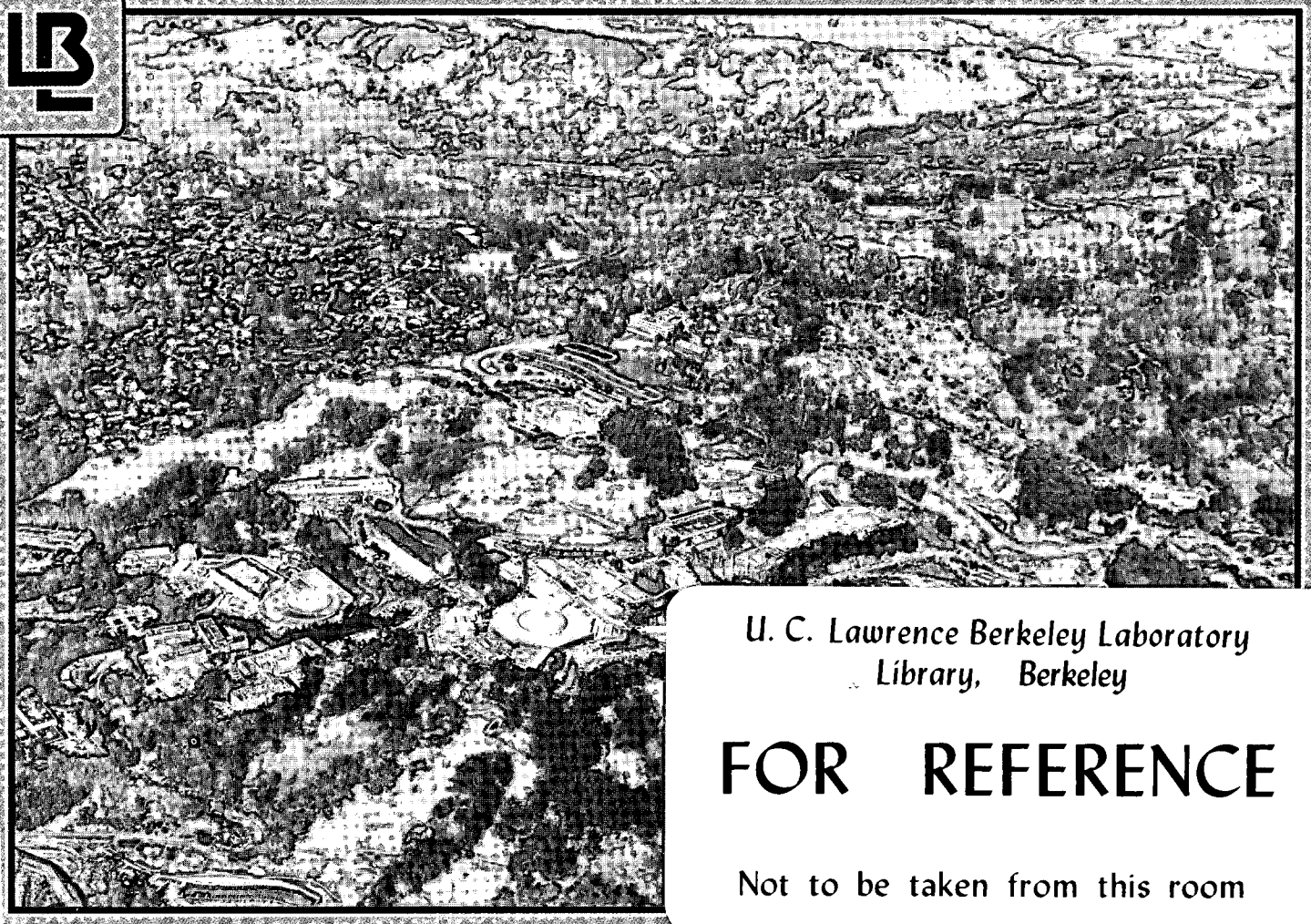
PUB-5409

LAWRENCE BERKELEY LABORATORY



FY 1995
SITE DEVELOPMENT PLAN

Lawrence Berkeley Laboratory
University of California ▪ Berkeley, CA 94720
April 1995

Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

DISCLAIMER

PUB-5409

Lawrence Berkeley Laboratory
FY 1995 Site Development Plan

April 14, 1995

Lawrence Berkeley Laboratory
University of California
Berkeley, California 94720

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Mission

The Lawrence Berkeley Laboratory (LBL), was established in 1931 by Ernest O. Lawrence as a single-purpose accelerator-based University research facility. It has since evolved into a multiprogram national laboratory with a mission to:

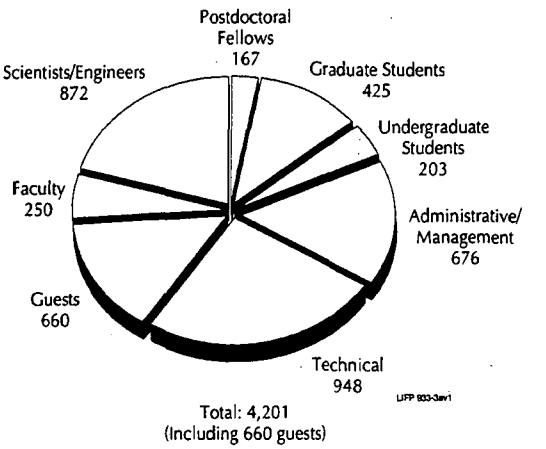
- Perform leading multidisciplinary research in the energy sciences, general sciences, and biosciences in a manner that ensures employee and public safety and the protection of the environment. The energy sciences include materials research, chemistry, earth science, and energy and environmental research. The general sciences include nuclear and high-energy physics and accelerator research. The biosciences include the life sciences and structural biology research.
- Develop and operate unique national experimental facilities for use by qualified investigators from throughout the world. These facilities include the Advanced Light Source, the 88-Inch Cyclotron and Gammasphere, the National Center for Electron Microscopy, and the National Tritium Labeling Facility.
- Educate and train future generations of scientists and engineers. 425 graduate students pursue research at LBL of whom about 100 receive advanced degrees each year. Precollege programs are conducted for science educators and students.
- Foster productive relationships with industry. The Center for Advanced Materials, the Center for X-Ray Optics, and the California Institute for Energy Efficiency are examples of collaborations with industry. Technology transfer programs promote the application of research results.

To advance LBL's capability to accomplish its mission, the Laboratory instituted in 1992 a strategic planning process focused on its "Vision 2000." Published in 1994, the plan focuses on maintaining scientific excellence, adding value through partnerships, optimizing the way we work, and empowering our people. This strategic plan also closely aligns LBL's directions with the DOE's strategic outlook. LBL's Institutional Plan for 1995-2000 reflects this alignment by identifying its programs as they further DOE's core businesses of science and technology, energy resources, and environmental quality.

Workload and Site Population

Program and Workload Areas. LBL programs are primarily supported by the DOE Office of Energy Research (51%). The largest programs are in Basic Energy Sciences, Nuclear Physics, High Energy Physics, and Health and Environmental Research. Energy Efficiency and Renewable Energy (10%) supports studies in building energy conservation, energy storage, and solar and geothermal energy. Other DOE-sponsored programs (21%) include environmental restoration and waste management, radioactive waste disposal, and fossil energy. Work for other agencies and institutions (18%) is primarily for the National Institutes of Health, Department of Defense, state agencies, and private industry. Projected costs for FY 1995 are $280 M.

Laboratory Population. In 1994, the Laboratory's employee population consisted of 3,541 full- and part-time employees, equating to 2,631 full-time employees (see figure below).



Laboratory Population in 1994.

LBL maintains a register of official guests, updated monthly, that contained 1,682 registered guests at the end of 1994. About 660 of these guests were on-site at any one time, so that total Laboratory population was close to 4,200. Of this total, 3,580 are located at the main site, 500 located in UC Berkeley Campus buildings, and 120 located in off-site leased buildings. The 20-Year Plan would allow additional growth to a

Laboratory average daily population of 4,750, including 640 on the Campus.

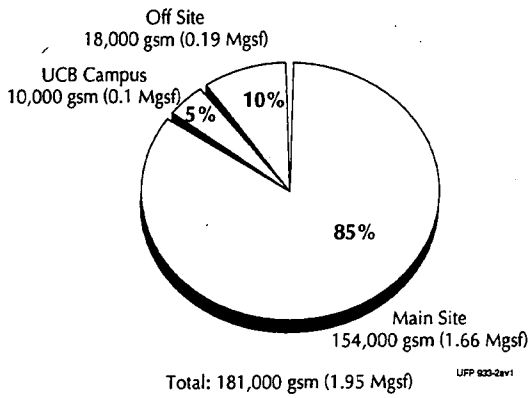
Site and Regional Information

The 54-hectare (134-acre) Laboratory site, located within 478 hectares (1180 acres) of University of California land, is leased by DOE through a series of 50-year lease agreements. The Laboratory is in Alameda County (population 1,280,000), with the eastern section in the City of Oakland (370,000) and the western section in the City of Berkeley (103,000). Although the area is largely urban and is served by interstate highways and an extensive public transit system, the Laboratory site has hilly topography with areas of steep slopes and trees that give LBL a rural character.

- *Land Use and Topography.* The Laboratory is on a hillside with elevations between 150 and 300 meters (500 and 1,000 feet). The site is zoned governmental and institutional by the cities of Berkeley and Oakland. On all sides of the Laboratory is a buffer zone of University land. The Site Development Plan (SDP) provides for landscape buffer zones between LBL facilities and the University boundary and includes guidelines to ensure compatibility with land use outside the University buffer zone.

- *Transportation Systems.* The Laboratory and the cities of Oakland and Berkeley are served by a network of public transit systems, three international airports (San Francisco, Oakland, and San Jose), two railroads, the Bay Area Rapid Transit system (BART), and a network of interstate freeways and state highways. LBL operates shuttle buses around the site and to the UC Berkeley campus, downtown Berkeley, and the Rockridge BART station.

- *Public Utilities and Community Services.* LBL purchases most of its electricity from the Western Area Power Administration (WAPA). Natural gas is purchased from the Defense Fuel Supply Center (DFSC). Adequate capacity is expected for the foreseeable future. Electricity and gas are supplied over Pacific Gas & Electric (PG&E) transmission facilities. Water is supplied by the East Bay Municipal Utilities District. On-site storage and reservoirs adjacent to LBL provide water for anticipated emergency needs. The Utility District is currently expanding its supplies and storage capacity. The Laboratory provides its own fire protection service and participates in statewide and county mutual aid agreements. Locally, LBL has a memorandum with the city of Berkeley whereby both parties agree to furnish fire protection and other emergency service to each other on an automatic aid basis.



LBL 1994 Space Distribution.

- *Condition of Buildings and Other Improvements.* LBL research and support activities are conducted in structures totaling 181,200 gsm (1.95 Mgsf) (see figure above). In FY 1995 the average age of the main-site buildings is 30 years. The inventory of building space, including current construction, is: adequate—51,972 gsm (558,839 gsf) (34%); substandard, can be made adequate—82,287 gsm (884,804 gsf) 53%; and substandard, cannot be made adequate—19,877 gsm (213,734 gsf) (13%).

- *Utilities.* LBL's utilities distribution systems (mechanical, electrical, and communications) are underground. Many portions were initially sized to serve large accelerators and can meet present and future requirements. Aged segments require rehabilitation to improve flexibility and reliability. Utility systems undergoing rehabilitation include natural gas, domestic water, cooling water, electrical power, sanitary sewer, compressed air, storm drainage, standby electricity, and alarm and security.

- *Circulation and Traffic.* LBL traffic circulates along an east-west central serpentine road, with north and south loops. Gates to the Laboratory are located at the ends of the

central east-west road and at a spur leading to Centennial Drive near the Lawrence Hall of Science. These main roads were designed in the 1940s and early 1950s and no longer meet construction or safety standards. Nearly 7,000 vehicle trips per day are made to LBL, including 77 shuttle-bus trips off site and 102 on site. The off-site shuttles carry an average of about 1,500 passengers per day.

- *Vegetation Management.* In 1995 the Laboratory is taking steps to follow the fuel management initiatives recommended by the East Bay Hills Vegetation Management Consortium, a group formed to address the fire safety issues surrounding vegetation management for urban-wildland interface areas in the East Bay Hills. The initial phase of LBL's "defensible site" project has been approved by the Director's Action Committee (DAC) and funded for FY 94-95. This phase will (1) restore the "high priority housekeeping" areas to the conditions they were in when last treated in FY 93, (2) commence to eliminate current broom and pampas grass from the site, and (3) reduce fuel loading in select tree groves located adjacent to and within LBL site property.

Program Projections and Requirements

Mission Projections. LBL's research and support trends are assessed and described in the FY 1995–2000 Institutional Plan. The major changes in mission activity motivated by LBL's Vision 2000 are in response to DOE's national programs in the Office of Basic Energy Sciences, the Office of Health and Environmental Research, and the Office of Fusion Energy. In response to national needs for high-brightness synchrotron radiation facilities, LBL has completed construction of the Advanced Light Source. The Light Source provides the world's brightest beams of soft x-ray and ultraviolet light for use in materials science research, chemistry, biology, and other fields. The Light Source provides ports for up to 55 end stations, permitting use by up to 200 guests at any one time. LBL must provide the research and facilities infrastructure to support this user community.

LBL, in coordination with other national laboratories, has prepared conceptual designs for an Induction Linac System Experiment for inertial confinement fusion. In addition, LBL has proposed a Chemical Dynamics Research Laboratory for advanced studies in reaction science and combustion chemistry. Other future projects include improvements to the National Center for Electron Microscopy, and strengthened programs in the Center for Advanced Materials and in the life sciences.

Specifics on the new program and support facilities required are given below in the functional areas of the Master Plan and the Five-Year Construction Plan (Table 1) on page 8. Appendix A contains Map 1, LBL Master Plan, and Map 2, LBL Current Land Use Plan.

Energy Sciences. The scientific outlook for the Energy Sciences is affected by developments in many scientific fields, but especially research in energy supply and efficiency technologies and in chemistry, geology, materials science, and physics. New program-related projects represent approximately 70% of LBL's anticipated increase in personnel or approximately 80% of the added LBL building area. The Laboratory views the following future research trends as important:

- Energy-use research important to national energy security will emphasize advanced high-efficiency combustion, energy storage, electric lighting, energy-intensive chemical processes, and energy flows through walls and windows. Reducing reliance on natural gas and other fossil fuels can mitigate emissions and waste disposal problems. Design of a new facility for support of building technologies is in process.

- Materials science research growth areas will support key materials of national interest, including materials with reduced dimensionality, high-temperature superconductors, semiconductors, composites, ceramics, light alloys, and polymers.

- Chemistry of inorganic and complex organic molecules will require advanced facilities using intense photon beams, nuclear magnetic resonance spectroscopy, and laser spectroscopy.

- Earth sciences research will include geophysical investigations of the continental crust and physical and chemical studies of geological materials, including petroleum and geothermal reservoirs, and processes involving

the transport and transformation of chemicals in complex geological structures. LBL requires staging areas, laboratories, and complete facilities to meet these needs.

General Sciences. LBL's general sciences programs are developed in conjunction with the high-energy and nuclear physics communities and with Federal programs in fusion research. New program-related projects represent no planned net increase in building area. LBL's general sciences programs include the following developments:

- Nuclear physics research will emphasize techniques that probe or alter the state of nuclei to explore nucleonic, hadronic, and quark-gluon matter. The Gammasphere at the LBL 88-Inch Cyclotron is central to continued research in nuclear structure. The STAR experiment collaboration is being planned at the Relativistic Heavy Ion Collider under construction at Brookhaven National Laboratory, and experimental facilities for studying unstable nuclei within an isospin laboratory are being considered at LBL.
- LBL will continue its high-energy physics research programs at the Tevatron and is a partner in the recently funded B-Factory upgrade at the Positron-Electron Project at the Stanford Linear Accelerator.
- LBL will continue its leading research in developing heavy-ion prototype accelerators for fusion in support of a technology that would ultimately employ accelerated beams of ions to ignite fusion fuel pellets. These research studies include Elise, the first phase of the Induction Linac System Experiment. (The fuel pellet research will be conducted by other laboratories.) The development of neutral-beam testing facilities to evaluate supplemental plasma heating will continue in support of the magnetic-fusion program for the International Thermonuclear Experimental Reactor.

Biosciences. The support for human genome research is expected to grow, requiring an expansion of life-sciences-related facilities, and specifically completion of the recently funded Human Genome Laboratory. In addition, LBL supports DOE's structural biology initiative through the Laboratory's instrumentation and mezzanine improvements at the Advanced Light Source (ALS), which will occupy existing buildings. New program-related projects represent approximately 10% of LBL's anticipated increase in personnel or approximately 20% of the added LBL building area. Programmatic growth areas are as follows:

- Sequencing of the human genome will be emphasized, including human genome structure and expression, robotics, novel instrumentation, development of advanced computation techniques, and medical genetics.
- Structural biology research will be directed toward determining the relationship between the structure of biological macromolecules and their functions. The application of synchrotron radiation and advanced computational techniques will allow the determination of the three-dimensional structure of proteins and nucleic acids.
- Biomedical research will continue the application of advanced technology to study, diagnose, and treat human disease through innovations in positron emission tomography (PET), NMR, and charged-particle radiation therapy and radiosurgery. A Biomedical Isotope Facility is under construction at an existing building to advance PET research.
- Environmental and health-effects research will include atmospheric chemistry and transport, deposition, and ecological effects of combustion products. Studies of sources and transport of chemicals from the subsurface environment will cover contamination of groundwater, radon exposure, and other pollutants.

Laboratory Projected Resources and Workload. Laboratory operating budget authority is projected to increase from $218 M in 1995 to $244 M in 2000. Total Laboratory funding, including equipment and construction, is projected to remain fairly constant, at $292 M in 1995 and $291 M in 2000. Near-term workload increases are projected, based on the operating budgets of the ALS, Human Genome Program, and initiatives associated with DOE's Division of Chemical Sciences.

Population Projections. The main-site population is projected to increase from 3,600 in FY 1995 to approximately 3,700 in FY 2000. The total projected Laboratory population will increase from 4,200 in FY 1994 to approximately 4,390 in FY 1999. The long-term projected

growth at the site, identified in the 1994 Laboratory Integrated Facilities Plan (LIFP), allows for an average daily main-site population of 4,100. The potential total Laboratory population (includes main site, Campus, and off-site areas) of 4,750 could be obtained within the 20-year master plan if national and regional programs require this growth.

Master Plan

Site planning at the Laboratory reflects long-range institutional goals and values based on the University's management of LBL to support DOE missions. The site development planning objectives are to:

- Evaluate future mission projections and anticipate DOE national research facility needs;
- Ensure a safe and healthful workplace in full compliance with building and fire codes;
- Protect the environment and buffer activities to enhance adjacent land uses;
- Protect the national investment in valuable government-owned research and support assets;
- Consolidate research and support services through proper siting of new buildings and maintenance of functional units;
- Work with UC to identify projects with synergistic benefits;
- Make efficient use of unique Laboratory assets and the adaptive reuse of facilities with potential to support Laboratory missions.
- Improve access and communications within and to the Laboratory; and
- Promote cost reductions and energy conservation through efficiencies in building design and location, operations and maintenance, and parking and transportation.

Five LBL site master plan concepts accommodate facilities improvement needs within existing geophysical, environmental, and operational conditions. They provide a basis for understanding and evaluating the more detailed elements of specific projects, planned locations, and other site improvement projections. The site planning concepts are to:

- Consolidate activities within seven functional planning areas to enhance efficiency and effectiveness and to provide specialized research facilities;
- Redevelop obsolete buildings and deteriorated infrastructure, eliminate temporary structures used for permanent functions, and improve building arrangements to increase safety and energy efficiency;
- Concentrate development along the east-west circulation and utilities axis to enhance transportation and service systems (e.g., develop off-road parking and improve pedestrian paths);
- Improve and maintain perimeter and internal buffer zones to screen noise-generating activities and minimize potential incompatibility between adjacent operations; and
- Provide off-site facilities for receiving, warehousing, and other support and research activities suitable for decentralization.

Design guidelines for site development have been developed to achieve specific improvements while respecting site constraints, and have provided coherence between buildings and their surroundings. These guidelines, described in more detail in the LIFP, address the following areas: safety considerations; utilities corridors; building mass, orientation, and exteriors; energy and operational efficiency; building use flexibility; circulation and parking; topography and grading; landscaping and open space; and guideline conformance review.

Facility and Land Requirements. If all the sites and buildings were developed in accordance with the 20-Year Plan, the result would be a net increase of approximately 40,000 gsm (0.4 Mgsf) to the existing main site of the Laboratory, for a total of approximately 190,000 gsm (2.0 Mgsf). For comparison, the 1994 total, including current construction, consisted of 150,000 gsm (1.62 Mgsf) at the main site (see table that follows). The 20-Year Plan increases provide for growth in life sciences, chemistry and materials sciences, conservation and renewable energy, earth sciences, and fossil-energy research. The SDP calls for the removal of 20,000 gsm (0.2 Mgsf) of buildings and the renovation of 70,000 gsm (0.8 Mgsf) of building space. Building sites are planned or reserved for 60,000 gsm (0.6 Mgsf) of

new construction. Increases are primarily for programmatic purposes. Proposed general-purpose facilities replace existing obsolete facilities.

Future Land Use. 32 hectares (80 acres) of the site are currently in undeveloped open space. Some of the open space is within buffer zones where development is limited for a variety of reasons. If all projects identified in the 20-Year Plan were completed, 31 hectares (78 acres) would be retained as open space and buffer. The proportion of the LBL main site that has been improved with structures, utilities, or roads would change from the current 38% to 42% (see table that follows). Nine buffer zones are described in the LIFP, with specific planning criteria identified.

Facility and Land Requirements

	1994	20-Year Plan
Buildings	154,000 gsm (1.66 Mgsf)	190,000 gsm (2.0 Mgsf)
Undeveloped Land	32 hectares (80 acres)	31 hectares (78 acres)
Improvements (% of total land area)	38%	42%

Future Major Facility Locations and Functional Areas. The functional planning areas are groupings of related facilities that enhance work efficiency and effectiveness. Building clusters form the core of each functional area, with circulation access, service, and parking at the perimeter. The 20-Year Plan identifies changes to each of the functional planning areas to accommodate potential research activities and to conform to LIFP objectives, planning concepts, and design guidelines.

The natural constraints of the site coupled with the desirability of maintaining efficient programmatic development delineate the seven functional planning areas:

- *88-Inch Cyclotron Research Area,* located on a hillside terrace near the Main Gate, currently includes buildings totaling 5,020 gsm (54,100 gsf). The area is expected to continue to be dedicated to the operation of the 88-inch Cyclotron and required support facilities. A second floor addition to support users of the Gammasphere and other experiments is under construction.
- *Central Research and Administration Area* houses the LBL Director's Offices and the main offices for Administration, Planning and Communication, Government and Industry Partnerships, Accelerator and Fusion Research, Earth Sciences, Energy and Environment, Engineering, Information and Computing Sciences, Nuclear Science, and Physics. The majority of LBL's light laboratories and support offices, as well as the cafeteria and reception center, are included within these complexes, with a total of 44,960 gsm (484,000 gsf) in building space. Current plans call for many building projects, including additional floors for Buildings 50E and 50F, a new reception center, and the development of a conference facility. Projects in slope stabilization and in seismic rehabilitation of Building 90 have recently concluded.
- *Bevalac Accelerator Complex* currently includes 33,560 gsm (361,300 gsf) of building space. These facilities are located on three benches separated by steep slopes. Existing facilities include the Bevalac, heavy laboratory experimental areas, Biomedical Isotope Facility, staging areas, associated offices, and facilities for advanced accelerator research and development. The proposed Master Plan anticipates the reuse of buildings for accelerator facilities and experiments, including the Induction Linac Systems Experiment. This area already has an extensive array of support utilities, crane and hoisting equipment, and related resources. Proposed new experiments could be located in the existing Experimental Particle Hall, Building 51B, requiring little or no expansion of existing structures. The Bevatron and SuperHILAC accelerators were shut down in FY 93. Plans for recovery of Bevatron space are discussed on pages 9 and 10.
- *Light Source Research and Engineering Area* encompasses approximately 6 hectares (15 acres), with buildings currently totaling 37,460 gsm (403,200 gsf). Projects planned to utilize the ALS facility include the ALS Beamlines Initiative, the Chemical Dynamics Research Laboratory, and an ALS reception center. A special research facility zone has been established around the perimeter of the ALS to reserve areas for programs requiring the use of the ALS photon beams.

- *Shops and Support Facilities Area* includes 15,950 gsm (171,600 gsf) of building space in an area adjacent to the Laboratory's Grizzly Gate entrance. Uses currently include Craft, Construction, and Maintenance Shops; Supply Shops; Supply Services; Transportation and Motor Pool; Mechanical Shops; the Environment, Health and Safety Division; and the National Tritium Labeling Facility. The Hazardous Waste Handling Facility is being relocated from this area to the Life Sciences Research Area. Consolidation of support facilities will continue with the construction of the Safety and Support Services Facility and a proposed Facilities Building.

- *Materials and Chemistry Research Area* includes the Materials and Molecular Research Laboratory, the National Center for Electron Microscopy, and the Surface Science and Catalysis Laboratory. Current building area totals 11,600 gsm (124,900 gsf). Plans include upgrades to the National Center for Electron Microscopy as well as a high bay addition to Building 62. All new development must take into account the visibility of this area from campus locations, including Strawberry Canyon below. The "Chicken Creek area" affords potential for additional facilities for research in cooperation with the UCB Campus.

- *Life Sciences Research Area* includes 4.4 hectares (11 acres) located in upper Strawberry Canyon in the easternmost portion of the LBL site, also known as the East Canyon. Current building area totals 5,360 gsm (57,700 gsf). Existing buildings include the Cell and Molecular Biology Laboratory, the Laboratory for Cell Biology, the new Hazardous Waste Handling Facility (under construction), and the recently funded Human Genome Laboratory. Proposals for this area include expansion of the Life Sciences facilities, and a parking structure.

Utilities Systems. Many of the utilities systems were initially installed during the 1940s and require upgrades or replacement to achieve improved levels of reliability and service capacity. Many systems have adequate capacity but require extensions or improvements to achieve satisfactory performance and maintenance efficiency.

- *Electrical Utilities.* LBL's power-distribution system comprises a main 12-kV switching center at the Grizzly Utility Substation and 24 substations with 32 km of 12-kV cable. A four-phase electrical system rehabilitation and improvement program will install six 12-kV switching stations throughout the Laboratory site and replace five aged and obsolete substations and all of the underground 12-kV distribution cable.

- *Mechanical Utilities.* Mechanical utilities comprise domestic and cooling water, storm drains and sanitary sewers and natural gas, compressed-air, and vacuum systems. These utilities are up to 40 years old, and many are undersized for current Laboratory demands. The 10-Year and 20-Year Plans provide for the orderly replacement of these utilities to accommodate current and projected requirements.

Utilities and fuel usage.

Utility system	FY 1994 usage
Electricity	59,557 MWh
Natural gas	5 million m^3 (162 million cu ft)
Domestic water	228 million L (60 million gallons)
Vehicle gasoline	297,206 L (78,522 gallons)
Diesel fuel	105,318 L (27,825 gallons)
Liquified petroleum gas	7,343 L (1,940 gallons)

Table 1

LAWRENCE BERKELEY LABORATORY CONSTRUCTION PLAN

FY 1996–FY 2001

Plan for Programmatic and General Purpose Facilities, Including Funded, Budgeted and Proposed Construction (FY BA, $M)

FY	Project	Scope	TEC	Prior*	1996	1997	1998	1999	2000	2001	2002	2003
	FUNDED PROGRAM RELATED PROJECTS:											
94	Human Genome Laboratory (KP)	3,809 gsm (41,000 gsf)	24.700	17.934	5.766	1.000						
	ALS Structural Biology Support Facilities	1,031 gsm (11,100 gsf)	7.900	5.282	2.618							
95	Elise	595 gsm (6,400 gsf)	20.200		3.200	4.500	4.700	4.400	3.400			
	SUBTOTAL - FUNDED PROGRAM RELATED		**52.800**	**23.216**	**11.584**	**5.500**	**4.700**	**4.400**	**3.400**			
	FUNDED MEL-FS PROJECTS (KG):											
93	Fire & Safety Systems Upgrade Proj. Ph I		4.600	3.470	1.130							
	Hazardous Materials Safeguards, Ph. I		4.720	3.432	1.288							
	SUBTOTAL - FUNDED MEL-FS PROJECTS		**9.320**	**6.902**	**2.418**							
	FUNDED ERWM PROJECTS:											
88	Hazardous Waste Handling Facility**	1,198 gsm (12,900 gsf)	12.625	12.454	0.171							
	SUBTOTAL - FUNDED ERWM PROJECTS		**12.625**	**12.454**	**0.171**							
	TOTAL FUNDED		**74.745**	**42.572**	**14.173**	**5.500**						
	BUDGETED MEL-FS PROJECTS (KG)											
96	Sanitary Sewer Restoration, Phase 1	1,036 m (3,400 ft)	2.400		2.400							
	TOTAL FUNDED and BUDGETED		**77.145**	**42.572**	**16.573**	**5.500**						
	PROPOSED PROGRAM RELATED PROJECTS:											
97	ALS Beamlines Initiative (KC)	1,877 gsm (20,200 gsf)	61.5			10.0	18.0	16.4	12.4	4.7		
	Chemical Dynamics Research Laboratory (KC)	3,066 gsm (33,000 gsf)	61.9		7.8	18.4	17.7	11.8	6.2			
	NCEM Electron Beam Microchar Facility (KC)	900 gsm (10,000 gsf)	17.9		1.0	1.1	8.9	7.4	0.5			
	TOTAL - PROPOSED PROGRAM RELATED		**141.3**		**8.8**	**29.5**	**44.6**	**35.6**	**19.1**	**4.7**		
	PROPOSED MEL-FS PROJECTS:											
97	No Funding Available											
98	Childcare Facility	595 gsm (6,400 gsf)	2.6				0.5	2.1				
	Elec Sys Rehab, Ph IV - BBC Swch Sta Replc		7.4				0.8	3.2	3.4			
99	Seismic Safety Improvement Project, Ph 1		4.2					0.6	2.1	1.5		
	Mechanical Equipment Replacement, Ph 1		5.1					0.5	4.2	0.4		
	Environmental and Support Bldg***		10.4					0.9	4.2	4.5	0.8	
00	Building Rehabilitation, Phase 1		5.7						0.5	2.3	2.1	
	Fire & Safety Systems Upgrd Project, Ph II		5.1						0.7	2.7	1.7	
	Admin Services Addn - Bldg 50E/F 2nd Fl	1,709 gsm (18,400 gsf)	8.5						1.0	4.5	3.0	
01	Mechanical Utilities Upgrade, Ph 2		7.5							1.1	4.1	2.3
	Roadway Safety & Stabilization, Phase 1		7.0							0.8	3.2	3.0
	Building Rehabilitation, Phase II		3.6							0.5	2.1	1.0
	SUBTOTAL - PROPOSED MEL-FS PROJECTS		**67.1**		**0.0**	**0.0**	**1.3**	**7.3**	**16.1**	**18.3**	**17.0**	**6.3**
	TOTAL FUND, BUDGT & PROP MEL-FS PROJ		**78.8**	**6.9**	**4.8**	**0.0**	**1.3**	**7.3**	**16.1**	**18.3**	**17.0**	**6.3**

* Prior costs from previous years.

** Per ER-80 Guidance.

*** This project incorporates the highest priority needs from the larger and previously submitted Safety and Support Facility, and Environmental Monitoring and Industrial Hygiene Building candidates. The prioritization and re-scoping are currently under way.

January 1995 escalation rates @ FY96 3.9%, FY97 3.8%, FY98 3.8%, FY99 3.6%, FY00 and beyond 3.6%. Overhead @ 17.8% on TEC and is subject to change.

Long-term projects also under consideration are IsoSpin Laboratory, Molecular Design Institute, and Energy Efficiency for the Climate Change Action Plan Initiative.

Management Considerations

Fundamental changes in the national and global context for scientific research have led to a reassessment of LBL's research priorities and allocation of resources, as set forth in Vision 2000 and the LBL Institutional Plan. An integral part of LBL's strategy for the future is its ability to provide buildings and infrastructure that make LBL the location of choice for facilities and programs.
At present, two-thirds of LBL laboratories, shops, utilities, and support buildings are inadequate for current and future needs. They are from 30 to 50 years old, are technically obsolete, and need improved safety, mechanical, electrical, and structural systems to meet current design standards and comply with building, fire, and safety codes. Other improvements are needed to provide employee support functions like those found in private industry and at other national laboratories, and are required at LBL to attract and retain a diverse, high-quality workforce.

LBL's facility planning therefore emphasizes the following areas:

- Upgrading or replacing deteriorated buildings and infrastructure
- Providing new research facilities
- Providing employee support facilities typical of a contemporary workplace.

Upgrading or Replacing Deteriorated Buildings and Infrastructure. The proposed Blackberry Canyon Switching Station is the final major element in the plan to rehabilitate LBL's 12 kV electrical power distribution system. The project would replace the existing distribution system in the Blackberry Canyon area, which consists of old, unreliable, and underrated equipment that is difficult to maintain and operate. The new system would increase operational flexibility and provide needed fault protection for valuable Laboratory equipment.

New state and local environmental protection measures require LBL to monitor sanitary sewer discharge for hazardous waste. Being over 50 years old, unreliable and costly to operate and maintain, sections of the sanitary sewer show signs of imminent leakage or failure. Some underground utilities and cooling towers were replaced by the Upgrade of Site Mechanical Utilities Project—Phase I. However, withdrawal of funds from the proposed second phase of this project has impacted LBL's ability to meet new regulations.

As funding continues to be unavailable for line item MEL-FS projects, stopgap repairs then become necessary, through usage of GPP funds, to prevent secondary deterioration and degradation of mission support capabilities. The proposed Five-Year Plan (FY 1997 through FY 2001) for facilities modernization will require budget authority of over $75 million for total implementation. Full modernization of the main site requires a 20-year investment program. Continued delay in correcting these problems will result in worsening conditions, increasing the backlog of substandard facilities and increasing operating costs.

Accurate tracking of maintenance deficiencies is obtained through LBL's Condition Assessment Survey (CAS) process, an ongoing program of inspection that establishes the condition of facilities. Based on CAS results, maintenance deficiencies are identified and corrective actions are scheduled. CAS identifies short term deficiencies that can be corrected on a day-to-day basis by preventive maintenance actions, as well as major deficiencies that require substantial funding commitments.

Providing New Research Facilities. The new programmatic research buildings and facilities in the 5-year plan serve the national interest in several research areas where LBL has established programs. The Human Genome Laboratory, ALS Structural Biology Support Facilities, and Elise accelerator are recently funded projects. Proposed are the Chemical Dynamics Research Laboratory, ALS Beamlines Initiative, and the Electron Beam Microcharacterization Facility, an expansion of the National Center for Electron Microscopy. The ALS Beamlines Initiative will substantially complete installation of user facilities on the second floor of the ALS building, essential to meet ALS program requirements. The Laboratory is also in the initial stages of planning for a Molecular Design Institute. All key initiatives are described in detail in the LBL Institutional Plan.

Decommissioning and Decontamination of Buildings 51 and 71. The development of new national program directions for nuclear physics resulted in the shutdown of LBL's Bevalac nuclear

physics program during FY 1993. We completed a Nuclear Physics stand-down-and-secure of the facility in FY 1993 and FY 1994. LBL is currently working with DOE/ER and DOE/EM to obtain a cost-effective and timely recovery of the space previously required for Bevalac operations and experimental programs.

The key element of LBL's plan is a waste minimization initiative, recently approved by DOE-ER and DOE-EM, for re-use of the Bevatron shielding blocks at the Relativistic Heavy Ion Collider (RHIC) at Brookhaven National Laboratory. This proposal leads to significant cost savings to DOE as it averts the disposal as low-level waste of 4,550 cubic meters (160,000 cubic feet) of shielding block. Thus, use of valuable burial space is avoided, valuable shielding blocks can be reused, over $40 million in burial costs at Hanford are eliminated, and 3,700 square meters (40,000 SF) of floor space at the Bevatron is made available for beneficial reuse by DOE and LBL.

As a consequence of approving shipment of Bevatron shielding blocks to Brookhaven, DOE-ER has officially withdrawn the Bevalac from the list of surplus facilities. LBL is therefore no longer seeking transfer of the facility to EM for decontamination and decommissioning. LBL is continuing to work with DOE to find cost-effective means of disposing of remaining materials at the Bevalac and recovering space at the Bevatron for beneficial use by DOE and LBL. For purposes of recovering space, efforts at the Bevatron (Building 51) and HILAC (Building 71) have been separated, with recovery efforts focused on the Bevatron.

LBL has also developed and submitted several proposals to the Inactive and Surplus Facilities Program (I&SFP; ER-80). These proposals are for the cleanup and cleanout for eventual reuse of nonactivated Bevalac equipment and peripheral spaces, permitting a gradual return of these spaces to productive Laboratory and programmatic use. Pending funding of facility cleanup, the Bevalac is in a surveillance-and-maintenance-only mode, currently funded by the Nuclear Physics Program in OER.

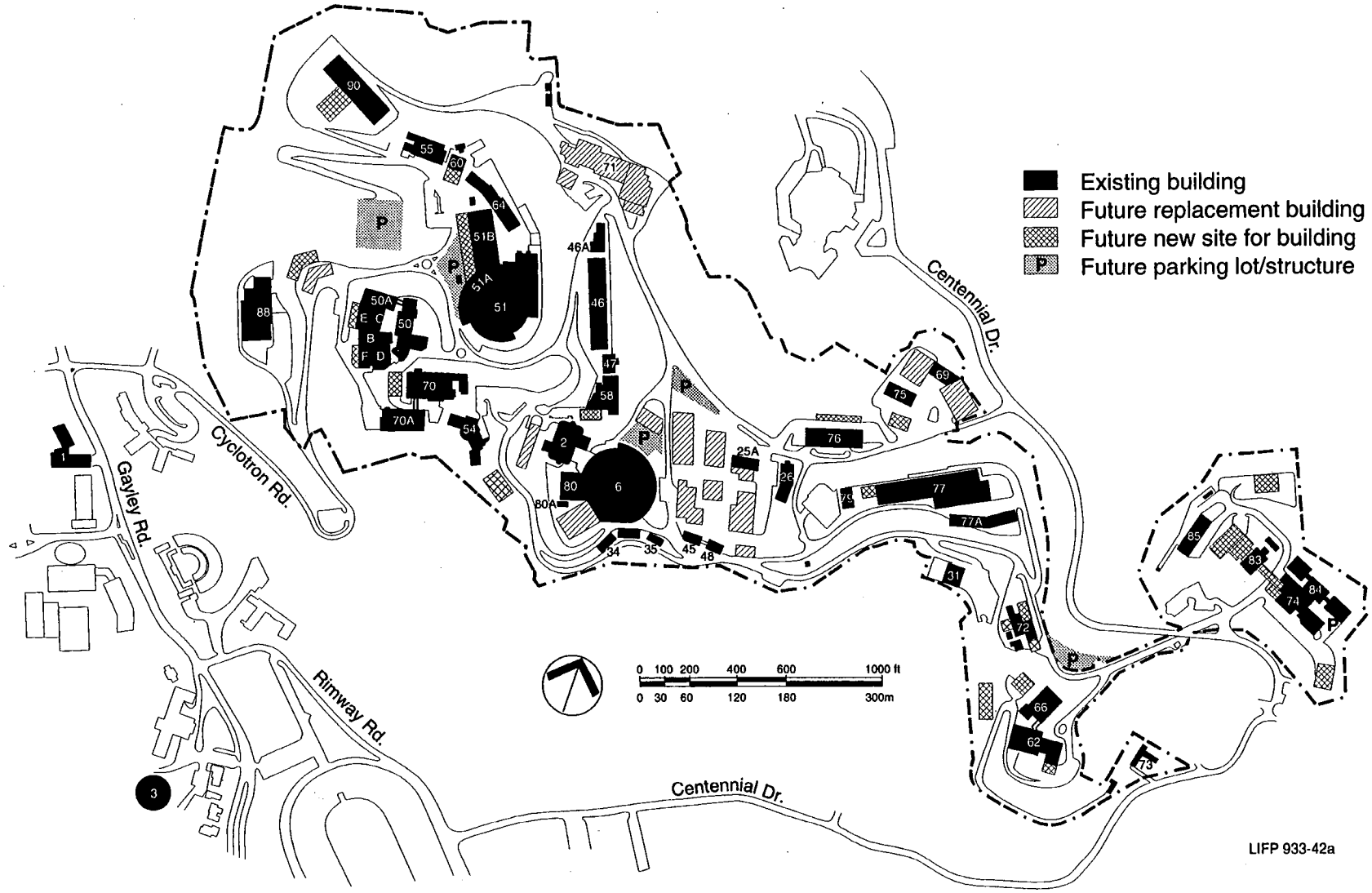
Aside from the Bevalac, the Laboratory conducts periodic reviews of facilities that may become inactive. Other facilities to be decommissioned include gamma irradiators.

General Plant Projects (GPPs). Funding to date has been inadequate to meet the Laboratory needs within a timely schedule. This program has a significant backlog of projects, exceeding $30 M. Roughly one quarter of this backlog is for environment, health, and safety needs and one-half is for general improvements and replacements. Increasing GPP funding to $6 M annually would ensure the success of the Laboratory's safety rehabilitation program and help reduce the current backlog of projects over the next five years.

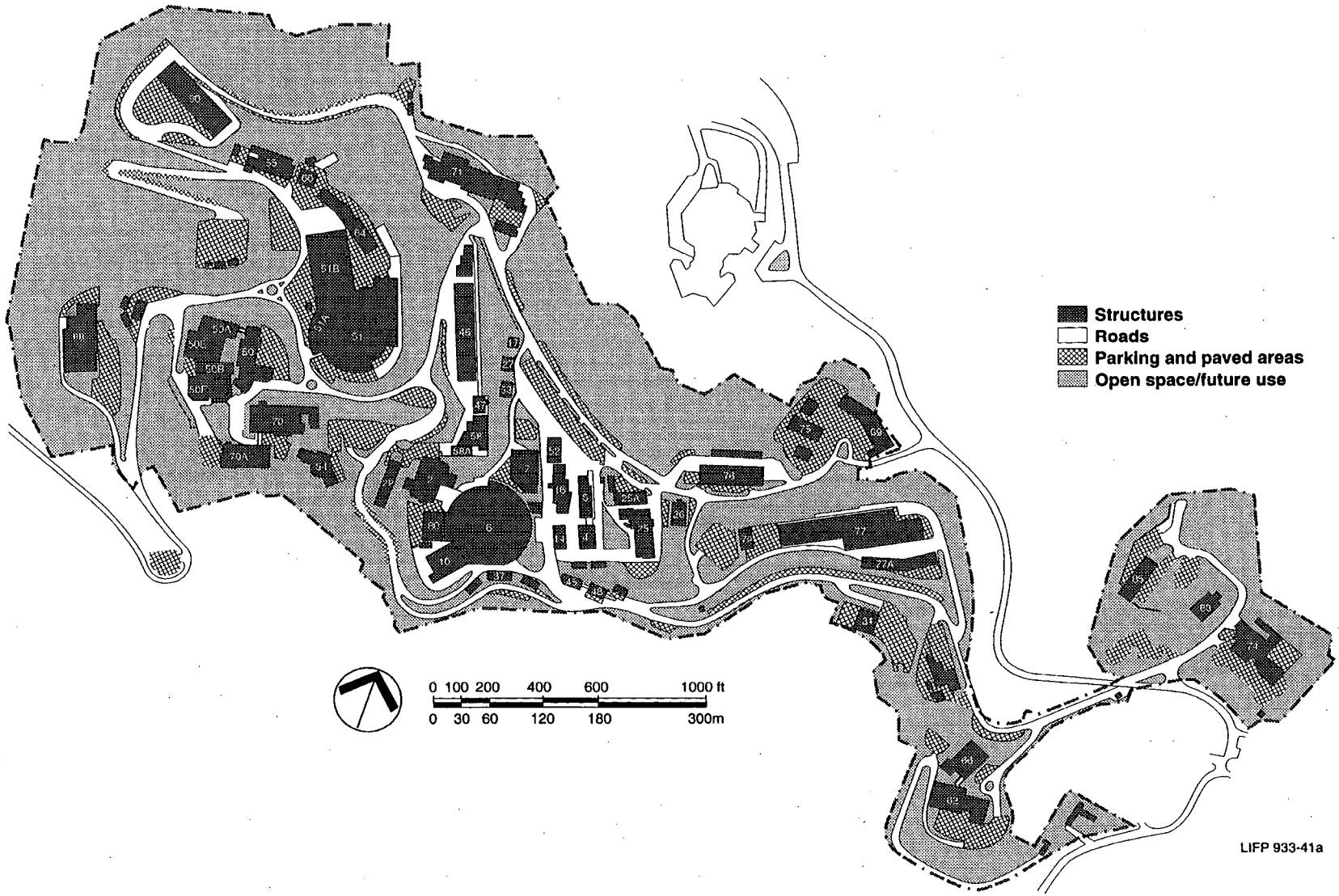
General Purpose Equipment (GPE). Essential support equipment has been funded through DOE. LBL's Five-Year GPE Plan identifies needs based on a range of criteria, including environment, safety, and health; legal requirements; failed, worn, inefficient, or obsolete equipment; substandard performance; or increased workload and demand. The current funding level of $1.7 M/year is minimally adequate to meet the Laboratory needs. Currently there is a $19 M equipment backlog for environmental monitoring and fire safety, physical-plant maintenance, mechanical and electrical shops, transportation, and data processing and communications. Consolidated GPE management at the level of the OER facilitates the implementation of an integrated and longer range GPE plan.

Conclusion. These management issues directly relate to LBL's ability to carry out its mission. If LBL is to be a location of choice for leading research programs and support DOE's strategic plan, it must undertake a broad-based renewal of the facilities and infrastructure which support present and future research programs. The 5-Year Plan given in Table 1 addresses the most pressing needs and represents only the first step in realizing the long-range goals stated in the Institutional Plan and Vision 2000.

Appendix: LBL Maps



Map 1. LBL Master Plan.



Map 2. LBL Current Land Use Plan.

FACILITIES DEPARTMENT
Lawrence Berkeley Laboratory
University of California
Berkeley, CA 94720