	Life Sciences Data Analysis Bl	B	N		SC	101	1	7,008	640,726	Excellent	39,581	36,233		1994
West	1506	Controlled Env & Animal Bldg.	B	N		SC	761	1	17,470	6,689,936	Excellent	84,898	77,716	122,308	1978
West	1505	Environmental Science Lab	B	N		SC	101	1	90,171	7,970,395	Adequate	389,343	356,407	418,438	1978
West	1504	Aquatic Ecology Lab	B	N		SC	761	1	12,444	4,765,287	Good	54,299	49,706	217,825	1972
West	1503	Plant Sciences Lab	B	N		SC	101	1	6,646	607,629	Excellent	91,285	83,563	1,685	1962
West	1062	West Office Building	B	N		SC	101	1	7,008	640,726	Excellent	48,779	44,653		1990
West	1061	Health Protection Services Fac	B	N		SC	741	1	7,008	2,552,310	Excellent	24,947	22,837	25,215	1992
West	1060	Laboratory	B	N		SC	741	1	9,540	3,653,234	Excellent	110,490	101,143		2000
West	1059	Health Effects Information	B	N		SC	741	1	7,008	2,552,310	Excellent	20,585	18,844	25,215	1992
West	1000	Engineering Office Building	B	Y	2006	SC	101	1	57,752	5,280,139	Poor	314,884	288,247	2,533,410	1946
West	0907	Walker Br. Watershed Lab	B	N		SC	761	1	3,947	1,511,458	Excellent	36,339	33,265	5,073	1948
West	0855	Operations Building 0800 Area	B	N		SC	761	1	2,346	898,374	Excellent	17,827	16,319		1989

*Note: All facilities **not** intended to be removed from the active facilities list (by transfer, safe shutdown, or demolition) are designated as “Mission Essential” in this *Ten-Year Site Plan*.

Appendix C: Excess Facilities

Table C.1. Excess facilities – contaminated

Property ID	Property name	GSF	Status	Year
2521F	Sewage Digester Building	100	operating	1995
3121	Cell Off Gas Filter House for 3019B	150	non-operating	1995
XG1404	Freels Bend, Var Dose Irradiation Facili	3,623	non-operating	1996
XG1406	Freels Bend, Exposure Field Control Room	190	non-operating	1996
XH1327	Freels Bend, Donkey Barn	880	non-operating	1996
XH1401	Freels Bend, Sheep Barn	3,000	non-operating	1996
9207	Biology	247,500	non-operating	2001
9211	Co-Carcinogenesis	76,600	non-operating	2001
9220	Virus Control Lab	22,350	non-operating	2001
9767-06	Utilities	400	non-operating	2001
9767-07	Utilities	404	non-operating	2001
2000	Solid St. Lab & Qual Assur/Ins	22,660	non-operating	2002
2001	Information Center Complex	25,338	non-operating	2002
2017	East Research Service Shop	228	non-operating	2002
2092	Storage	115	non-operating	2002
3508	Elect. Services	13,863	non-operating	2002
3541	MSR Process Dev. Lab.	870	non-operating	2002
3550	Research Lab Annex	14,036	non-operating	2002
3550T	Trailer, Van Type (Intercomparison SDL)	314	non-operating	2002
3592	Coal Conversion Facility	1,280	non-operating	2002
2011	Electric & AC Service Center	6,636	non-operating	2003
2024	Quality Assurance & Inspect	10,300	non-operating	2003
2061	Building 2011 Stack	64	non-operating	2003
7600	Containment Building	107,922	non-operating	2003
9204-1	ENGR Technology	210,491	operating	2003
9401-01	Laboratory	12,000	operating	2003
9204-03	Isotope Separations	255,656	operating	2004
9210	Mammalian Genetics	65,700	non-operating	2004
9224	Cell Fractionation System	10,100	non-operating	2004
9201-02	Fusion Energy Building	324,448	operating	2005
3503A	Sheltered Storage pad	2,040	non-operating	2006
2010	ORNL Cafeteria	12,946	operating	2008
2018	Elect & Air Cond Service Ctr	7,803	operating	2008
2019	Solar Energy Lab/Laser Lab	800	operating	2008
2643	Chlorinator Building	117	operating	2008
3003	Solid State Accel. Fac.	10,806	operating	2008
3036	Isotope Area Stor & Service Bldg	2,048	operating	2009
3100	Source & Sp Mat Vault	1,686	operating	2009
3503	High Rad Lvl Chm Eng Lab	13,716	operating	2009
7057	Sandblast Cleaning Fac	504	operating	2009
7058	Machine Auxiliaries Strg	1,008	operating	2009
7094	Physics Division Storage 2	190	operating	2009
3017	Quality Services Division Building	10,140	operating	2010
3095	Reac Area Equip Bldg	7,008	operating	2010
2026	Radioactive Materials Analytical Lab	28,144	operating	2011
3504	Geosciences Lab	3,952	operating	2012
3587	Mail Services Building	5,473	operating	2012
7005	Lead Shop	5,406	operating	2012
7015	Metal Storage & Cut Fac.	7,480	operating	2012
7020A	HVAC Decontamination Facility	1,178	operating	2012
2008	ORNL Whole Body Counter	4,886	operating	2013
2528	WHPP Development Facility	4,201	non-operating	2013
3037	Chemical Technology Offices	8,008	operating	2013
3047	Isotope Technology Bldg	25,535	operating	2013
3543	Msr Dev Lab	612	operating	2013
3012	Rolling Mill	8,431	operating	2014
3074	Interim Manipulator Repair Fac	3,760	operating	2014
7003	Welding & Brazing Shop	5,433	operating	2014
7007	Paint Shop	3,461	operating	2014
7021	Fab Equip Storage	1,464	operating	2014
7035C	Equipment Storage	589	operating	2014
7075	Waste Storage building	475	operating	2014
7085	90-Day Waste Storage	600	operating	2014
7709	Health Physics Research Reactor	3,784	operating	2014
7710	Dosar Fac-Hprr	8,432	operating	2014
7712	Dosar Low-Eng Accelerator	1,025	operating	2014
7735	Rad Calibration Lab	2,800	operating	2014
7758	HFIR Parts Storage	400	operating	2014

Table C.2. Excess facilities – noncontaminated

Property ID	Property name	GSF	Status	Year
XC1405	Office Trailer (12x46)	552	non-operating	1996
XE1451	Barn B	5,120	non-operating	1996
XF1301	Barn D	8,025	non-operating	1996
XF1302	Shed D Butler	2,000	non-operating	1996
XF1303	Barn E	8,025	non-operating	1996
XF1304	SILO E		non-operating	1996
XF1401	TWIN I	4,160	non-operating	1996
XF1576	Shed D	2,000	non-operating	1996
XF1577	Shed W	1,440	non-operating	1996
XF1578	Shed E	1,440	non-operating	1996
XF1579	New Swine Barn	9,805	non-operating	1996
XF1580	Solway Bend, Twin I Barn	5,120	non-operating	1996
XF158X	Solway Bend, Barn	5,120	non-operating	1996
XG1402	Freels Bend, Machine Storage Shed	245	non-operating	1996
XG1403	Freels Bend, Van Gilder Barn	4,356	non-operating	1996
XG1405	Freels Bend, Shed	1,008	non-operating	1996
XG1407	Freels Bend, Block Building	128	non-operating	1996
XG1408	Freels Bend, Portable Aluminum Building	80	non-operating	1996
XG1409	Freels Bend, Pump House Building	80	non-operating	1996
XG1410	Freels Bend Donkey Arena	2,375	non-operating	1996
XH1326	Freels Bend, Barn	5,120	non-operating	1996
XH1402	Freels Bend, White Barn	19,200	non-operating	1996
XH1403	Lagoon (2) Freels	14,400	non-operating	1996
XH1404	Underground Silo	3,800	non-operating	1996
XH1405	Freels Bend, Silo 14x41	176	non-operating	1996
2087	Storage I-E	191	non-operating	2002
2088	Emerg Generator B 2000	161	non-operating	2002
7584	BJC Office Trailer (Old 7964D)	672	non-operating	2002
7609	Stack Monitoring House	144	non-operating	2003
7610	Storage House - R&Ps	378	non-operating	2003
9422	Helium Compressor Bldg	2,500	non-operating	2003
9743-02	Pigeon Quarters	2,200	non-operating	2003
9770-02	Radiation Source Bldg.	155	non-operating	2003
9999-01	Motor Generator (E 9204-3)	500	non-operating	2003
9999-03	Switchgear Building	2,400	non-operating	2003
9207A	9207 annex	7,200	non-operating	2004
1060COM	1060 Commerce Park Drive	54,365	operating	2006
3111	Sentry Post No 8b	149	non-operating	2006
7009	Carpenter Shop	9,300	operating	2006
7020	Interim Grnds Equip Stg	960	operating	2006
7060	Steel Yard Office	100	operating	2006
7061	Hlth.Phys. Envrn. Stg.	1,060	operating	2006
7065	Rigger Equip Storage	1,008	operating	2006
7066	Grounds Maint.Storage	1,008	operating	2006
7074	Sentry Post #20C-PedGte 7012	16	non-operating	2006
7079	Bottle Storage Building	192	operating	2006
7848	Trailer	100	operating	2006
7933	Trailer	400	non-operating	2006
7964A	Triple Wide Office Trailer	2,115	operating	2006
7964C	Trailer, Office	2,124	operating	2006
7964G	Office Trailer, Triplewide	1,440	operating	2006
1000	Engineering Office Building	57,752	operating	2007
2009	Cafeteria Warehouse	4,368	operating	2007
2517	HR&Diversity Programs / Training	2,922	operating	2007
2653	Coal Yard Building	88	operating	2007
3008	Source & Spec Mat Vault	561	operating	2007
3080	Reactor Exper Control Room	1,872	operating	2007
3523	Expensed Bench Stock Building	1,176	operating	2007
3544A	Office trailer	450	operating	2007
7033	Electrical Material Strg.	5,500	operating	2007
7077A	Reservation Services Offices	288	operating	2007
7081	Portable Generator Storage Shed	870	operating	2007
7083	ESD Model Airplane Shop	288	operating	2007
7090	Electrical Storage West	288	operating	2007

Table C.2. Excess facilities – noncontaminated (continued)

Property ID	Property name	GSF	Status	Year
7091	Electrical Storage East	288	operating	2007
7093	Physics Division Storage 1	190	operating	2007
7095	Physics Division Storage 3	190	operating	2007
7096	Environmental Protection Storage	190	operating	2007
7098	Transportation Services Trailer	160	operating	2007
7957	Office Trailer For 7920	500	non-operating	2007
3115	Solid State Off.	2,782	operating	2010
3605	TSD Storage Building	387	operating	2010
3610	Storage Building	197	operating	2010
7062	Storage-Miscel Materials	312	operating	2010
7070	Storage Shed	6,700	operating	2010
7097	Crane and Elevator Office trailer	800	operating	2010
7953A	Trailer	1,416	operating	2010
7953B	Research Reactor Storage Trailer	1,416	operating	2010
7964E	7964E Conference Trailer	2,490	operating	2010
7964F	7964F Office Trailer	1,344	operating	2010
7968	Trailer	192	operating	2010
9983-FX	FRC Field Support Trailer	680	operating	2012
2652A	2652A Office Trailer	1,728	operating	2013
2652B	2652B Office Trailer	1,728	operating	2013
2652C	2652C Office Trailer	1,464	operating	2013
7964H	Solid State Office Trailer, Neut Scat	2,016	operating	2013
7964I	Solid State Office Trailer, Neut Scat	2,016	operating	2013
7965A	Trailer, Office	1,620	operating	2013
7965B	7965B Office Trailer	1,620	operating	2013
7965C	7965C Office Trailer	1,620	operating	2013
7006	Paint Stores	2,520	operating	2014
7020B	Temporary Waste Storage Facility	304	non-operating	2014
7020C	Temporary Waste Storage Facility	304	operating	2014
7020D	Office Trailer	160	operating	2014
7020E	Trailer, Temp Waste Storage Facility	230	operating	2014
7020F	HP Office Trailer	256	operating	2014
7026	M&C Storage	1,120	operating	2014
7030	Heavy Equipment Storage Shelter	5,000	operating	2014
7031	Fabrication Storage Shed	1,152	operating	2014
7035A	Paint Mix Building	620	operating	2014
7035B	Paint Storage	651	operating	2014
7035D	Can Drying Facility	268	operating	2014
7035E	Utility Mechanics Storage	620	operating	2014
7035F	Shed Storage Facility	589	operating	2014
7082	Salt Storage Building	1,491	operating	2014
7092	Hustler Mower Storage	1,040	operating	2014

Appendix D: Science Laboratories Infrastructure (SLI) Line Item Construction Projects

Appendix D: Science Laboratories Infrastructure (SLI) Line Item Construction Projects

4500 North and South Modernization Upgrades (ADSs AA0D0056, AA0D0057 Multi-year Landlord Line Item). The proposed projects are integral parts of the new Facilities Revitalization Project (FRP) for revitalization of ORNL's research capabilities and infrastructure in support of the U.S. Department of Energy Office of Science (DOE-SC) initiative to modernize their national laboratories. Consistent with DOE's approved *ORNL Institutional Plan*, new laboratories, supporting offices, and the necessary support facilities are being proposed for construction as part of an integrated new campus environment in the area north and east of the 4500 North and South Buildings complex. The 4500 North and South complex will be modernized to provide laboratory, office, and support functions. The overall goals of this facilities revitalization initiative are to reduce the burdensome costs of maintaining the current inventory of facilities 50 years and older, provide a safer environment for current staff activities, and ensure ORNL's ability to conduct world-class science in the 21st century, including attracting and retaining world-class research scientists. The payback period is approximately six years. In this Ten-Year Site Plan, there are five separate upgrade projects in these two facilities, as well as the adjacent Buildings 4501, 5505, and 3500. The highest priority of these projects is 4500N (Wing 4) and is proposed for construction in the first five years of this planning period.

Potable Water System Upgrade Phase I (ADS C97D0061 Landlord Line Item). The Potable Water System Upgrade, Phases I and II, will replace or refurbish aged water lines serving the primary research and support facilities in the central campus area of the Laboratory. The main lines running along Central Avenue and the north side of the Building 3508/3517 Area will be replaced in the first phase of the project with the Laboratory facilities north of Central Avenue in the vicinity of First Street and the 3047 Isotopes Area. Because of the subsurface contamination concerns within the central campus, multiple technologies are being evaluated for this project, including standard below-grade pipe replacement, above-grade insulated piping, and in-situ lining of existing lines where it is appropriate and feasible. A preliminary estimate of return on investment (ROI) is 10%, with a payback period of seven years.

Laboratory Facility Ventilation System Upgrade, Phase I (ADS A98D0007, Landlord Line Item.) The Laboratory Facility Ventilation System Upgrades, Phases I and II, are projects that will modernize ventilation and exhaust systems in approximately ten ORNL facilities, totaling over 200,000 ft^2 of space. Ventilation and exhaust systems in many ORNL facilities are in serious need of upgrade to continue service at any level. Some laboratory areas are not used for research because of a lack of proper ventilation. Systems feature 35-year-old equipment applied in a 35-year-old design concept. In many systems, the exhaust ducting and filter housings are seriously corroded and have only a marginal future life expectancy. New exhaust fans, ducts, hoods, and an EPA-compliant stack are needed for compliance with regulations. The majority of these duct/housing units are contamination zones that will require closely controlled work conditions. A preliminary estimate of a payback period for this project is seven to nine years.

Appendix E: Resource Needs

Table E.1. ORNL summary of resource needs - unconstrained baseline case (submitted 5/19/04)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2004 Approp. ($000)	FY 2005 Budget ($000)	FY 2006 Target Budget ($000)	FY 2007 Target Budget ($000)	FY 2008 Target Budget ($000)	FY 2009 Target Budget ($000)	FY 2010 Target Budget ($000)
SITE NAME: ORNL									
PROGRAM: SC									
1.0 Capital Line Item (Include project number & identify Funding Program)									
1.1 New Construction (facilities and additions) RSC (02MEL025)	**A99D0056**	**50,000**	9,600						
1.1.2 New Programmatic Construction (facilities & additions) CNMS	**AA1D0002**	**80,000**	19,882	17,811					
1.2 All Other Projects (recap) (Landlord)	**39KG**				1,940	15,590	42,210	45,780	31,800
Subtotal Line Item Projects		**130,000**	29,482	17,811	1,940	15,590	42,210	45,780	31,800
2.0 General Plant Project (GPP) (Include project no. & identify Funding Program)									
2.1 New Construction (facilities and additions)	**KC03**		4,640				2,000	4,200	3,500
2.2 All Other Projects (recap) (Landlord)	**KC03**	**58,400**	1,175	5,990	8,990	9,353	6,850	5,000	5,900
2.3 All Programmatic GPPs (recap)			0	0	0	0	0	0	0
Subtotal All Landlord and Programmatic GPPs			5,815	5,990	8,990	9,353	8,850	9,200	9,400
3.0 Institutional General Plant Project (IGPP)									
Subtotal IGPP Projects			6,000	3,134	3,000	3,000	3,000	3,000	3,000
4.0 Operating/Expense for Excess Elimination and Other									
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column		**18,883**	760	1,000	1,000	5,000	8,000	10,000	10,000
Subtotal Operating/Expense Projects			760	1,000	1,000	5,000	8,000	10,000	10,000
TOTAL Capital & Operating Investment:			36,057	24,801	11,930	29,943	59,060	64,980	51,200
TOTAL Overhead Investments (IGPP)			6,000	3,134	3,000	3,000	3,000	3,000	3,000

Table E.2. ORNL summary of resource needs - constrained baseline case

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2004 Approp. ($000)	FY 2005 Budget ($000)	FY 2006 Target Budget ($000)	FY 2007 Target Budget ($000)	FY 2008 Target Budget ($000)	FY 2009 Target Budget ($000)	FY 2010 Target Budget ($000)	FY 2011 Target Budget ($000)	FY 2012 Target Budget ($000)	FY 2013 Target Budget ($000)	FY 2014 Target Budget ($000)	FY 2015 Target Budget ($000)
SITE NAME: ORNL														
PROGRAM:														
1.0 Capital Line Item (Include project number & identify Funding Program)														
1.1 Landlord Line Item Projects														
New Construction (facilities and additions)	**39KG**													
Research Support Center (02MEL025)	**A99D0056**	**50,000**	9,600											
Modernize Wing 4, 4500N (06-KG-01)	**AA0D0056**				1,940	8,650	6,910							
Modernize Wing 4, 4500S (07-KG-01)	**AA0D0104**									1,940	8,650	6,910		
Building 5505/4501 Rad Lab Upgrade and 3500 Renovation	**AA4D0033**									2,000	10,000	5,000		
Potable Water System Upgrade, Phase I (07-KG-03)	**C97D0061**									1,000	4,000	2,000		
Laboratory Vent System Upgrades, Phase I (07-KG-02)	**A98D0007**											1,000	2,500	3,070
Modernize Wing 3, 4500N	**AA0D0095**											1,750	14,000	3,000
Modernize Wing 2, 4500S	**AA0D0098**												2,100	12,500
Subtotal Landlord Line Item Projects		**50,000**	9,600	0	1,940	8,650	6,910	0	0	4,940	22,650	16,660	18,600	18,570
1.2 Programmatic Line Item Projects														
Center for Nanophase Materials Sciences (03-R-312) Const (39KC00)	**AA1D0002**	**80,000**	19,882	17,811										
Genomes to Life Facility (06-KP-01)	**AA2D0115**	**165,000**				1,000	80,000	106,000	87,000					
Energy Reliability and Efficiency Lab (04-EB-1) (39EB00)	**AA1D0041**	**52,000**	736		764	13,200	4,800							
Spallation Neutron Source (SNS) (99-E-334)	**S97D0046**		123,865	80,535	41,100									
SNS Expansion/CLO and Power Upgrade	**AA4D0044**						2,898	7,400	26,900	43,400				
Facility Mods for Installation of Pu-238 Chem Proc Eqpmt (AF)	**AA3D0056**				4,000	14,500	14,500	16,000	11,500	6,000				
Quasi-Poloidal Stellarator (QPS) Experiment	**AA4D0053**			5,000	6,300	6,300	5,700	1,000						
HFIR HB-2 Guidehall	**AA4D0054**	**40,000**									2,125	10,924	42,438	36,556
U-233 Disposition				13,600	15,800	12,200								
Subtotal Programmatic Line Item Projects		**337,000**	144,483	116,946	67,964	47,200	107,898	130,400	125,400	49,400	2,125	10,924	42,438	36,556
GRAND TOTAL LINE ITEM PROJECTS		**387,000**	154,083	116,946	69,904	55,850	114,808	130,400	125,400	54,340	24,775	27,584	61,038	55,126
2.0 General Plant Project (GPP) (Include project number & identify Funding Program)														
2.1 Landlord GPPs	**KC03**													
Advanced Materials Characterization Laboratory	**AA0D0063**	**6,900**	1,340											
7625 Highbay	**AA0D0072**	**30,000**	3,300											
4508 Highbay	**AA4D0021**	**15,000**					1,000	2,000	1,500					
Manipulator Repair Facility	**AA0D0017**	**20,000**							1,000	3,000				
7900 Area Maintenance Building	**AA0D0053**	**10,000**							200	1,000	1,700			
New Fire Headquarters	**A01D0056**	**13,000**								1,000	4,000			
Central Campus Research Building	**AA0D0077**	**14,000**									2,500	2,000		
Dosimetry Laboratory	**A01D0020**	**5,000**										1,500	2,500	
Maintenance Shop Addition, 4509	**C97D0089**	**2,500**										200	1,000	
Addition to Building 6012	**S97D0002**	**6,500**									300	1,400		
Hazardous Environment Experimental Facility	**AA2D0094**	**12,000**												4,500
East Campus Service Building	**AA0D0064**	**20,000**											1,500	2,900
7900 Area Office Building	**AA0D0079**	**20,000**											250	1,800
Central Complex Facilities Upgrades	**AA3D0083**		1065	335										
Sanitary System Treatment Capacity Increase	**AA3D0073**									2,040	2,040			
Bethel Valley Process Waste and Once Through Cooling Elimination	**AA3D0084**			500	1000	2000								
4500N, 4501 and 4505 Gaseous Waste Systems	**AA4D0007**			400	1800	1000								
Source Treatment and TRU Removal Systems	**AA4D0008**			640	1960	2000								
Primary Substation upgrades	**AA0D0094**			2000										
Centralized LLLW Treatment Facility	**AA3D0017**			640	1260	1000	1000							
Emergency Lighting and Generators at ORNL	**AA4D0030**						1,533	1,533	1533					
Fire Protection System Upgrade	**C97D0071**								400	400	400	400	400	400
Gaseous Waste Fac Modernztion, Consolidated Hot Cells	**AA4D0007**						2500	2500						
Install New Vessel Off-Gas Scrubber System in 7920	**A02D0010**									1,000	2,000	2,000		
Bethel Valley Process Waste Drain Elimination	**AA3D0079**								400	1,000	2,600			
Ventilation Systems, Ductwork, and Fume Hood	**C97D0054**								1,000	1,000	1,500			
Extend Power Line	**S97D0004**									650				
Building 6025 HVAC Upgrades	**AA3D0004**											120	950	
Replace Hood/Secondary Confinement Exhaust Sys 7920	**A00D0032**										50	700	1,000	
4511 Cooling Tower Replacement	**A98D0016**											200	1,200	
Bethel Valley Road Traffic Calming	**A00D0017**											500	900	
6010/6025 Renovation	**AA0D0080**											200	900	
Upgrade Motor Control Centers/Switchgear REDC	**A01D0036**										50	100	1,000	
Water System Upgrades - 7600 Area	**A98D0010**											200	1,000	
Add Low-Level Rad Waste System to 3525	**AA3D0019**											2,500		
Extend Water Main - 7000 Area	**S97D0023**											1,000		
Restore Natural Gas Distribution	**S97D0020**												800	1,000
Computer Network Upgrades	**AA1D0001**													3,000
West End Steam Upgrade	**S97D0032**													250
GPP Reserves			210	1800										
Subtotal Landlord GPPs		**174,900**	5,915	6,315	6,020	6,000	6,033	6,033	6,033	11,090	17,140	13,020	13,400	13,850
2.2 Programmatic GPPs														
Building 1059 Modification	**AA2D0004**		200	1,000										
HFIR Permanent Pool Storage Tanks Project	**AA1D0007**		37	1,900										
Replace HFIR Steam System Piping, Internal and External	**AA2D0039**			126										
HFIR Primary Heat Exchanger Replacement	**AA2D0034**				2,050									
HFIR Pool Heat Exchanger Replacement	**AA2D0035**		321											
HFIR User Support Facility	**AA1D0003**			500	4,000									
HRIBF ORIC Motor-Generator Set Replacement	**A00D0047**		598											
HFIR Secondary Coolant System Life Extension	**A01D0046**			1,500										
SBHE Ductwork In-Service Inspection and Repair	**AA2D0026**				1,061									
HFIR Electrical Cabling System Life Extension	**AA2D0031**			474										
Normal/Emergency Diesel Generators and Switchgear	**AA2D0032**			1,300										
Relocate Isolation Flange, CPS, LLLW Drains, Bldg. 7930	**A02D0021**			50	100	150								
HFIR Highbay Storage	**AA0D0078**			1,000										
Upgrade Building 6000, High Power Target Lab (AIP)	**AA3D0060**		1,800	1,762										
SBHE Fan Shed and Filter Pit Housing Upgrade	**AA2D0030**				2,822									
Replace 15 HVAC Units in HFIR Building	**AA2D0029**			423										
Infrastructure Improvement, HFIR	**AA0D0051**				625									
Upgrade CAMS and Monitrons	**AA2D0040**			342										
7900 Area Office Building I	**AA0D0043**				400	2,400								
Material Handling Facility Addition	**A01D0049**				1,800									
Upgrade/Replace Shielded Caves A and B, Bldg. 7920	**A98D0135**		100	150	900									
Implementation of Fire Hazards Analysis Corrective Actions	**A01D0047**		100											
Replace Main 7920 Supply Fans	**A98D0131**				75	200	1,300							
Accelerator Upgrade, Holifield Radioactive Ion Beam Facility	**A99D0043**		400	400	400	400	400	400	400	400	400	400	400	400
Building 3144 Addition	**S97D0057**			1,500										
Subtotal Programmatic GPPs			3,556	12,427	14,233	3,150	1,700	400	400	400	400	400	400	400
GRAND TOTAL GPPs			9,471	18,742	20,253	9,150	7,733	6,433	6,433	11,490	17,540	13,420	13,800	14,250
3.0 Institutional General Plant Project (IGPP)														
Utility Modifications	**AA2D0097**		545											
SIOU Parking Lot	**AA1D0056**		174											
Building 1506 Renovations	**A00D0043**		2,612	27										
Central Avenue Extension	**AA2D0111**		144											
Main Entrance Entry and Parking	**AA2D0112**		1,001	1,278										
Quadrangle Common Area	**AA2D0059**		1,261	1,436										
Storm Drain Modifications	**AA2D0096**		-3											
Fire Protection Upgrade, 7930	**AA2D0114**		3											
5500 Laboratory Mods	**A00D0017**		-80											
Road and Parking Lot Paving	**C97D0104**		260											
West Campus Infrastructure	**AA4D0042**			500										
7920 VOG HEPA	**AA4D0077**			700										
5000 Area Utility Systems Upgrades	**AA4D0080**			325										
East Campus Storm Water Upgrades	**AA4D0079**			750										
East Campus Parking Expansion	**AA1D0058**		100	1350										
4000 Area Substation Upgrades	**AA4D0081**			525										
Priority IGPP Projects				1109	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
GRAND TOTAL IGPPs			6,017	8,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
4.0 Operating/Expense for Excess Elimination and Other														
4.1 Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Building 2016 Demolition (SLI)		2,427	121											
Building 2069 Demolition (SLI)		7,386	273											
Building 5000 Demolition (SLI)		4,360	174											
Building 7010 Demolition (SLI)		3,366	118											
Building 7055 Demolition (SLI)		1,344	74											
Building 9204-1 Cleanout (SLI C/0 from FY02 & FY03)		*21,0491	428											
Future SLI Funded Building Demolitions		TBD		1,000	1,000	1,000	1,000	1,000	1,000	5,000	8,000	10,000		
4.1 Subtotal		18,883	1,188	1,000	1,000	1,000	1,000	1,000	1,000	5,000	8,000	10,000	-	-
4.2 Nuclear Facilities Consolidation			5,000	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
4.3 Future Liabilities Program					10,000	17,576	11,000	11,000	6,200	3,600	2,500			
Subtotal Operating/Expense Projects			6,188	1,000	11,000	18,576	12,000	12,000	7,200	8,600	10,500	10,000	-	-
TOTAL Capital & Operating Investment:			169,742	136,688	101,157	83,576	134,541	148,833	139,033	74,430	52,815	51,004	74,838	69,376
TOTAL Overhead Investments (IGPP)			6,017	8,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000	3,000
GRAND TOTAL			175,759	144,688	104,157	86,576	137,541	151,833	142,033	77,430	55,815	54,004	77,838	72,376

***SF does not contribute to Excess Elimination**

Table E.2. ORNL summary of resource needs - constrained baseline case (continued)

Integrated Facilities and Infrastructure Budget Data Sheet (IFI)	Project Number	Gross Building Area	FY 2004 Approp. ($000)	FY 2005 Budget ($000)	FY 2006 Target Budget ($000)	FY 2007 Target Budget ($000)	FY 2008 Target Budget ($000)	FY 2009 Target Budget ($000)	FY 2010 Target Budget ($000)	FY 2011 Target Budget ($000)	FY 2012 Target Budget ($000)	FY 2013 Target Budget ($000)	FY 2014 Target Budget ($000)	FY 2015 Target 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														
Nuclear Energy Research and Development (NE)			334	344	354	365	376	387	399	411	423	436	449	462
Nonprolific National Security Program (NN)			73	75	77	80	82	85	87	90	92	95	98	101
WFO			659	679	699	720	742	764	787	810	835	860	886	912
Basic Energy Science (KC)			2149	2213	2280	2348	2419	2491	2566	2643	2722	2804	2888	2975
Weapons Activities (DP)			96	99	102	105	108	111	115	118	122	125	129	133
Isotope Production and Distribution (ST)			32	33	34	35	36	37	38	39	41	42	43	44
Magnetic Fusion (AT)			80	82	85	87	90	93	96	98	101	104	108	111
Nuclear Physics (KB)			481	495	510	526	541	558	574	592	609	628	646	666
Biological and Environmental Research (KP)			828	853	878	905	932	960	989	1018	1049	1080	1113	1146
Environmental Management - Defense (EY)			179	184	190	196	201	208	214	220	227	234	241	248
Vehicle Technologies (VT)			89	92	94	97	100	103	106	109	113	116	120	123
** Chargeback dollars costed against various program sponsors.														
Total Direct Maintenance & Repair			5,000	5,150	5,305	5,464	5,628	5,796	5,970	6,149	6,334	6,524	6,720	6,921
5.2 Indirect (from Overhead or Space Charges)														
Include indirect O/E maintenance projects in total														
Interior and Exterior Structure			2673	2,753	2,836	2,921	3,008	3,099	3,192	3,287	3,386	3,488	3,592	3,700
Mechanical Systems (Drains, Supplies, Elevators, Vacuum Systems, Compressed Air, Exhaust, Sprinklers)			4079	4,201	4,327	4,457	4,591	4,729	4,871	5,017	5,167	5,322	5,482	5,646
Electrical Systems (Distribution, Generators, Relamping)			2251	2,319	2,388	2,460	2,534	2,610	2,688	2,768	2,851	2,937	3,025	3,116
HVAC (Central Systems, Chillers, Cooling Towers, Window Units)			4220	4,347	4,477	4,611	4,750	4,892	5,039	5,190	5,346	5,506	5,671	5,841
Safety Systems - ESH (Rad Surveys, Safety Showers/Eye Wash, Emergency Lights, Surveillances, Inspections, Asbestos Abatement)			844	869	895	922	950	978	1,008	1,038	1,069	1,101	1,134	1,168
Subtotal Indirect			14,067	14,489	14,924	15,371	15,833	16,308	16,797	17,301	17,820	18,354	18,905	19,472
Total Indirect Maintenance & Repair			19,067	19,639	20,228	20,835	21,460	22,104	22,767	23,450	24,154	24,878	25,624	26,393
6.0 Indirect O&E Excess Elimination (demolition, sale, lease, transfer) Show area eliminated in Gross Area column														
Building 2016 Cleanout & Deactivation (OH)		2,427*	150											
Building 2069 Cleanout & Deactivation (OH)		7,386*	200											
Building 5000 Cleanout & Deactivation (OH)		4,360*	120											
Building 7010 Cleanout & Deactivation (OH)		3,366*	80											
Building 7055 Cleanout & Deactivation (OH)		1,344*	50											
Future Excess Facility Elimination (OH)				1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500
Total Indirect Excess Elimination		-	**600**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**	**1,500**

***SF does not contribute to Excess Elimination**