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May 21, 2001

Dear Colleagues and Friends

This Campus Master Plan resulted from three years of study and evaluation, and a year of review, discussion, and modification. It was approved by the University of Colorado Board of Regents on February 17, 200 and by the Colorado Commission on Higher Education on March 1, 2001. This printing incorporates all changes advocated by the Board and the Commission. The Campus Master Plan's purpose is to identify the forces of change that will affect the University campus and translate emerging institutional needs into a capital development program that meets those needs through the year 2008.

On behalf of the University of Colorado at Boulder, I wish to express gratitude to the many, many people both within and outside of the institution for their dedication to this project, and their commitment to the importance of working toward a future that positively benefits the campus and the community.

We are celebrating 125 years of increasingly illustrious history in 2001, and I believe that this Campus Master Plan will be yet another milestone in forging a physical environment that inspires continuation of our excellence in education and research. We want to be a cornerstone of intellectual vitality and cultural opportunity for the Boulder community. We believe our plan will contribute to the local community and campus aesthetics that make Boulder such a jewel in the state and nation.

Sincerely,

Richard L. Byyny
Chancellor

Preface

Purpose of the Campus Master Plan

This University of Colorado at Boulder Campus Master Plan is the guide for future physical development of the campus. The plan takes into account a number of changes impacting the campus, many of which are due to the rapid evolution of technology for information and learning. Other changes include an increasing enrollment, increases in research activity, new goals and procedures from sources both external and internal to the university, increased expectations by students and the community, and changing resources. The Master Plan addresses both a backlog of needs and projections of future needs. This plan is a guide for the University of Colorado at BoulderÕs capital investment and other physical changes on the campus.

The University of Colorado at Boulder has a long tradition of producing master plans, often about once a decade, and has successfully implemented provisions of these plans. The previous master plan was approved in early 1990, served its useful purpose, and needs to be replaced with a more current plan. The State of Colorado Commission on Higher Education (CCHE) requires each higher education institution in Colorado to have a current master plan. The program plans for specific buildings, major renovations, and new infrastructure are required by CCHE to be consistent with the current master plan for the institution.

The Campus Master Plan is a land use plan to guide decisions, not a fixed plan that could unduly limit opportunities and creativity. This approach is more usable and flexible. For specific campus areas, micro-master plans are developed in more design detail.

The purposes of the five chapters in the Campus Master Plan are to:

1. identify institutional goals pertinent to campus planning, with projections for enrollment, research, and employment;
2. provide a relevant history and analysis of the setting and patterns of development;
3. analyze facilities needs, within major land use categories;
4. set forth the comprehensive framework plan for buildings, outdoor areas, environmental management, transportation, and utilities infrastructure; and
5. address community relations, land acquisition, and capital improvements planning.

Planning is an ongoing process. Within the framework this plan provides, much work remains to be done. There are almost always program plans in process. Studies will be underway during the year 2000 regarding conference facilities and utilities. Facilities standards will be updated to implement plans. But for the next several years, this Campus Master Plan will be the guide that identifies the goals and ties the planning efforts together.

Time Frames

The plan is applicable for the 10-year period from 1998 to 2008. Timeliness of the data available as the base for this plan varied slightly, some from the 1997-98 school year, some as recent as fall 1999.

CCHE requires that the plan include at least the next five yearly capital funding cycles, which are fiscal years 2000-01 through 2004-05. Because projects receiving initial funding in 2005 may not be completed until 2008, it is necessary to look out to at least 2008 in terms of projected enrollment and other activities.

It is difficult to plan definitively for longer than about 10 years, given the changes occurring in higher education and uncertainties inherent with annual funding cycles. However, parts of the plan are longer-range, in order to provide direction, vision, and identification of the long-term development potential of the campus.

Preparation Process

The University of Colorado at Boulder began the process of preparing a new Master Plan in early 1997. In March 1997, Dr. Richard Byyny, then Interim Chancellor, appointed a Pre-Planning Task Force chaired by Paul Tabolt (then Facilities Management Director) "to gain a better understanding of policy and political issues that will need to be carefully analyzed and evaluated during the master planning process." This task force interviewed Regents and CU-Boulder administrators. Comments were collected about major goals, land use issues, campus image, signage, landscaping, transportation, land acquisition, and property-specific issues (for Williams Village, Grandview, and CU-Boulder South).

The initial interviewees suggested a process of widespread involvement by the university community and local community. Consequently, in August 1997, Chancellor Byyny appointed eight task forces:

1. Projecting Demographics, Space, and Economic Impact
2. Reassessing Academic Facilities
3. Creating Living-Learning Environments
4. East Campus/Research Park Planning Principles
5. Interfacing the Campus and Community
6. Land Use Principles for Location of Student and Administrative Services
7. Creating Image through Architecture, Landscaping, Density, and Signage
8. Facilitating Transportation.

Task forces membership included faculty, staff, students, and community representatives. James Baily, Campus Planner, directed the master plan process throughout, including coordination of the task forces and a thorough review process.

The task forces reported their recommendations in February 1998. Issues raised were charted and discussed with a large number of representative groups during the next year. Among these groups were the:

1. Board of Regents (particularly their Capital Planning Committee),
2. Boulder Campus Planning Commission (a representative body of

faculty, staff, and students),
3. Design Review Board (four prominent architects and landscape architects),
4. University/City Steering Committee (Regents and Boulder City Council members),
5. Chancellor's Executive Committee,
6. Chancellor's Community Advisory Board (local business and community leaders),
7. Faculty Assembly (through their Executive Committee),
8. Council of Deans, and
9. Staff directors of divisions in Administration and Student Affairs.

Drafting of the plan began in July 1998. Twenty-two people on campus were selected in July to initially draft or provide materials for various sections. Nine consultants were selected to provide:

1. Space needs analysis (Paulien & Associates),
2. Outdoor areas planning (Civitas, Inc.),
3. Transportation information (Felsburg Holt & Ullevig),
4. Flood hazard analysis (Love & Associates, Inc.),
5. Outdoor lighting analysis (Clanton & Associates),
6. Housing site selection, and Williams Village area planning (Design Workshop),
7. Grandview area planning (Shapins Associates),
8. Mountain Research Station surveying (Boulder Land Consultants), and
9. Norlin Quadrangle planning (Design Concepts).

Over the year beginning in July 1998, the in-house and consulting sources provided analyses to James Baily, who wrote the plan. An initial draft was published in July 1999 and widely circulated. In late 1999, comments received were incorporated into the plan, prior to final action by the Board of Regents.

This lengthy preparation process has allowed many people to have input and review. This has created a better plan, and a greater commitment for implementation of provisions of this Campus Master Plan.

Terminology

The University of Colorado at Boulder is elsewhere referred to as "the university," "CU," "UCB," "CUB," "CU-Boulder," or the "Boulder campus." Hyphens and commas are sometimes added in the institutionÕs name.

In this plan, most references are more precise:

1. "CU-Boulder" is used as the short form of the official name, the University of Colorado at Boulder.
2. The "university" or "CU" refers to the entire University of Colorado, a multi-campus system headquartered in Boulder. References to property ownership and transactions are correctly "university" items under the governing board, the Board of Regents.
3. The "campus" means the real estate of CU-Boulder, both the land and the improvements on the land.

Acknowledgements

More people were involved in the preparation of this Campus Master

Plan than in any previous master planning for the University of Colorado at Boulder. Many of the groups and consultants who participated are noted in the "preparation process" section above, and their contributions are gratefully acknowledged.

On-campus individuals who prepared initial drafts of material included: Lisa Adair, Facilities Management Environmental Services; Mansour Alipour-fard, Facilities Management Fire Safety; Mark Augustin, Employee Development; David Cook, Division of Parking and Transit Services; Tom Cowing, Facilities Management Engineering and Utilities; Noel Cummings, Office of Planning, Budget, and Analysis; Bill Deno, Office of the Campus Architect; Rich Harpel, University Academic Affairs and Federal Relations; Steve Hecht, Office of Facilities Planning; Bill Herbstreit, Office of Financial and Business Services; Ana Johnson, Division of Parking and Transit Services; Bill Kaempfer, Academic Affairs; Marilyn Laverty, Employee Development; Jeff Lipton, Facilities Management; Dennis Maloney, Information Technology Services; Lou McClelland, Office of Planning, Budget, and Analysis; Larry Nelson, Office of Contracts and Grants; Kathleen Rogers, Office of Planning, Budget, and Analysis; Joe Roy, Division of Parking and Transit Services; Phil Simpson, Office of Facilities Planning; Ron Stump, Student Affairs; Will Toor and staff, UCSU Environmental Center; Michele Van Pelt, Office of Financial and Business Services; and Richard Wobbekind, Business Research Division. James Baily, Campus Planner, wrote all final material.

In addition, reviewers included: Richard Byyny M.D., Chancellor; Paul Tabolt, Vice Chancellor for Administration; Robert Sievers, Chair, RegentÕs Capital Planning Committee; Bobbi Barrow, Executive Director of Institutional Relations; Albert Bartlett, Professor Emeritus; Stephen Lester, student; John Prosser, Jerry Seracuse, Eldon Beck, and Cab Childress, members of the University Design Review Board; and William Arndt, Administrative Assistant, Facilities Planning.

Most graphics were prepared by Stephen Wendzel, Assistant to the Master Plan Coordinator, with assistance from the Facilities Management CAD Office. Assistance by the Office of Publications and Marketing included: Linda Besen, text editing; Barbara Diehl, layout design; and Eileen Witt, project management.

Thanks are extended to these and many other people who contributed to this plan.

I. Institutional Goals and Planning

"Who knows only his own generation remains always a child"

These words cut into the stone facing of Norlin Library serve as a metaphor for both the roles of the library and of the university in society. Innovation, creativity, learning, scholarship, history, knowledge, communication, and the maturation of the individual occur within the university learning environment. This Campus Master Plan for the University of Colorado at Boulder will help ensure that this nurturing university environment is maintained and enhanced over time.

This first chapter summarizes the planning goals, then looks at trends and projections for the three primary measures of the institution's size: student enrollment, extent of research endeavors, and faculty/staff employment.

A. Planning Goals

The University of Colorado at Boulder is a comprehensive, residential research university. "CU-Boulder" is one of four campuses in the University of Colorado system. Exhibit I-A-1 presents basic facts about CU-Boulder.

1. University Priorities

The University of Colorado system identified these priorities:

- Support innovations in learning and creative scholarship;
- Be more responsive to students and other constituents;
- Use technology to improve learning, teaching, and research; and
- Enhance the university's infrastructure.

This Campus Master Plan serves as a means to ensure that the university's physical environment is a total learning environment.

2. Vision, Mission, and Strategic Planning

At CU-Boulder, research, teaching, learning, and community outreach occur with synergy and with integration. This living-learning community fosters innovation, critical thought, creativity, scholarship, professional competence, responsible citizenship, and leadership. CU-Boulder serves Colorado, the nation, and the world by advancing and imparting knowledge across a comprehensive range of disciplines.

CU-Boulder strategic goals are to:

- Enhance student learning;

- Serve the community;
- Ask "What's best for students?";
- Increase support for teaching, research, and creative work;
- Foster a campus community that is civil, diverse, healthy, and involved;
- Allocate limited resources wisely;
- Effectively manage student enrollment;
- Enhance the human, financial, and organization infrastructure; and
- Develop interdisciplinary advanced technology programs.

3. Campus Master Plan Goals

The Campus Master Plan establishes a facilities framework, addressing how the campus can support the institution's vision and mission. An institution of exceptional educational quality requires a physical campus of equally exceptional quality. Facilities need to support teaching, research, community service, and deployment of effective technology. This Campus Master Plan must be flexible since accumulated knowledge and changes in technology have been growing at an exponential rate, creating new educational program priorities and innovative research directions.

The previous Master Plan in 1990 identified these four goals for campus master planning:

- Provide high-quality facilities to meet institutional needs;
- Preserve and enhance the traditional beauty of the campus;
- Acquire and use land wisely;
- Design campus systems (infrastructure) to ensure an efficient, pleasing, and safe campus for many years to come.

To incorporate university priorities and strategic goals, this plan now adds six additional goals:

- Provide more experiential learning opportunities for students;
- Use technology to improve learning, teaching, and research;
- Ensure widespread involvement in campus planning;
- Foster a living-learning community, including residential academic programs;
- Ensure access through improvements in all modes of transportation; and
- Improve the open spaces, outdoors lighting, and signage.

Five goals more specific to the planning period (through the 2008-09 academic year) are added:

- Accommodate projected enrollment growth of 7.2 percent;
- Facilitate increased graduate student enrollment to reverse a downtrend in the percentage of graduate students enrolled;
- Retain the 10-minute class change possibility for most undergraduate courses;
- Provide additional housing to maintain or increase the percentage of students housed on campus;
- Begin to address the need for affordable housing for faculty and staff.

These Campus Master Plan goals, 15 in total, guide the facilities recommendations of this plan.

4. Preservation

In the Campus Master Plan goals, there is a balance between preservation and growth. The beauty of the Main Campus is a major asset of the university. There is a long-term commitment to maintaining and enhancing the aesthetic qualities. Continuing to use the palette of building materials, which includes sandstone walls, tile roofs, and limestone trim, is essential but not sufficient. The entire design fabric, including outdoor areas, is important.

To understand how to successfully integrate a new project into the design fabric of the Boulder campus, one first needs to look at the basic principles of the original Klauder Campus Development Plan and associated building architecture. . . . The spaces between buildings and the wings of individual buildings ranged from small and intimate to large and spacious. This variety of outdoor rooms is a key element in the charm of the Boulder campus. (William R. Deno, Body & Soul: Architectural Style at the University of Colorado at Boulder, 1994)

The oldest area of campus, the Norlin Quadrangle, has been designated a State and National Historic District. Buildings designed in the 1920s through 1940s by architect Charles Klauder set the campus character. His buildings are located both in the historic district and elsewhere on the Main Campus. His influence on all subsequent development on campus has been great, and the university is committed to perpetuating the design legacy.

The expansion of this university is the most earnest and the most successful effort in the U.S. today to integrate new buildings with an existing campus. (John Morris Dixon, Architectural Forum, October 1966). Campus planning includes updating existing buildings and constructing new buildings. Each year, the renovations and new construction compete for capital construction funding.

The campus development history and heritage will be further explored in Chapter II. The development master plan will be presented in Chapter IV.

5. Growth

Forty years ago (1959), consultant John Carl Warnecke and Associates prepared "A Study of Long Term Land Requirements for the University of Colorado, Boulder Campus." This study was based on a projected student enrollment of 20,000, which was the foundation for planning in the 1960s and which determined the sizing of campus infrastructure. Growth in enrollment and research has long since exceeded the maximum envisioned in that study. Growth has been accommodated through incremental improvements. Much of the Main Campus infrastructure has been stretched as far as feasible without major capacity changes. The campus has also grown to be several properties, and this plan will address the infrastructure needs of each of these properties.

This Campus Master Plan needs to accommodate a modest increase in enrollment, a larger increase in research, and additional space to better accommodate existing functions. Growth on the Main Campus is constrained. Since the property is essentially fully developed, any new use of a site displaces an existing use. Carefully planned and designed infill development can accommodate some growth on the Main Campus. The East Campus, Williams Village, and CU-Boulder South properties have considerably more vacant land to accommodate growth. Consequently, those non-academic functions

that need not be located on Main Campus are increasingly being located on the other properties.

The primary time frame of this Campus Master Plan is through the 2008-09 academic year, 10 years from the 1998-99 year in which this plan was drafted. But growth of programs and other needs for the university will continue beyond the 10 years in ways difficult to predict today. The intent of this plan is to chart a course for a decade, but also to lay a foundation for many more years into the future. This plan will help assure options and flexibility for the long-term future of the university, beginning the planning for use of the newly acquired CU-Boulder South property, adopting new technologies, and keeping education current by facilitating leading-edge research.

6. Evaluation of the Previous Master Plan

The University of Colorado has a century-long tradition of master planning to guide campus development. The purpose of a campus master plan is to periodically identify what is needed and to comprehensively plan development of the campus to accommodate those needs.

Almost a decade will have passed between when the Board of Regents approved The University of Colorado at Boulder Long-Range Facilities Master Plan on June 21, 1990, and when this Campus Master Plan is approved to replace it. The 1990 plan, written by university staff, received accolades from the University Design Review Board and others for its organization, clear presentation, and useful approach. But by 1997 the need for a revised plan was obvious. An overall reassessment of campus development planning is needed to incorporate major changes occurring in higher education.

Projections made in 1990 proved uncannily accurate. As projected, student enrollment during most of the 1990s did not change greatly. Federally funded research activity somewhat exceeded even optimistic projections. And as expected, the number of employees increased, in large part due to the increase in research. National and statewide economies prospered, allowing the state to fund some of the capital facilities needs.

Building space on the campus grew substantially during the 1990s as facilities that had been in the 1990 plan were constructed. The new construction included the: Mathematics Building, Dal Ward Athletic Center, Euclid Avenue and Regent Drive Autoparks, Police and Parking Services Center, MCD Biology, Benson Earth Sciences, Housing System Maintenance Center, Chemical Waste Storage Facility, Mountain Research Station Hostel, and the Imig Music Building addition. The 1990 plan was amended to facilitate a new engineering program, the Integrated Teaching and Learning Laboratory, through construction of the Drescher Undergraduate Engineering Building. Also, a new Humanities Building is being built as this plan is being written. The major planned renovations completed were Hale Science, the Power House, Institute for Behavioral Genetics, ICS/Muenzinger, Chemistry and Biochemistry, and the Hazel Gates Woodruff Cottage for Women's Studies. US West research facilities ensured a successful Research Park, where a building was renovated for CASA, and the EPOB Greenhouse was added. Projects planned but not implemented include an Alumni Center addition and several renovations of older academic buildings. Only one project was removed from the capital projects list: a space

renovation that would have supported the now-defunct federal superconducting supercollider. There has been considerable capital construction since 1990. Even the large maintenance backlog has been decreased because of a higher level of annual funding.

Even with the booming economy, the time schedule for projects in the 1990 plan was overly optimistic, so some projects identified in 1990 remain to be completed. Planning continues for those remaining projects. This Campus Master Plan builds on the success of the 1990 plan, encompassing many of the same goals and the remaining capital projects. This plan will also address new needs, many encompassing new technologies.

B. Enrollment

An educational institution's size is traditionally measured by student enrollment, and student enrollment is the principal basis for determining the educational space needs identified in this plan. This section reviews CU-Boulder's enrollment goals, provides a brief enrollment history, projects enrollment for the next 10 years, and explains how the projections were derived and how they should be used.

1. Enrollment Goals

For perspective, CU-Boulder is one of the smallest of the AAU universities, with which it competes nationally for students. As shown on Exhibit I-B-1, enrollment is relatively small yet CU-Boulder is a major research university. Also, the percentage of graduate students is relatively low at 18 percent. One of the enrollment goals is to increase the graduate student population to be more in line with AAU peers.

In fall 1995 the CU-Boulder Chancellor established the Enrollment Management Team (EMT) with representation from all parts of the campus. In May 1997 the EMT articulated the enrollment policy in the Strategic Enrollment Management Plan, which was updated in spring 1998.

The program of enrollment management outlined in the Strategic Enrollment Management Plan is designed to:

- manage the size of the student body to a level consistent with campus capacity and budget, while continuing to provide quality education;
- understand and shape the characteristics of the student body;
- increase the student-centered nature of the campus; and
- understand and shape the interaction between the quality of student experience and academic success.The plan includes these specific goals:
- Plan to accommodate about 27,000 students by the year 2008.
- Balance student enrollment with campus physical and academic capacities, including numbers of faculty and staff. In doing so, fully utilize the capacities of each school and college; monitor housing, instructional, and service capacities for new freshmen; and review physical and academic capacities annually, considering very carefully any actions that would increase or decrease capacity.
- Maintain access for Colorado residents.
- Use financial aid to ensure affordability.
- Maintain enrollment of non-Colorado residents to add

geographic diversity, to provide financial support to the institution, and to enhance the intellectual environment.
- Improve the ability to recruit and retain students by improving the quality of the undergraduate educational experience and by increasing the involvement of both faculty and staff with students.
- Increase graduate-level enrollments to 20 to 21 percent of fall headcount, a level in line with AAU peers and last seen on the Boulder campus in 199193.
- Ensure diversity in the student body, in order to serve all of the population and provide an enriching educational environment.
- Conform to all relevant Colorado Commission on Higher Education (CCHE) and state regulations governing enrollment.

The university is committed to increasing ethnic, cultural, economic, geographic, and philosophical diversity among its students, faculty, and staff, in recognition of Colorado's multicultural heritage. An education is incomplete without exposure to the viewpoints of a broad spectrum of society. These concerns are best addressed by establishing and maintaining a student body, faculty, and staff from many communities of the state, nation, and world.

Many policies constrain enrollments. These include the CCHE admission standard, a statutory rule that at least 55 percent of fall freshman matriculants must be Colorado residents, CU-Boulder's own admissions guarantee for Colorado high school graduates applying as freshmen, the Minimum Academic Preparation Standards (MAPS), a statutory rule that at least two-thirds of fiscal year enrollment must be Colorado residents, and the CCHE requirement that the institution plan for diversity in its student population.

2. Enrollment History

Exhibit I-B-1 illustrates the enrollment growth over time. The Boulder campus experienced steady, moderate enrollment growth from the early 1980s (1980 fall headcount was 21,878) through 1990 (fall headcount was 25,176) despite state caps at the time on resident enrollment. Enrollment peaked in 1991 at 25,571.

From the peak in 1991, total enrollment leveled off and began a slow, steady decline through 1995 to 24,440, despite a record-high freshman class of 4,200 in fall 1995. By 1995 the Boulder campus had 1,100 fewer students than in 1991.

Since 1995 enrollment again increased, reaching 25,125 in fall 1998. This figure includes a record 20,595 undergraduates and reflected two consecutive freshman classes (1997, 1998) over 4,200. At this writing, preliminary enrollment figures indicate fall 1999 enrollment will top the previous peak enrollment set in 1991.

Throughout the last decade, several factors have been critical for understanding CU-Boulder enrollments.

The first factor is the size of the freshmen class, which is related to high school graduates. Over 80 percent of CU-Boulder enrollment is undergraduate, over 70 percent of undergraduates enter as freshmen, and over 80 percent of new undergraduates enter within two years of graduating from high school. The "mix," or percentage of residents, is as important, or more important, than the total enrollment in determining revenue, because nonresident tuition subsidizes costs for residents. Nonresidents also add an additional

diversity of backgrounds, interests, and perspectives that enriches the educational experiences of all students.

Colorado is a relatively small state. CU-Boulder has historically enrolled 6 to 7 percent of all Colorado high school graduates each fall. In contrast, peer institutions in larger states, such as California and Michigan, serve a smaller portion of the state's high school graduates. CU-Boulder is classified by the state in the "highly selective" admissions tier relative to other Colorado institutions. All qualified applicants who submit on-time complete applications meeting the CCHE and CU-Boulder academic standards are admitted, subject to residency and capacity limits. In 1997, 87 percent of all resident freshmen applicants, and 81 percent of nonresident applicants, were admitted.

The graduation rate (about 66 percent in six years) is average for public research institutions enrolling freshmen with similar academic qualifications. It is higher than rates at most of the other Colorado public institutions.

3. Enrollment Projections

In 1995 an internal commission, the Commission on Buffalo Futures, was created to study the projected increases in demand for resident undergraduate enrollment. The commission concluded that "unlimited growth [at CU-Boulder] is unacceptable because it threatens academic quality, affordability, and the limits of campus and community facilities." At the same time, "failing to meet any increased resident demand is also unacceptable."

Colorado higher education faces significant enrollment increases in the next decade, offering opportunities for institutional growth, service, innovation, and differentiation. CCHE projections of Colorado high school graduates through 2008 (see Exhibit I-B-3) show a 29 percent increase over 1997, although most of the increases predicted have not yet materialized for higher education.

The University of Colorado at Boulder is committed to participation in state enrollment growth while continuing to provide undergraduate, graduate, and professional education of the highest quality. The CU-Boulder projections take into account projected growth in the number of Colorado high school graduates.

In developing enrollment scenarios, figures are inherently part prediction, part choice. Predictions must take into account the behaviors of high school graduates, transfers, new graduate level students, and their families; the state, with policies on funding, tuition, aid, and admissions; the public, with reactions to CU and to state policies; and the institution itself, with admittance rates, financial aid, recruiting, and capacity limits.

The scenarios detailed in Exhibit I-B-4 represent CU-Boulder's combination of choices and predictions. The 26,500 headcount enrollment total for fall 2003, approved by the Chancellor in spring 1998, is consistent with the enrollment goals stated in the Strategic Enrollment Management Plan, referenced above.

Three scenarios are shown: midpoint, high, and low. In the midpoint estimate, enrollment increases to 26,500 by fall 2003, with an increasing proportion of residents, then to almost 27,000 by fall 2008. The high estimate couples higher enrollment with a lower proportion of residents; the low estimate couples lower enrollment

with a higher proportion of resident students. The midpoint estimate is used for planning purposes. It underlies the projections throughout this Campus Master Plan, including projected needs in the Space Needs Analysis (Section I.E).

These projections were made in spring 1998 to cover the 10 years in this plan (fiscal years 1998-99 through 2007-08). Actual enrollment in 1998-99 was 25,125, near the low end of the estimate range. At this writing it appears that 1999-2000 enrollment will be near the high end of the estimated range for this year. Projecting on the basis of the last year only results in higher projections, but this would not take into account the fact that market demand for higher education fluctuates. Further, facilities will constrain enrollment.

Overall, the projected increase for the decade ending 2008 is from 25,125 to 26,942, which is just over 1,800 students, for a growth rate of 7.2 percent over 10 years.

4. Enrollment Data Considerations

As the listing of low and high estimates implies, actual enrollment will vary from the midpoint estimate. This is especially true for subgroup data, such as freshmen. For campus planning purposes, the precise figures for each year are rarely used, but rather the more important overall trend (a 7.2 percent increase over the10-year period).

Reported enrollment may increase somewhat faster in 1999-2000, when degree-seeking continuing education students are added into the reported total for the first time.

C. Sponsored Research

Research is integral to CU-Boulder's mission as a comprehensive university that leads in innovation, creativity, discovery, and dissemination of knowledge. Both undergraduate and graduate participation in research greatly facilitates participatory learning. A lifelong commitment to creative work also enables faculty members to be effective and enthusiastic teachers who impart both traditional and newly discovered knowledge to students and colleagues. In conducting research, the faculty, research staff, and students all have the opportunity to contribute to the ongoing advancement of learning and the development of knowledge. Furthermore, campus research participants transfer information to many sectors of society through publications, performances, exhibitions, lectures, outreach activities, development of patents and licenses, and technology transfer. These efforts are essential to the economic and social well-being of the state and the nation.

Contributions to the advancement of knowledge are made in both sponsored (externally funded) and unsponsored research programs. Student enrollment and sponsored research are the impetus for growth considered in this Campus Master Plan.

1. Sponsored Research Goals

The University of Colorado at Boulder has established aspirations for its research activities that can be summarized as follows:

- Engage the student population in the discovery and creation of new knowledge.

- Maintain and enhance the richness of undergraduate and graduate educational programs,
- Maintain and improve CU-Boulder's position as a premier research university,
- Maintain and enhance CU-Boulder's status as the flagship campus of the CU system and the premier research university in the Rocky Mountain West, and
- Continue to improve CU-Boulder's national reputation.

There is a need to continue to recruit and retain outstanding faculty to maintain excellence in research, attract increased research funding, and to attract top graduate students. Faculty at the forefront of their research fields provide a rich learning experience for undergraduate and graduate students. They bring unique understanding and insights to the classroom. These individuals provide a rich learning experience because of their own contributions to research and scholarship and their deep understanding of work done by others. They not only disseminate knowledge but also teach students how to learn by mentoring them in independent research projects.

The students benefit in many ways by involvement in research. They create new knowledge, and they develop skills that would not be transmitted in classroom settings. Critical thinking is improved by research experience. Practical experience in writing and speaking about research also improves students' communication skills.

2. Sponsored Research History

The faculty have been very successful in attracting sponsored research funding. Extramural contracts and grants increased from $80.2 million in fiscal year 1988 to $181.7 million in fiscal year 1998 (see Exhibit I-C-1). Preliminary 1999 figures released as this plan was being written indicate $204 million in extramural contract and grant funding in 1999. Adjusted for inflation, the increase has been about 4.6 percent per year annually. This growth rate was well above the national research funding growth rate.

Sponsored research funding has been very successful at CU-Boulder because of a creative and entrepreneurial faculty and because of the ways in which research has been institutionalized on campus. In conjunction with individual faculty efforts and departmental efforts, CU-Boulder has a large number of institutes and centers, such as JILA and CIRES, which have established ongoing relationships with federal agencies such as NIST and NOAA. The interdisciplinary work of institutes and centers draws talent from several fields as needed to address research concerns. These institutes and centers are able systematically to assist faculty and students to identify research interests, obtain funding, conduct the research, and communicate the results.

Increases in sponsored research award dollars, as well as the goal of providing more experiential learning opportunities for students, drive the need for new or renovated research laboratory and office space. The availability of high-quality research space is a critical consideration in competing for new grants and in recruiting and retaining the outstanding faculty and researchers who are responsible for conducting the research.

From the 1960s to present, CU-Boulder invested in facilities for several science fields, notably in engineering, astrophysics and space

sciences, and biochemistry. These investments attracted additional extramural research funding.

Some of the growth in research has been accommodated in research spaces that have been extensively renovated as a result of new, sponsored research projects. But the increase in research facilities space has not kept pace with the need. A substantial backlogged need of approximately 560,000 ASF has accrued, which will be detailed in Space Needs Analysis, Section III.A.

3. Sponsored Research Projections

Research at CU-Boulder heavily depends on federal funding. Approximately 90 percent of CU-Boulder's research funding comes directly or indirectly from federal sources. Federal funding is expected to continue to increase, as there are indications that federal support of research may even be stronger in the future. This support, plus a healthy U.S. economy, a balanced federal budget, and low inflation, provide an optimistic outlook for future federal research support.

Based on past experience, it seems appropriate to project that federal funding for CU-Boulder research will increase over the next decade at a similar rate as realized in the last decade, about 4.6 percent after removing inflation from the dollars received. The growth rate for research facilities has been less: between 1 percent and 2 percent. The facilities growth rate should increase in order to address a backlogged need and to provide appropriate facilities. The research funding rate of growth is not sustainable in the long term, at the same rate. The extramural factors are difficult to quantify in this Master Plan, but a moderation of the rate of growth is inevitable.

A number of factors contribute to the need for more research space. Several research operations are at present separated into dispersed facilities, creating inefficiencies in both operations and use of space. Consolidating these research operations through reallocation of space is generally not feasible, given existing building configurations, thus the need for new construction is greater than the data would otherwise suggest. Space vacated through moves to newly built space could create several options: reallocating space to other operations, terminating leases of off-campus space, and demolishing structures that now house research but that are outdated or in poor condition.

Within this 10-year plan period, a substantial increase in laboratory, office, and support space is planned. Approximately 57,000 ASF of research space will become available in Research Laboratory No. 3 during the time this plan is being written due to the move off campus by a federal agency that has been renting space. The Building Plan (Section IV.A) will identify the new research facilities being planned.

Additional space should be suitable to the specific research purpose yet be flexible enough to meet ever-changing needs. It must meet building codes and other applicable requirements. Research funding agencies often require specific space standards in order for the specific research to be funded. In order to recruit and retain the best faculty, and maintain high-quality student participatory learning opportunities, the university must also provide the infrastructure for them to conduct their research.

Increased research funding drives the need for more research space,

even if the number of tenure-track faculty remains constant. Additional space should also be provided so that institutes can accept some of the funded new activities that are competing to join them. The number and abilities of faculty are a limiting factor in research growth, and the university must constantly recruit additional creative new faculty and replace retiring faculty.

4. Sponsored Research Data Considerations

As previously illustrated on Exhibit I-A-1, a substantial portion (39 percent) of total CU-Boulder revenue derives from contracts, grants, and gifts, while another 5 percent comes from research indirect cost recovery (ICR). Approximately 11 percent of the CU-Boulder general fund budget (which excludes auxiliaries such as the Research Building System) is generated by extramural contract and grants through ICR.

An estimated 550,780 square feet (GSF) of developable building space potential remains on the undeveloped Research Park sites. However, it is unlikely that all of this space will be built for CU internal research purposes.

A comprehensive study of research space needs for each individual department, center, and institute is beyond the overall space assessment in the next chapter and would be a major undertaking, but it could give a more accurate picture of what research space is needed and how urgent is the need. Such a study would need to assess the likely decreases or increases in grant funding, due to changes in funding available and each unit's competitiveness in the national marketplace.

D. Employment

The University of Colorado at Boulder offers more than 2,500 different courses in over 150 fields of study. To provide these courses and support the students, CU-Boulder employs roughly 6,500 faculty and staff members. Faculty members include nationally and internationally recognized scholars with many academic honors and awards, including the 1989 Nobel Prize in chemistry. It is this human infrastructure that makes CU-Boulder's many accomplishments possible.

The level of faculty and staff employment on the campus places pressures on campus space. The need for land and buildings is not only a function of changes in student enrollment. Increasing the quality of instructional programs often requires more space for faculty and staff. Cultivating cutting-edge knowledge and using technology create additional demands for staffing and space. The quality of student life is another factor in assessing the need for additional staffing and space. Support staff is required to serve the needs of the primary staff in teaching, research, and services.

As research programs grow, so do the number of researchers and support staff, their space and equipment. Support services staffing (e.g., payroll and accounting) needs are also generated by the steady increase in research. The important role that research plays in participatory learning argues strongly for supporting research and insuring that facilities will not be the limiting factor.

This section reviews CU-Boulder's employment goals, provides a brief employment history, projects employment for 10 years, and explains how the projections were derived and how they should be used.

1. Employment Goals

The university's mission to advance and impart knowledge can only be achieved with the dedicated support of faculty and staff. The exponential increase of information and knowledge in many disciplines encourages the creation of new course material and interdisciplinary centers and institutes. The primary goal remains to produce graduates with critical thinking skills, in-depth knowledge of their specialty, and the capacity for lifelong learning.

The CU-Boulder Strategic Plan identifies several goals that impact employment, notably including:

Ask "What's Best for the Students?" - As the learning process evolves, faculty are encouraged to consider the needs of students through cooperative, collaborative, and supportive involvement, in order to engage faculty and students in a network of learners and teachers. This translates into more time needed for the faculty and other employees to advise students.

Increase Support for Teaching, Research, and Creative Work - In an effort to integrate faculty efforts with student needs, CU-Boulder seeks to maintain the synergy and integration of research, teaching, and learning. In this effort, CU-Boulder will recognize and reward the scholarship of teaching; require departments to define teaching/learning and research/creative work appropriate to their faculties; recognize good interdisciplinary work; foster faculty productivity by altering the mix of teaching, research, and service; and innovate using technology to improve learning and research. These efforts translate into increased employment in support of research.

Enhance the Human Infrastructure- No institution the size of CU-Boulder can succeed without a mission-driven staff and faculty who are trained and dedicated to serving the needs of students. CU-Boulder seeks to support its employees by providing fair compensation and professional development programs within a supportive work environment; respecting individuals; enhancing health and safety programs; rewarding quality; enhancing personal growth; committing to diversity; encouraging individual responsibility, opportunity, and reward based on merit; recognizing human dignity; and encouraging innovation and creativity. Additional support staff may be needed to ensure the quality of human infrastructure.

2. Employment History

The University of Colorado at Boulder is one of the largest employers in Boulder County. Approximately 6,500 employees work on the Boulder campus. Of the total number of employees, currently 30.5 percent are faculty and instructional, 22.7 percent are academic non-instructional or research, 41.2 percent are classified staff, and the remaining 5.6 percent are unclassified staff. "Classified" staff are employees in the State of Colorado personnel system.

The number of faculty and staff employees has increased 13 percent since 1989. The largest increase, 29 percent over 10 years, has been in the research, non-instructional category. Instructional positions increased by 12 percent, while staff (classified and non-classified) increased by 8 percent over the past 10 years.

Over the last 10 years, only non-instructional research positions have

experienced an increase as a percentage of the total faculty/staff headcount. Research employees comprise 23 percent of CU-Boulder employees, compared to 20 percent in 1989, representing an increase in the level of total research employment at CU-Boulder.

In addition to the 6,500 CU-Boulder employees, there are approximately 250 employees working on campus who are part of the University of Colorado System Administration Offices. These 250 employees have not been included in the analysis for purposes of this Boulder Campus Master Plan. As this plan was being written, about 60 employee positions in effect were being shifted from CU-Boulder to the CU System Administration, as a result of consolidated service centers for human resources and procurement and the Administrative Streamlining Project. These shifts have been included in the data for the applicable projected years.

In Exhibit I-D-1 are the fall headcount figures for all CU-Boulder employees over the past 10 years. These figures do not include student employment data.

Instructional - Faculty and all other instructional positions, including teaching assistants, increased from 1,768 employees in 1989 to 1,973 in 1998. Of this total, the number of tenure and tenure-track faculty has increased modestly from 997 in 1989 to 1,040 in fall 1998. The instructional category has increased a modest 1.2 percent in annual percentage terms over this decade (compounded growth over nine interval periods), which is in line with modest enrollment growth. Faculty-to-student ratios have remained relatively static over the last 10 years from 24.4 in 1989 to 24.2. This is a measure of the number of tenured and tenure-track faculty per fall semester student headcount.

Non-Instructional/Research - This category is comprised of mainly research faculty - research associates and professional research associates - and represents the single largest increase over the past 10 years of all the four categories. The increase is a result of the tremendous success in sponsored research funding that CU-Boulder has achieved.

Academic non-instructional/research positions have increased from 1,142 employees in 1989 to 1,469 employees in 1998. Unlike the modest annual growth percentages in the other three categories of employees, this category has increased by 2.8 percent in annual percentage terms over the decade. Greater incremental increases of these employees were experienced until a peak in 1994. In fall of 1995, research employment dropped off due to a reduction of $17 million in sponsored research funding awards in Fiscal Year 1996 within the Graduate School. The decrease in this year was due in part to the federal budget crisis and a change in disbursement methods of several large sponsored research grants. Since that time, this category has been steadily increasing as funding sources have regained their position and additional research efforts have begun.

Classified Staff - A great majority of the staff employees are classified. Since 1974, classified positions have been under the jurisdiction of the civil service system, managed by the Department of Personnel/General Support Services of the State of Colorado.

Classified staff employment increased from 2,465 employees in 1989 to 2,666 employees in 1998. This category has increased a modest 0.9 percent in annual percentage terms over the past decade. The number of classified employees has fluctuated annually over the

course of the last two years in response to enrollment and support services needs.

Unclassified staff - Unclassified positions account for a small percentage of the total CU-Boulder staffing, numbering 363 employees. The majority of unclassified positions are middle-level management, and the number of these positions has grown over the past decade at an annual percentage rate of 0.7 percent, from 341 unclassified employees in 1989 to 363 in 1998. The level of these employees dipped in the early 1990s, but has risen modestly since 1996.

3. Employment Projections

The CU-Boulder faculty and administration recognize the continuing need for additional faculty, teaching assistants, graduate part-time instructors, and research-related personnel in order to offer a greater number and diversity of courses and sections. The number of CU-Boulder faculty has increased over the past decade in order to maintain the student-to-faculty ratio at a constant level. The increase in instructional category employees has resulted in a need for additional offices and other support staff and facilities. Sponsored research funding also drives a significant proportion of the future employment on campus. The Enrollment Management Team has planned on controlled moderate growth in enrollment figures over the next 10 years (as shown in the enrollment section of this chapter). Into the future, student-to-faculty ratios are projected to continue at approximately current levels. This ratio affects the need for additional faculty, student and teaching assistants, as well as support staff.

Exhibit I-D-2 outlines the level of employees (fall headcount) projected to be employed on the Boulder campus in the 10 years of 1999 to 2008, if current trends continue. These projections are approximate, being extrapolations of trends, correlated with projected increases in enrollment where appropriate. The actual number of people to be employed will depend on further management and resource decisions, using an Integrated Resource Management Strategy (IRMS) being implemented by the university.

The projections include 929 additional employees on the campus by the fall of 2008, a 14.4 percent overall increase since 1998. The significant amount of the employment growth projection is due to the predicted large increase in future sponsored research funding and staffing. The projections allow for a modest increase of 0.98 percent in annual percentage terms for the faculty/instructional and staff categories, and an increase of 3.07 percent in annual percentage terms for the academic non-instructional/research category.

In developing the employment projections of CU-Boulder, analysis found that all categories, except the academic non-instructional/research category, followed similar trend lines and had many features that correlated to student enrollment. As a result, the annual percentage enrollment growth was used in determining the number of employees needed annually in the instructional, classified staff, and unclassified staff categories. The past modest enrollment growth compared with the greater rise in sponsored research funding suggests that they are not a function of each other, although the number of faculty may ultimately be a determining factor in research growth.

CU faculty has great success in their ability to have grant applications

awarded. The percentage of grant applications that are awarded has been around 50 percent, compared with peer research institutions whose award percentage range around 30 percent. As a result, the research-related projection includes the assumption of research funding increasing at the same rate as in the past, with consequent continued increases in the number of non-instructional/research employees.

The projections also allow for a planned reduction in staffing due to a shift in administrative duties resulting from the Administrative Streamlining Project and the consolidated service centers. By the fall of 2002, a reduction of 58 classified staff and 2 non-classified staff, for a total of 60 employees, is expected. Of the 60 employees being shifted under System Administration's jurisdiction, 37 employees will be working at the new Fitzsimons facility by 2002 and the remaining 23 employees will remain on the Boulder campus in the Administrative and Research Center-East Campus as part of the centralized center for procurement, payroll and benefits to the CU system. Although remaining on the Boulder campus, these 23 employees will report to system administration and have not been included in CU-Boulder projection figures.

Exhibit I-D-3 shows the number of new employees in fall of 2003 and fall of 2008.

4. Employment Data Considerations

Research related employment and award amounts have progressively risen in the past 10 years with the exception of Fiscal Year 1996. The level of sponsored research funds fell in this fiscal year, but regained its prior level the following year. The awards fell roughly $19 million below the previous year, $17 million of which was for the institutes and centers under the Graduate School. The reductions were in various institutes, such as the Cooperative Institute for Research in Environmental Sciences (CIRES), the Institute for Arctic and Alpine Research (INSTAAR), the Institute of Behavioral Sciences (IBS), the Joint Institute for Laboratory Astrophysics (JILA), and the Laboratory for Atmospheric and Space Physics (LASP). The reduction of federal funding for research in Fiscal Year 1996 can be mainly attributed to the timing of award cash flows for various multi-year funded projects, and partially a result of the federal government shut down in late 1995.

Since Fiscal Year 1996, sponsored research awards not only regained to their prior year levels, but have exceeded them. This is due to the continuation of prior year levels of percentage increases in funding in the established programs and the formation of new research activities. An example of a new research activity since Fiscal Year 1996 is the Center for Limb Atmospheric Sounding (CLAS), which began receiving funding in Fiscal Year 1997 at the level of $15.8 million and received $25.4 million in Fiscal Year 1998. Fluctuations in grant funding due to disbursement issues or political events are occurrences that cannot be controlled, but should be accounted for in projecting into the future. Therefore, although the events during years 1995 and 1996 may be considered anomalies, the projections include these years in an effort to accommodate for unpredictable events in the research employment predictions.

The employment projections are based on past trends and relationships. A number of factors will influence actual faculty and staff counts in the future. Factors not quantified in this analysis

include the utilization of telecommuting among staff on campus, fiscal resources constraints, economic variability of markets dependent on research and technology advancement, and changes in laws or enrollment policies. The employment projections are not be used to justify future positions. Positions will be individually justified and created within the context of the CU-Boulder Integrated Resource Management Strategy (IRMS).

II. Campus Setting

A. The Campus of CU-Boulder

1. Regional Setting

The campus is located in the Rocky Mountain Front Range area where the majority of Colorado's residents live. Within the Front Range area, the city of Boulder is about 25 miles northwest of Denver, which is the major center of commerce, transportation, and culture for the Rocky Mountain region. The same pioneer spirit that once prompted settlers to come here is kept alive by a new generation of entrepreneurs attracted to Colorado. The natural beauty of Boulder and quality educational opportunities have attracted scientific research, labs, high technology enterprises, outdoor sports enthusiasts, and cultural activity.

The University of Colorado at Boulder is the original campus of the University of Colorado system. The system includes four campuses, all located in Front Range communities, as shown diagramatically on Exhibit II-A-1. Two campuses are located in Denver, the University of Colorado at Denver and the University of Colorado Health Sciences Center. The Health Sciences Center is relocating from Colorado Boulevard at 9th Avenue in Denver to Fitzsimons, a former military hospital campus in Aurora, east of Denver. The University of Colorado at Colorado Springs is 90 miles south of Boulder. It has been the most rapidly growing campus in terms of enrollment during the last decade. Exhibit II-A-1 also shows the relative location of CU-Boulder's Mountain Research Station.

Several regional issues affect CU-Boulder:

- Open Space Preservation
  The magnificent mountain backdrop attracted settlers to Boulder, helping make it a highly desirable place to live, work, and study. Boulder County and the City of Boulder are committed to preserving the mountain backdrop and acquiring a substantial greenbelt of open space surrounding the city. CU-Boulder has helped to preserve natural open space areas along Boulder Creek on the Main Campus, east of Foothills Highway on the East Campus, and at the Mountain Research Station. Open Space considerations potentially affecting portions of the campus include trail connections, flooding concerns, water quality concerns, flora and fauna habitat, and wetlands protection.

- Regional Growth and Housing
  In recent years, partially due to the physical limits of Boulder's setting, growth has shifted eastward to the nearby communities of Longmont, Louisville, Lafayette, Broomfield, and Superior. New residents, including university faculty, staff,

and students, experience difficulty finding affordable housing in Boulder, so many choose to reside in these nearby communities or elsewhere in the Denver metropolitan region. Indeed, more than half of the CU-Boulder staff live outside the city of Boulder, primarily in the above mentioned communities. Given the area's attractiveness to new residents, many communities in the region west of I-25 have instigated policies to control growth. Most new university faculty and staff face longer commutes to work than in previous decades. This is true to a lesser extent for students, most of whom find housing in Boulder.

- Regional Traffic
  As a consequence of regional growth, traffic congestion in and around Boulder has increased. Traffic generated by development along the U.S. 36 corridor between Denver and Boulder is impeding regional access to the Boulder campus, especially at peak hours. Impediments to regional mobility are an increasing challenge for the campus community. CU-Boulder has supported the provision of alternate mode choices to ease the congestion, but regional transportation problems will increase, since transportation provisions are not keeping up with the urban growth.

The related issues of regional transportation and affordable housing are now important factors affecting CU-Boulder's hiring of employees and are likely to increase in importance to students. As a consequence, this campus Master Plan will address what CU-Boulder can do as an institution to address housing and transportation needs not being met by non-university entities.

2. Campus Properties

The CU-Boulder campus includes three proximate properties, all of which are located within the City of Boulder: the 306-acre Main Campus, the 197-acre East Campus, and 64 acres at Williams Village. In addition, the campus includes the undeveloped CU-Boulder South, 308 acres just southeast of the City of Boulder, and the Mountain Research Station, 190 acres situated in the mountains west of Boulder between Nederland and Ward. Exhibit II-A-2 shows the campus location in Boulder (on subsequent maps in this plan, this exhibit has been reduced to serve as a key map, shaded to indicate which property is shown on each exhibit map).

a. Main Campus

The university has acquired properties over time, increasing the Main Campus from the original 44 acres of donated land in central Boulder to the current 306 acres. The campus has grown by acquiring houses and lots adjoining the Main Campus, plus a few larger tracts of land. Land acquisition has occurred through gifts, purchases, and vacating railroad and street rights-of-way. The Main Campus is generally bordered by Broadway on the west, streets near Boulder Creek on the north, 28th Street on the east, and Baseline Road on the south. Over the years, the number of streets transversing the Main Campus has been reduced in order to maintain the quiet, parkland atmosphere of the campus core and to provide a safer area for pedestrians and bicyclists. Today only two city streets transverse the Main Campus: Regent Drive and University Avenue.

The Main Campus houses academic programs with related research,

cultural facilities, student services, some single student and family housing, and some indoor and outdoor athletics and recreation facilities.

The 306 acres include 6 acres north of University Avenue, within a 10-acre area plotted as Grandview Terrace (referred to simply as Grandview). The university is in the process of acquiring remaining property in this area. Streets in Grandview are currently city streets. Most campus properties in this area are used for academic purposes, including research. The Main Campus also includes the natural areas along Boulder Creek, and student family housing north of the creek.

b. East Campus

The East Campus is located two blocks east of the Main Campus. The East Campus is generally bordered by 30th Street on the west, Arapahoe Avenue on the north, Foothills Parkway (which links to Denver via U.S. Highway 36) on the east, and Colorado Avenue on the south.

The East Campus was purchased in 1955. It has been reduced in size from the original 220 acres when it was acquired to 197 acres today, with conveyances of rights-of-way used to construct city streets and Foothills Parkway. All of the East Campus east of Foothills Parkway, 4.3 acres, was allocated by the university to the Boulder Open Space Program as a preserve; however, CU-Boulder still owns this land.

The East Campus houses some research, support services, student housing, and athletics facilities. Occupying much of the East Campus is the CU-Boulder Research Park, a development of 96 buildable acres designed to enhance the university's research capabilities, provide collaborative opportunities with government and business, and increase technology transfer. U S West, Sybase and other corporations have located research facilities in the Research Park. Some CU research activities are also conducted here, at the Laboratory for Atmospheric and Space Physics (LASP), the Center for Astrophysics and Space Astronomy (CASA), and the EPO Biology Greenhouse. About 37 acres in the Research Park remain undeveloped. Wetlands near Boulder Creek provide nature study opportunities.

c. Williams Village

Williams Village is located two blocks southeast of the Main Campus, near the end of the Boulder-Denver Turnpike, U.S. Highway 36. The highway serves as the southern boundary of the property. Williams Village is bordered by Williams Village Shopping Center on the west and single-family residential areas to the east and north.

The Williams Village property consists of 64 acres deeded to CU-Boulder by the Williams Foundation in 1964 to be used for student housing and related activities. In 1966, when the first student residences were constructed on this campus, the campus housing department began making annual payments based on a contractual formula to the Williams Foundation for use of the land. In 1975 the assets of the Williams Foundation were donated to the University of Colorado Foundation, so the annual payments are now made to the CU Foundation. The annual payment obligation ceases in the year 2010.

Some of the single student housing, recreation areas, parking lots, as

well as the University Residence (formerly the University of Colorado President's home) are housed on this property.

d. CU-Boulder South

CU-Boulder South is 308 undeveloped acres in unincorporated Boulder County, contiguous to the southeast boundary of the City of Boulder. Louisville, Lafayette, and Superior are located to the east. It was acquired for approximately $11 million in 1997 from the Flatiron Companies, which mined gravel on the property up to the time of acquisition. Prior to being named "CU-Boulder South" by the Board of Regents in February 1999, it was referred to as either the Gateway Property, due to its location at the U.S. 36 gateway to Boulder from Denver, or as the Flatirons property, due to its previous ownership as well as stunning views from the property of the Flatirons rock formation.

When CU-Boulder South was acquired in 1997, Boulder Interim Chancellor Roderic B. Park said:

We have no particular immediate use in mind for the property but view it as a strategic acquisition for university purposes for the long-range future. Long-range planning, including strategic land purchases, is important for the future of the university. CU-Boulder has a history of far-sighted land purchases that have allowed the campus, many years later, to meet the state's evolving needs.

The CU Board of Regents acquired the property in order to serve the future needs of Colorado students. The land has been reclaimed from the gravel mining. It is currently undeveloped, except for one warehouse building with office space, a cross-country running course, and a public pedestrian and bicycle trail on the property. Several ponds were created temporarily by the previous owner during gravel mining operations.

e. Mountain Research Station

The Mountain Research Station is located at an elevation of 9,500 feet in the mountains west of Boulder, accessed by traveling up Boulder Canyon on Highway 7 and north along the Peak-to-Peak Highway, Highway 119. It is three miles east of the Continental Divide and six miles southwest of Ward, Colorado. The site contains approximately 192 acres. It is completely surrounded by the City of Boulder Watershed, Indian Peaks Wilderness Area, and Roosevelt National Forest. Development consists of approximately 65 buildings, most being small seasonal structures. There are laboratory, office, housing, and dining uses. The Marr Alpine Laboratory, about 6,000 square feet, is the focus of activity. A new hostel for temporary housing is partially completed at this writing. The total gross square footage of buildings at the station is just 25,600 square feet, of which 23,900 is assignable (usable) space.

The Mountain Research Station (originally called University Camp, then Science Lodge) began in 1914 as a recreational retreat for university faculty. It now functions as an interdisciplinary research facility devoted to the study of environmental sciences. It is managed by the CU Institute of Arctic and Alpine Research (INSTAAR), supporting research in biology, geography, atmospheric sciences, and geology. The station is used not only by CU faculty and students but also by researchers from a variety of agencies and institutions around the world. In the last few years, operations that

were largely confined to the summer have begun to expand to year-round operations. Some of the research occurs on the adjoining Niwot Ridge, an alpine environment where atmospheric sampling and monitoring stations are located.

The Mountain Research Station is unique in providing these research opportunities within a 45-minute drive of a major university campus.

f. Other Properties

In order to acquire CU-Boulder South, two university-owned properties in Boulder's Flatirons Industrial Park were sold to the Flatiron Companies. One of these was an unimproved lot on which a building that had been occupied by the Laboratory for Atmospheric and Space Physics (LASP) was demolished prior to sale. When the LASP building was constructed on the East Campus in the Research Park, this Flatirons Industrial Park lot had been cleared and made available for sale or trade. The other property exchanged with the Flatiron Companies is still occupied under lease by the CU-Boulder Distribution Center at 2000 Central Avenue. It is CU-Boulder's warehouse operation for storage, shipping and receiving, and surplus property disposition.

The Academy is a 3.7-acre property in the University Hill residential area, several blocks west of the Main Campus, at 10th Street between Aurora and Cascade Streets. A private corporation holds a long-term lease on the property, which is not available for university use. Originally a Catholic girls' school, it was purchased by CU from the Sisters of Providence in 1969. For many years it was occupied by the Department of Theatre and Dance, the Division of Continuing Education, and student organizations, until it was extensively damaged by fire in 1980. During 1997-98, the property was privately redeveloped, under long-term ground lease, into a retirement community. The historic Academy Building and Chapel have been fully restored and "recycled" for the new use.

CU-Boulder and associated operations such as the CU system administration and CU Foundation occasionally purchase or lease other properties in Boulder. The CU system administration leases spaces within two privately owned office buildings located in the Pearl Plaza office park along Pearl Parkway, about a mile northeast of campus. While these are not specifically CU-Boulder campus properties, they are mentioned here because they are the largest off-campus leases by the university in Boulder. University Management Systems (UMS), CU's central administrative computing unit, occupies 37,094 assignable square feet (ASF) in One Pearl Plaza. CU's system administrative offices of the university controller, internal audit, and treasurer occupy 11,294 ASF, or about one-third of the building, in Two Pearl Plaza. The CU system administration also leases space in the U S West Building in the Research Park, to house administrative offices of the System Budget Office, University Risk Management, Associate Vice President for Academic Affairs and Federal Relations, Public Affairs, and Administrative Streamlining Project. This Boulder Campus Master Plan does not include an analysis of the needs and facilities of the CU system administration and CU Foundation.

B. Campus Development History and Heritage

The University of Colorado at Boulder has grown from one building in

1876 into a teaching and research institution of national reputation. The setting and uniform architectural style of Main Campus contributes greatly to its reputation. The Main Campus has been ranked the fourth most beautiful in the country (according to Thomas Gaines, The Campus as a Work of Art, 1991). The campus reflects a history of attention to planning and design that continues to this day.

1. Early Years (1875-1917)

After Boulder was selected as the site of the State University in 1872, Boulder citizens rallied to raise $15,000 in matching funds to construct CU's first building, now known as Old Main, on land donated by three prominent citizens. The result was a fine three-story red-brick building with two towers rising from the treeless plateau above Boulder Creek. Completed in 1876, it contained the living quarters for the president and his family, classrooms, library, laboratories, and rooms for the building custodian and his family.

Eight years later, smaller buildings were added nearby, housing men, women, and the university president. The construction of Woodbury Men's Residence Hall in 1890 and Hale Science in 1892 set the stage for an expanded formal campus. In the next 30 years, the university grew around a large cruciform-shaped open space that became Norlin Quadrangle, now listed in the State and National Registers of Historic Places. Significant buildings added during this time include Buckingham Library (now the University Theatre), Guggenheim Law (now Guggenheim Geography), Macky Auditorium, additions to Hale Science, and a Power House for steam generation.

The university's physical growth included more than the construction of buildings. Mary Sewall, wife of the university's first president, was responsible for much of the early landscaping. She beautified the barren surroundings with large green lawns and many trees. In these early years, students requested that sidewalks be laid from Boulder up the steep hill to campus to solve the problem of muddy footpaths. In 1888 faculty members and students started the tradition of planting trees on campus every Arbor Day, an annual tradition that continues to this day. In spite of these efforts, the campus lacked coherence in its architecture and landscaping, leading George Norlin, then a classics professor, to observe in 1916 that the campus looked like "a third rate farm."

2. Klauder Years (1918-1939)

Campus buildings constructed prior to 1917 represent a variety of Gothic, Classical, and Victorian architectural styles. In 1917, the Colorado General Assembly supported increasing CU-Boulder enrollment from 1,200 to 3,000 students. As a result, the Board of Regents directed President Livingston Farrand to hire an architectural firm to conduct development planning in order to improve the campus appearance.

The Philadelphia firm of Day and Klauder was commissioned to do the work under the direction of George W. Norlin, who had become the interim university president. Day and Klauder had earned a strong reputation by designing buildings for Princeton University and Wellesley College in the collegiate gothic style. Architect Charles Z. Klauder's first sketches for Boulder campus buildings were in this style represented by the existing Macky Auditorium, but he ultimately rejected them for a variety of reasons. He wanted to create a unique style that would use the locally quarried sandstone to produce

architecture that would blend more harmoniously with Boulder's magnificent mountain backdrop. As it turned out, Norlin (then fully-appointed university president) and the Board of Regents agreed.

The Board of Regents approved the resultant 1919 Campus Development Plan and accompanying scale model. The model, now on display at the Heritage Center in Old Main, depicts demolition of many of the previous buildings, new symmetrically designed buildings, refinement of a quadrangle plan, axial alignments between major buildings, and additional buildings in monastic-like clusters. Most buildings shown are narrow to accommodate natural light and airflow, often with wings radiating from a central core.

Hillside villages and rural farmhouses that he had observed as an architect touring the Tuscany area in Italy, and similar styles in Spain, influenced the architectural style that Klauder had in mind. His reinvention of a Mediterranean style for the Boulder campus includes charming building elevations, often with towers and chimneys near the ends that add a picturesque quality to the cascading roofs. Sprawling wings form intimate courts that can be used as outdoor rooms for classes or retreats. The Italian influence is echoed as well by stone details, such as limestone arches framing entrances and windows, carved limestone cartouches, benches, column capitals, and fountains. Many consider Sewall Hall, completed in 1934, to be the best of Klauder's CU work.

When viewed in aggregate, the campus is reminiscent of hill towns around Florence and Siena.

Architectural historians categorize the style as Tuscan vernacular. Klauder simply referred to it as "University of Colorado Style." It is characterized by multi-hued sandstone walls and tile roofs, off-white limestone trim, and black metal accents. Exterior walls built of locally quarried sandstone vary in color from light buff to reddish purple. These split rectangular stones were laid flat face down with the fractured face jutting out from the mortar wall line, creating an ever-changing shadow pattern on the wall. The limestone-trimmed windows, doorways, and ornamentation contrast with the sandstone walls to create an overall red and white look. Roofs have various heights, pitches, and forms, complementing the stone walls and nestling well below the view of the Flatirons mountain backdrop. Roofing material is clay barrel tiles of various hues, combining to create a red or terra cotta appearance.

Dr. Norlin characterized Klauder's buildings as a physical body complementing the academic soul and spirit of the university. Remarkably, the central ideas of the 1919 Campus Development Plan, notably its distinctive architecture and variety of open spaces, have endured.

3. War and Post-War Years (1940-1960)

World War II and the postwar period altered demands on university facilities. It was an era when quantity rather than quality was in demand. Klauder died in 1938 after designing his last CU building, the University Club. Following his death, facilities continued to be designed according to his style, but without the same creativity that Klauder had brought to his work. During and after the war, the successor firm to Day and Klauder, Trautwein and Howard, built austere, stripped-down buildings in the Tuscan vernacular style without the fine detail or careful configuration seen in the prewar

buildings. Examples of buildings from this period include Cheyenne Arapaho Hall, Wardenburg Health Center, and the High Altitude Observatory building (now housing Speech, Language and Hearing Sciences).

CU grew rapidly after World War II. In addition to the flood of students funded by the GI Bill came families and older students. Although Klauder's original plan called for additional buildings along Broadway, growth instead occurred by repeated extensions of the university's southern and eastern boundaries. Campus growth was facilitated by the elimination in 1932 of a rail line (passing through where Ramaley Biology is now located) that had inhibited eastward expansion. At the same time, the town of Boulder continued to grow and eventually encircle the Main Campus.

In the 1950s and 1960s, the university embarked on a more expansive land acquisition program. It purchased 220 acres of farmland, now known as the East Campus and the University Research Park. It also accepted, with fiscal obligations, the Williams Village property as a location for housing students. The University of Colorado at Boulder became three campus areas - the Main Campus, the East Campus, and Williams Village - within the city of Boulder. During this period and into the 1960s, peripheral buildings were built that were not in the Tuscan vernacular style. In-house design staff designed several East Campus buildings, including Litman Research Laboratory, and Research Laboratories 2 and 3 (RL-2 and RL-3). It was increasingly obvious that a change was needed to revitalize building design for the campus.

4. Recent Years (1961 to present)

In the early 1960s, President Quigg Newton, campus administration, and the Colorado architectural community acted to change the way campus building design occurs. A new campus development plan was created by Sasaki, Walker and Associates, headed by Hideo Sasaki, chair of the Department of Landscape Architecture in the Harvard Graduate School of Design, and consulting architect Pietro Belluschi, dean of the School of Architecture and Planning at the Massachusetts Institute of Technology (MIT). Their plan sustained Klauder's design principles, materials, and humanistic spirit but allowed flexibility to incorporate new concepts and forms. For example, concrete became used for exterior walls, and often replaced the use of limestone for trim. Indigenous sandstone walls and clay barrel tile roofs still predominated, but in more flexible ways, continuing to visually link Klauder and post-Klauder building. The institution also severed the tie to a single architectural firm. Instead, depending on who is best suited to the task at hand, a variety of architects are commissioned to design campus facilities, with continuity ensured by campus staff and the university Design Review Board.

CU grew rapidly during the 1960s. Exhibit II-B-1 shows that campus building space doubled from the early 1960s to the mid-1970s. New academic and administrative buildings soon surrounded the main student residential area, which had been on the eastern periphery of campus. New student housing, the Kittredge Complex, was built on the southeastern edge of Main Campus in 1963 and 1964. The first major academic building to not slavishly follow the Klauder style, yet inspired by that style, was the Engineering Center in 1965, which, with its extensive use of concrete and introduction of shed roof forms, remains controversial. Stearns and Darley towers, a brick high-rise residence hall complex, were built in 1966 and 1969 on the

newly acquired Williams Village.

The Soviet Union's launch of the Sputnik satellite in the late 1950s presaged a new era of campus construction in the late 1960s and 1970s, with the federal government funding science buildings in a race to catch up. The Duane Physical Laboratories complex and the Life Sciences Laboratories complex (Muenzinger Psychology and Porter Biosciences) were among buildings of this period. Scientific research at CU accelerated. Adherence to Klauder's architectural style during this era meant that CU-Boulder avoided the "modernist" style, often poorly interpreted on college campuses.

In 1971 the State Legislature established an enrollment limit of 20,000 FTE (full-time equivalent) students for the Boulder campus. The capping of enrollment signaled the transition of the campus from rapid growth to maturity, although the enrollment limit was later removed. Campus maturation meant an emphasis on renovating existing facilities where possible and developing new space to support CU's growing role as a major research institution. The "postmodernist" era, which began in the 1970s, has revalidated creative use of historical styles, with their richness of material and form, and fit neatly with Boulder's already well-established Tuscan vernacular style.

In the 1980s and 1990s, attention turned to older buildings needing rehabilitation, such as Old Main, Macky, Hale, the Power House, and the Women's Cottage, all of which have benefited from appropriate renovations, giving the oldest buildings new life while preserving their heritage.

Most recently, the challenge again is to accommodate an increase in enrollment, this time for the children of the postwar "baby boomers." At the same time, CU-Boulder remains committed to preserving its reputation as one of the most beautiful higher education campuses in the nation. In order to maintain a fine campus while accommodating dynamic programs and projected enrollment growth, development will increasingly occur on East Campus and Williams Village sites, and at CU-Boulder South. The CU living and learning environment is sustained by a campus that speaks, through its architecture and campus planning, about its history and concern for quality.

C. Natural Setting

This section identifies specific elements of the natural setting that affect campus development: climate, topography, flooding hazards and wetlands, and the subsurface soil conditions.

1. Climate

At an elevation of 5,400 feet, Boulder's semi-arid climate is temperate with pleasant days and cool evenings. More than 300 days of sunshine per year and annual moisture accumulation of 18.8 inches allow outdoor activities year-round. But Boulder is also well known for occasional high winds. Winter weather varies from sunshine to snow and hailstorms. Overall, the campus architecture and landscaping are well suited for these climatic conditions. For example, the red tile roofs offer excellent protection against wind and hail, and typically small window openings control the amount of solar gain, preventing overheating of campus buildings and conserving energy.

2. Topography

All campus properties, except for the Mountain Research Station, are located in the Boulder Valley, at the base of the Rocky Mountain foothills. This topographic setting affords many fine views and recreational opportunities. The topography of CU-Boulder properties is shown on Exhibits !!-C-1 through II-C-5.

a. Main Campus

The Main Campus slopes gently to the north and east from the highest areas along Broadway near the University Memorial Center (UMC), down toward the bluff overlooking Boulder Creek. At this escarpment, the land drops sharply 70 feet to Boulder Creek. North of Boulder Creek, university property is in the relatively flat floodplain.

Besides the bluff along Boulder Creek, development is influenced topographically by Observatory Hill. This hill is located between Fiske Planetarium and 28th Street, and it is anchored at its east end by the Coors Events/Conference Center. Its slope, rising approximately 40 feet from Regent Drive, provides an obstacle to vehicular and pedestrian circulation in the southeast corner of the campus.

b. East Campus

The East Campus slopes very gently about 30 feet from the southwest corner to the northeast corner. Boulder Creek flows diagonally from the west to the northeast, dividing the East Campus into separated areas on the two sides of the creek. Two smaller creeks also flow through the East Campus. Skunk Creek, entering midway along the south property line, flows northeasterly to connect with Bear Canyon Creek, which flows through the portion of the East Campus located east of Foothills Parkway.

c. Williams Village

The Williams Village property slopes very gently about 25 feet from higher areas on the southwest edge of the property to a low point at the northeast corner. Bear Canyon Creek flows through the property, entering midway along the southwest property line (U.S. 36 right-of-way), flowing across to the northeast corner.

d. CU-Boulder South

Most of the CU-Boulder South property also slopes very gently from the southwest to the northeast. The relatively flat area was excavated in recent years for gravel mining. Along the east and south borders is a berm near South Boulder Creek, reducing the flood hazard for the site and other properties. Along the western border, south of the Tantra neighborhood, the land rises more sharply toward houses to the west.

e. Mountain Research Station

The Mountain Research Station sits on a heavily forested site just east of the Continental Divide. The developed portion sits on the steeply sloping face of a mountain ridge. The topography is a major form determinant of development and is discussed in more detail in the plan for the property in Chapter IV.

3. Flooding Hazards and Wetlands

The creeks that create beautiful natural areas on campus also have the potential to occasionally flood. The Front Range setting of the campus, and the local meteorological occurrence of severe thunderstorms, create the potential for sudden and significant flooding. Information on the flooding potential is one of the major influences on campus land use planning. This section provides an assessment of the potential flooding hazards on campus properties. Land use planning based on this information is found later in this plan in Section IV.D.4: Flood Mitigation.

In order to protect lives and property on campus, information from flood engineers and off-campus regulatory authorities is evaluated to assess potential flood hazards on the Boulder campus. Based on this information, potential flood hazard areas for up to a 100-year flood event are shown in Exhibit II-D-C, for the three developed campus properties in Boulder. Maps of potential flooding on CU-Boulder South and the Mountain Research Station are not included here, since flood studies for CU-Boulder South are underway at the writing of this plan, and the Mountain Research Station potential flooding has never been mapped. The flood mitigation section in Chapter IV will propose how to proceed with land use planning in the absence of current flooding information for these other two properties.

Most flood regulations are based on a 100-year flood event. In any year, there is a one-percent probability that a 100-year flood will occur. Smaller floods occur more often. Greater floods are possible but are not considered to be frequent or predictable enough to warrant regulation. The 1997 flooding of the Colorado State University campus, which exceeded a 100-year flood event, demonstrated the potential severity of flooding. Land areas inundated are classified as either floodways or floodplains by most regulatory authorities. Floodways are areas of greatest flood hazard and could convey the 100-year flood. During such a flood, waters in floodways will flow at significant depths and/or at significant velocities. Floodplains are all land areas that will be inundated by a 100-year flood.

Other terminology is also used to identify flooding areas. Beginning in 1989, the City of Boulder opted to define a "conveyance zone," with somewhat stricter criteria than the Federal Emergency Management Agency (FEMA) floodway definition. The City of Boulder also identifies a "high hazard zone," taking into account the combined effect of floodwater depth and velocity on life safety. The university does not use the City of Boulder terminology or regulations, but takes the information into account in accordance with the state Executive Order # 8504.

Floods do not just occur every 100 years on average. Smaller floods occur more often and can cause damage. Almost every year the campus experiences a thunderstorm that causes localized flooding of some basements.

a. Main Campus

Given the location at the base of the foothills and the climate that includes seasonally high spring runoff due to melting snow and sudden substantial thunderstorms, there is the potential for major Boulder Creek floods with little warning. Boulder County has

established a network of rainfall and creek flow measuring stations and a limited flood warning system. Most of the Main Campus is located on a mesa well above Boulder Creek. The potential for major (100-year) flooding on the Main Campus is generally limited to the areas adjacent to Boulder Creek, especially north of the creek. Most of the land from Boulder Creek to Arapahoe Avenue, between 17th Street and Folsom Street, is in the floodplain. CU has student family housing units in this area, and there is considerable privately owned residential development in this 100-year floodplain as well.

Flood mapping and building elevation surveys were conducted as part of this master plan to assess the potential hazard in this housing area, since it appeared to be the area at greatest flood risk on the Boulder campus. There are approximately 10 CU housing buildings in the floodway in this area. The remainder of the campus housing buildings in the area are located within the floodplain, more shallow flooding areas. A few of the buildings, notably Athens North, may be elevated sufficiently to escape the 100-year flood. In the early 1970s, Newton Court buildings were built on elevated ground and still lie outside the regulatory floodplain; however, recent floodplain studies place many of them in the floodplain.

The campus buildings that appear to be at greatest risk are Faculty-Staff Court housing buildings. All seven buildings in this complex have first-floor elevations approximately three feet below the 100-year flood level. The first floor elevations of the nine buildings in Athens Court appear to be very nearly at, or slightly below, the 100-year flood level.

A small cluster of privately owned houses just east of 17th Street, on the north bank of Boulder Creek, compounds the flooding hazard. Also potentially restricting floodway conveyance are the bridges across the creek, including two CU footbridges and one CU vehicular/footbridge.

Several basements of Main Campus buildings (Sibell Wolle Fine Arts, and Environmental Design, for example) tend to flood every few years, often following a thunderstorm. In recent years, substantial improvements have been made to the campus storm sewer system (and more are planned) in order to reduce instances of minor flooding.

b. East Campus

The East Campus is affected by flood flows from Boulder Creek, Skunk Creek, and Bear Canyon Creek. Most of the East Campus buildings located north of Boulder Creek are in the floodplain. Minor modifications to these buildings could help reduce flood damage. Newer buildings in this area, notably the Computing Center and the Housing System Maintenance Center, were elevated above the 100-year flood levels according to information available at the time of the construction of these buildings.

The Research Park lies south of Boulder Creek. Major regrading removed the building sites in the Research Park from the floodplain. In one of the largest such projects in the Boulder area, the university re-established wetlands and ponds with native vegetation in the flood areas. These wetlands were established through a Corps of Engineers permit. Access is limited in order to maintain the somewhat fragile environment. Public trails and a rest area are located nearby to permit enjoyment of the scenic resource.

The Skunk Creek floodplain on the East Campus was re-established into a channel, which emulates the natural meandering of a stream, in order to contain a 100-year flood event. Bear Canyon Creek may flood the dedicated open space area of East Campus that lies east of Foothills Parkway.

c. Williams Village

The Williams Village campus is bisected by the Bear Canyon Creek floodplain. Some reconfiguring of this floodplain was done to protect the University Residence east of the creek from flooding. Land uses in the floodplain area are open space; recreational facilities, including playfields and tennis courts; parking; and undeveloped property. No wetlands have been designated on the property.

d. CU-Boulder South

South Boulder Creek lies east of the CU-Boulder South property. A berm along the creek was installed when the property was mined for gravel and has recently been widened by the seller of this property. A study of flooding for this area is underway as this plan is being written, so there is insufficient information to assess the flood hazard at this time. A wetlands analysis should also be conducted for the property prior to development.

e. Mountain Research Station

Como Creek runs through the Mountain Research Station. No floodplain or floodway has been identified. As in all mountain areas, there is the potential of flash flooding along the creek. However, only one small occupied structure is located near the creek. Access to the station crosses the creek and could be affected in the event of a significant flood. Much of the station and adjoining U.S. Forest Service lands are sensitive ecological areas, including steep slopes, wetlands, protected fish habitat, and alpine areas.

4. Subsurface Soils

Subsurface soils and groundwater are site-specific concerns. Often swelling subsoils and/or groundwater levels and quality dictate remedial measures be undertaken for building construction.

a. Main Campus

On the Main Campus, subsurface conditions vary considerably, making it essential that soils tests be conducted before buildings are designed. In general, there are materials (weathered claystone and sandstone) not suitable for building foundations at shallow depths, with dense blue shale at varying depths below these layers. The latter provides good bearing capacity for drilled pier construction. In some areas, the poor soils prevent slab-on-grade construction and structural slabs have been used. The greater costs of these types of construction must be taken into account when establishing construction budgets. The bluff rising immediately south of Boulder Creek has areas of unstable surface and subsurface conditions.

b. East Campus

Soil conditions on the East Campus vary throughout the property. A review of the available soils reports indicates that much of the central

and western portions consists of a layer, up to 14 feet deep, of mixed sandy and silty clay over strata of water-bearing sandy gravel, over claystone bedrock. The subgrade condition along the south boundary appears to be a shale slope. Depending on core sample results, drilled pier and grade beam foundations have been required for multistory buildings in some portions of the East Campus, and basements are not recommended without detailed investigation.

c. Williams Village

The soils investigation conducted for the construction of Stearns Towers, Darley Towers, and Darley Commons indicates 7 to 21 feet of sandy clay over weathered shale to hard blue shale at 27 feet, suggesting a high load-bearing capacity for multistory buildings. The material between this strong layer and the surface is poor material that may swell. This has been taken into account when constructing buildings and hard-surface facilities such as tennis courts, and it may prevent slab-on-grade construction.

d. CU-Boulder South

Insufficient information is available at this time to assess subsurface soil conditions of the CU-Boulder South property. It appears that surface mining removed much of the sandy gravel over the bedrock.

e. Mountain Research Station

The subsurface conditions of the Mountain Research Station site vary greatly depending on location. The developed portion sits on glacial till brought down from the mountains during the last ice age. Recent excavation for a hostel revealed that this layer extended over 14 feet deep with only an occasional large rock. A large granite layer was discovered during the wastewater treatment plant design, requiring blasting, indicating the importance of investigation for each potential building.

D. Campus Land Use

A pattern of land uses has developed on the campus over time. CU-Boulder has a long tradition of land use planning, as detailed in the Campus Development History and Heritage section earlier in this chapter. Exhibit II-D-1 maps the existing land use pattern on the three adjoining campus properties.

1. Land Use Categories

Land use has been divided into seven categories, each accommodating a different type of activity. Activities may be both indoors and outdoors:

- Academic land use areas predominantly include buildings housing classrooms, instructional and research labs, faculty and departmental offices, assembly spaces, exhibit spaces, and library spaces.
- Services and administration areas are where administrative offices, student services, and physical plant spaces are concentrated. The University Memorial Center (UMC), which is the student union building, and Wardenburg Health Center are included in this land use category.
- Residential land use areas predominantly include student

housing, including the residence halls and family housing units. Also included are conference facilities and recreational facilities operated by the Housing Department. If faculty/staff housing is developed on campus in the future, it will be in this land use category.
- Athletics and recreation land use includes the intercollegiate athletics facilities and the major student recreation spaces.
- Non-institutional agencies, as a land use, are in areas predominantly accommodating corporate research, and other space on campus leased to uses not part of CU-Boulder (a bank on Arapahoe Road, for instance).
- Undeveloped areas are unutilized tracts of land.
- Natural areas include floodway, steep slopes, and wetlands, where buildings are not anticipated during the life of this Master Plan.

2. Arrangement of Land Uses

These categories are used throughout this Campus Master Plan. Land uses tend to be clustered, and the pattern has been developed over time for the following reasons:

- Academic uses benefit from the proximity of related disciplines. Student class schedules benefit from the concentration of most classrooms within a 10-minute walking area.
- Services and administrative uses have been clustered to reduce trips between offices. Services requiring high in-person student contact have been located just outside the academic core. Services requiring less in-person student contact are on somewhat more remote sites.
- Residential uses are generally peripheral to the academic areas.
- The principal athletics spectator areas have been given prominence just outside the academic core. Intercollegiate Athletics practice areas are more peripheral. Some student recreation areas are located near student housing areas. Athletics and recreational facilities may also be located at CU-Boulder South early in the life of this Master Plan.
- Most non-institutional uses on campus, such as corporate research, are peripherally located, mostly on the East Campus.
- Natural areas are inappropriate for buildings because they have some or all of the following characteristics: high flood hazard, steep slopes, large ponds needed for campus drainage, unique flora or fauna, and/or wetlands. Some natural areas have native vegetation, many have re-established vegetation, and some have irrigated landscape maintained as the rest of the campus grounds are maintained.
- Undeveloped areas have no buildings, but many of these sites are already destined for one of the other land uses through previous planning or current planning.

Exhibit II-D-2 illustrates the land use information in terms of percentages of land use rather than number of acres. This has been calculated for the three adjoining properties shown, individually and together.

Although they are not shown on this map (the map scale would make it unreadable), these same categories generally apply to all campus properties. For CU-Boulder South, there has not been enough planning yet to designate which sites will be used for which of the various land uses, and which portions may be left as natural areas.

The one building on the CU-Boulder South site is temporarily being used for both services and non-institutional uses. Much of the Mountain Research Station is a natural area with dense forest cover on steep slopes. Land uses in the developing portion of the Mountain Research Station are shown and discussed in Section IV.C.2, the Mountain Research Station Plan.

There is a tremendous capital investment in these land uses, and they are unlikely to change in a major way over the 10-year planning period covered by this plan. In fact, it would be undesirable to have major changes, since these areas are generally working well for the institution.

Some of the areas were created when the campus was physically smaller and there were fewer people. For example, if the campus were to be rebuilt today, the student housing area around Farrand Residence Hall might logically be an academic area, since academic areas are now both west and east of it. But the substantial investment in housing is in place, providing convenient and needed student housing. Residential academic programs have been very successful in this location given the proximity to academic areas where faculty offices are located.

The last master plan for the campus, in 1990, converted land use into "land use zones." However, unlike local government zoning, no zoning enforcement mechanisms were established, and this plan simply recognizes the desirability of continuing this land use planning.

3. Land Use Changes

As noted, land in the undeveloped land use category will be developed. The undeveloped sites shown on the East Campus have already been designated as "pods" (sites) in the Research Park. As they are developed, the land use is likely to be either academic/research use by the university or non-institutional research use related to the university. The plan is to use the undeveloped property at Williams Village for student and faculty housing and recreation.

The pattern of land use should help to guide future land use decisions. The few specific land use changes intended (further discussed in Chapter IV) include:

- More academic land use (including research) in Grandview, as properties are acquired and the two parcels now used for office services may be converted to academic use.
- Conversion of the services uses northeast of the Folsom Field to athletics use.
- Relocation of Observatory Field to adjoin Business Field, allowing the current Observatory Field to be used for academic use (expansion of Business and related parking).
- Relocation of the Kittredge tennis courts to allow for an academic land use, likely a new Law School building.
- Phasing out of non-institutional use of the RL-3 and RL-6 buildings east of Boulder Creek on the East Campus, to accommodate expansion of adjoining academic, and/or services and administration land uses.
- Conversion of Prentup Field, the baseball field on East Campus, to academic or non-institutional use as part of the Research Park (unless Intercollegiate Athletics reaches a financial

agreement with the Research Park for future athletics use).
- Relocation of the recreational uses from west of Bear Canyon Creek to east of Bear Canyon Creek at Williams Village, to accommodate more housing west of the creek.
- Location of athletics and recreational facilities, and eventually other uses, at CU-Boulder South.

4. Outdoor Spaces

By categorizing land use by university activities, the variety of outdoor spaces is not clearly shown on the land use map. Land use zoning maps typically include most outdoor spaces, parking, and other ancillary uses within the major functional land use categories. A categorization by physical character would include: buildings (as shown on most maps in this plan), parking and streets (as shown on maps in the Transportation Plan in Chapter IV), and the remaining outdoor spaces (most of which are landscaped). The wonderful variety of designated outdoor spaces is shown on Exhibit II-D-3. Most of these have been designated with a name. The Board of Regents has in previous actions assured the preservation of the scheduled student recreational fields shown. Most of the other designated outdoor areas shown will remain for at least the next 10 years, but some will not, as noted in the preceding section on land use changes. Enhancement of all outdoor areas is discussed later in this plan (Section IV.C).

Before setting forth the land and facilities plan, the facility needs (for the many activities within the land use categories) will be addressed in the next chapter.

III. Facilities Needs

A. Space Needs Analysis

1. Application of CCHE and Other Guidelines

This section of the master plan calculates space needs for the University of Colorado at Boulder. It looks at space by major type, such as classrooms, instructional laboratories, research space, and academic office space. In all these categories, support spaces often called Service Space are included in the major category.

In 1999, the Colorado Commission on Higher Education (CCHE) significantly increased the utilization expectations for classrooms and instructional laboratories, and deleted major portions of the guidelines that had been in use since the founding of CCHE in 1965. The new CCHE expectations are described and followed, and for those space categories where no CCHE guidelines currently exist, alternative processes were used which are described in the appropriate sections.

A guideline analysis has been done using fall 1997 data and 2003 and 2008 projected data. The results of this guideline analysis are summarized in three tables. Exhibit III-A-1 shows findings for fall 1997 using CCHE guidelines in each category where guidelines exist. (In cases where CCHE guidelines do not exist, a proposed guideline is discussed in the relevant narrative section.) Exhibit III-A-2 and III-A-1 III-3 show similar guideline calculations based on 2003 and 2008 enrollment and staffing projections.

Data used for guideline calculations come from three campuswide databases: (1) the Facilities Room Inventory database, containing information on building and room use, size, and responsible department; (2) the Student Information System (SIS), containing information on courses on a section-by-section basis and room utilization; and (3) the Payroll/Personnel system database, containing information on personnel by job categories. Data taken from these three databases provide a snapshot of data for the fall 1997 semester, which is used as the base year for this planning, since it was the most recent data available at the time the original analysis for this report was conducted. The consulting firm of Paulien & Associates, Inc. conducted the analysis using information in these databases.

2. Overview of Findings

The analysis of fall 1997 data indicates that about 1,718,000 assignable square feet (ASF) of additional space are needed. The campus has 75 percent of the space needed. Projected data for 2003 indicate a need for about 2,191,000 additional ASF. The campus has 70 percent of the space needed at that level. The 2008 projected

data indicate a need for about 2,756,000 additional ASF. The campus has 65 percent of the space needed. The uses with the largest need for space (more than 100,000 ASF currently needed and projected to increase by the year 2008, in order beginning with the largest current need) are: research, athletics, library, housing, academic offices, and recreation. No category shows a substantial space surplus for fall 1997 under the guidelines.

3. Space Needs by Use Category

a. Classroom and Service Space

The CCHE formula (see below) for determining guideline square feet for classroom and classroom service space employs room use (hours per week), student occupancy (percent of seats or stations filled), and the average student station size. A station is defined as the space occupied by one student, including sufficient circulation space so that the sum of the student stations produces a workable room with aisles and instructor space.

The newly adopted CCHE guidelines expect a classroom to be used 60 hours per week at 70 percent student station occupancy when the room is in use. This is the highest expectation in the U.S. The CCHE space needs guideline is 0.75 assignable square feet (ASF) per weekly student contact hour. The 31.5 ASF per classroom station is a derived figure using the three CCHE factors.

The CCHE formula for determining classroom and service square feet per weekly student contact hour follows:

$$\frac{\text{31.5 ASF per Student Station}}{\frac{\text{60 Weekly Room Hours x 70\% Station Use}}{}} = \text{0.75 ASF per Weekly Student Contact Hour}$$

The total number of weekly student contact hours for a course section is obtained by multiplying the enrollment of the course section by the number of meeting hours in one week. Therefore, a course with 30 students, meeting three class hours per week, would generate 90 weekly student contact hours. Completing the calculation, if that course section is taught in a regular classroom, the required amount of space as determined by the formula would be 90 weekly student contact hours multiplied by 0.75 square feet, or 67.5 ASF.

Similar calculations are done for each section of each course. If rooms are used more than 60 hours per week, or if the average student occupancy exceeds 70 percent, a space requirement that exceeds existing space often will be indicated by the guideline formula. If actual use is lower, less guideline space may be indicated. Similarly, if classrooms have significantly less square feet per student station than the new guideline suggests as an average, the guideline may indicate a need for more space than exists.

The University of Colorado at Boulder has very heavy classroom use. Studies done by CU-Boulder show that the average centrally-scheduled classroom is in use 52 hours per week. The CCHE has indicated that in looking at the higher utilization factor, they are willing to consider the use of the rooms for things other than

scheduled credit instruction. This would include non-credit classes through continuing education, special one-time meetings for class review sessions, and meetings by departments, faculty groups, student groups, and community use. The University of Colorado documents those additional uses for all the centrally-scheduled classrooms. Those classrooms were used approximately 41 hours per week for scheduled instruction. When these additional uses were added, the use averaged 52 hours per week. The station use for classroom for scheduled instruction was calculated at 69 percent. For the one-time uses, there is no method to count the number of users for an individual event. Therefore, the utilization percentage can only be calculated for the scheduled courses.

Similar information is not currently collected by a central source for departmental classrooms. For this master planning effort, a survey was made of selected campus academic units. The one which had a large number of departmental classrooms was the College of Music. Its 10 classrooms were used a documented 60 hours per week, counting all use for the fall 1998 term. These rooms were only used approximately 20 hours per week for scheduled use in an analysis done with fall 1997 data. This indicates the unscheduled use of these rooms is approximately triple the scheduled use.

Most of the other classrooms on campus for Arts and Sciences, Business, Education, Engineering, and Journalism are centrally scheduled. The unscheduled use of the centrally scheduled classrooms is approximately 27 percent above the scheduled use. As shown, Music had much more unscheduled use for its departmental classrooms. Since campuswide data is not available, an assumption was made and 25 percent unscheduled use was added to the guideline finding for scheduled use of classrooms.

The CCHE guidelines were issued just prior to this analysis. There are inconsistencies in the student station size guidance, the expectation for hours of occupancy per week appears to be the highest in the nation (which doesn't work well for an average), and keeping track of unscheduled use is difficult for a large institution. The consulting firm, Paulien & Associates, did the best it could given these uncertainties. The University of Colorado at Boulder agrees with the general goal to optimize use of classroom space.

The guideline calculations (including unscheduled use) for fall 1997 show a need for about 76,000 ASF of additional space. After the Humanities Building and its 20 classrooms come on line, the need decreases to about 67,000 ASF at the 2003 campus size and increases to almost 72,000 ASF in 2008.

b. Instructional Laboratories and Service Space

In 1999, CCHE abolished the instructional laboratory space guidelines it had been using since 1973. Those guidelines showed differing space needs amounts for individual lab disciplines. They were quite detailed and, in some cases, there were 10 or more guidelines within a particular discipline. Nothing has replaced those values to date. Therefore, this master plan utilizes the laboratory guidelines of the Council of Educational Facilities Planners, International (CEFPI) in their Space Planning Guidelines. This document has been adopted by several states and is the most widely used guideline system currently in use. It shows a range for each discipline. The standard application of CEFPI has been to use the high end of the range for the university sector. The Council of Educational Facility Planners,

International usually provides one guideline per discipline area. Therefore, it is applied to all of the laboratories in a discipline. It is recognized that some laboratories may have more intensive space needs than others within a discipline.

The CEFPI guideline station sizes vary depending on the type of instruction taking place. The Council of Educational Facility Planners, International attempts to provide an average number that will generate appropriate space for that discipline. The CEFPI guidelines include basic laboratory space and service space needed in those disciplines.

The guideline square feet per student station for a chemistry laboratory is 75 square feet per station. Using a general chemistry lab section as an example, the number of ASF per weekly student contact hour is determined as follows:

$$\frac{\text{75 ASF per Student Station Including Service}}{\text{40 Weekly Room Hours x 80\% Station Use}} = \text{2.34 ASF per Weekly Student Contact Hour}$$

A hypothetical general chemistry lab section with 20 students meeting three hours a week would produce 60 weekly student contact hours. Multiplying that finding by the space factor of 2.34 ASF per weekly student contact hour produces 140.4 ASF for that section. Similar calculations were done for all laboratory course sections. The computer database used in these calculations has the name and square feet of the appropriate CEFPI guideline assigned to each department.

There are a number of laboratories, particularly for upper division and graduate courses, where a room needs to be dedicated to the work in that course. This is because there are unique spaces utilized, or because the methodology of the course requires students to leave work in place and build on it during the semester. The revised CCHE utilization targets, which are higher than those adopted by any other state, do allow unscheduled and informal use of laboratories to be taken into account. A utilization study for the CU-Boulder, done as part of this master plan, showed the utilization of laboratories to average 23 hours a week, when only scheduled credit is taken into account. For this master planning effort, selected units within Engineering and Arts and Sciences were asked to provide documentation of the total use of their teaching laboratories.

As can be seen, all of these departments substantially increase the use of their laboratories through open lab time in which students are conducting work, or laboratory personnel are preparing, or tearing down, laboratory experiments. These departments average unscheduled use at 125 percent of the scheduled use. This study assumed that 100 percent will be an average achieved at CU-Boulder. This assumption is carried forward in the Campus Master Plan space needs findings. The weekly student contact hours for credit use have been increased by 100 percent for this analysis.

The University of Colorado at Boulder does not currently collect information about the number of student stations in teaching labs in its Facilities Inventory. Therefore, a percent of utilization analysis cannot be conducted with the current data. The average enrollment

in scheduled laboratory classes is 19, which suggests that the percent of utilization is quite strong because many laboratories are limited to 24 stations by teaching methodology requirements.

When guideline calculations are compared to existing ASF for this category, a need of 42,000 assignable square feet is indicated at the base year (the need increases to about 54,000 ASF in 2003, and about 57,500 ASF in 2008).

c. Other Teaching Facilities and Service Space

Types of rooms included in this category are computer laboratories, language laboratories, music practice rooms, mathematics tutoring and testing facilities, and other similar facilities. By traditional CCHE definition, other teaching facilities are not used on a regularly scheduled basis, but they do serve students either in groups or individually.

The Colorado Commission on Higher Education does not address guideline space for the use of computer labs, language labs, music practice rooms, or support space for Other Teaching Facilities. Given the increased specialization of technology and dependence on technology, the demand and need for this type of space will only increase in future years. These "open labs" range from 5 to 10 ASF/FTE at similar campuses.

A reasonable guideline is eight ASF per full-time equivalent student. This is a number consistent with 1999 guidelines of the Kentucky Council on Postsecondary Education, which does most of its guideline analysis on a square feet per full-time equivalent student basis. This number has been applied to the University of Colorado at Boulder figures and shows a need of about 27,000 ASF in this category at the base year. The need is almost 37,000 ASF in 2003 and almost 40,000 ASF in 2008.

d. Academic Office and Service Space

Office space needs have been affected by new types of office equipment. The proliferation of personal computers (PCs) and individual workstations has resulted in a need for additional space both for professionals and support staff. The typewriter has been replaced by a monitor, keyboard, and, in many cases, printer. Where a PC is used rather than a terminal, a processing unit is often also on the desk. Adding this new technology has resulted in the need for about 20 additional square feet per workstation.

Most faculty members have microcomputers and collections of books and journals that require more space than traditional guidelines. Given these increased space needs, this master plan uses 140 ASF, a figure used in many other recent space guideline applications, including those for the University of Nebraska and the University of Missouri.

It should be noted that the CCHE approved 150 ASF faculty offices for the School of Law in a 1972 program plan that authorized the current facility. The University of Colorado has included this size office in recent programming for expanded law facilities. Larger 180 ASF studio offices for environmental design, music, and art faculty are used in this plan for space needs analysis, but will vary as program plans are done.

Figures for other types of positions are taken from the CEFPI guidelines, with some adjustments based on previous planning practices for CU-Boulder studies. Academic administrators at the dean level are given a 200-square-foot allocation, while executive, administrative, and managerial positions are given an allocation of 180 ASF. Employees categorized as professional received 120 ASF, technical personnel received 110 ASF, graduate assistants received 60 ASF, and undergraduate student workers received 30 ASF.

The CEFPI guidelines for service space include storage for such things as copy machines and supplies, and conference room space. These are based on the size of departments and are fairly complex formulas. While they are not repeated here, they were used in the analysis, and the results are shown in the tables.

This category currently shows a need for 110,000 ASF of additional space. The need increases to about 166,000 ASF in 2003 and about 230,000 ASF in 2008.

e. Other Instructional Space

This category consists of all spaces assigned to academic units that are not classrooms, laboratories, or offices. They include departmental study rooms, animal quarters, greenhouses, exhibition areas, storage areas, and computer rooms. These areas differ from those in the Other Teaching Facilities category in that they are not customarily used for instruction. No CCHE guideline is available for this category.

At other large universities studied by Paulien & Associates, the space in this category ranges from 5 to over 25 ASF per student. This master plan uses a guideline figure of 10 ASF per student, which results in an 18,000 ASF need, increasing to about 30,000 ASF in 2003 and almost 35,000 ASF in 2008.

f. Research Laboratory and Service Space

Research awards grew from $80.2 million in 1988 to approximately $204.0 million in 1999.

The existing space research included in this analysis is space that CU-Boulder has coded as research laboratory and service space. Only units that are coded as academic have been included in this analysis. Other room types used by research units are coded under Other Instructional Space. In many cases there is no clear distinction within an academic department between the use of support space for instruction and for research, because the two are inseparable.

The University of Colorado is one of the leading research institutions in the United States. In the most recently published list of top institutions in federal research and development expenditures it was ranked 15th nationally among all public and private institutions, and exceeded the total research of such prestigious institutions as Yale University, the University of Illinois at Urbana-Champaign, Duke University, the University of Virginia, and the University of North Carolina at Chapel Hill.

The CCHE has abolished its research guidelines which tended to be less generous than those utilized in many other jurisdictions, but still showed the University of Colorado at Boulder with a need for additional research space. In looking at alternate approaches, a peer

analysis of 14 major public research universities showed them averaging over one million assignable square feet in research lab space. The University of Colorado currently has just over 500,000 assignable square feet.

Only four of the 14 institutions listed had higher research expenditures than CU-Boulder in the most recent list of top institutions compiled by the National Science Foundation.

A recently adopted state research guideline, that of the Kentucky Council on Postsecondary Education, utilizes 700 square feet per $100,000 of research expenditures. Utilizing this guideline produces over 1.2 million square feet of need for the University of Colorado at Boulder, based on its existing research program. This is higher than the average of the peer institutions. The peer institution average is used as the guideline amount for the base year in this study.

The Campus Master Plan does not project specific increases in research dollars for CU-Boulder, but does project a 21 percent increase in research staffing by 2003, and a 44 percent increase by 2008 based on a 1997 base. These percentages were utilized in calculating increased space needs for research.

This analysis shows a normative current need for 563,000 ASF, more than a doubling over existing space. The need increases to about 791,000 ASF in 2003, and over 1,041,000 ASF in 2008. Actual research need is highly dependent on the grants received. Specific building plans will be brought forward as the research program grows.

g. Assembly and Exhibit Space

This category consists of facilities used for art exhibition, music performance, and theatre performance. In addition, assembly space may be coded in this category, along with other university-related specialized museums. The amount of space that CU-Boulder has in this category is substantially less than space at several comparable universities. The University of Nebraska-Lincoln has three times as much space in this category. The University of Georgia and the University of South Carolina each have approximately twice as much space.The only organization that has attempted to quantify standards for this category is the Council of Educational Facility Planners, International. Their numbers have been used in this analysis. They show the Boulder campus substantially short of space in this category based on its size and its complete set of visual and performing arts programs. The additional need is 45,000 ASF, increasing to 52,000 ASF by 2003, and almost 55,000 ASF for the 2008 campus size.

h. Library Space

This category covers all library space including the Law Library, which reports to the School of Law dean.

The University of Colorado recently prepared a program plan for the School of Law that included expansion of the Law Library. The findings of that study, an increase of about 20,000 ASF, are used for that library. For the rest of the library system, the CCHE Master Planning Library Guidelines were applied for the base year, 1997, and for the years 2003 and 2008.

Results of the guideline calculations for this category reveal a

shortage of about 175,000 square feet (library space, including offices) when compared to existing space. This shortage is projected to drop to almost 165,000 ASF by 2003 because of a remote storage facility in development on the Fitzsimons site, which will store significant numbers of volumes currently housed in Norlin Library. This facility has been incorporated into the analysis for the years 2003 and 2008. For the year 2008, the need increases again to over 183,000 ASF.

i. Administrative Office and Service Space

These are the general, campuswide administrative units for CU-Boulder. Many of these units report to the Vice Chancellor for Administration, some report directly to the Chancellor, and some to the Vice Chancellor for Planning, Budget and Analysis. This category also includes the administrative programs that report to the Vice Chancellor for Student Affairs.

The office spaces for the student union, athletics, recreation, and the units in the physical plant category are included with their other spaces in those categories.

The office space findings for these units indicate the need for almost 32,000 ASF of additional space at 1997 staffing levels, over 35,000 ASF at projected 2003 staffing levels, and almost 39,000 ASF at 2008 staffing levels.

j. Other Administrative and General Space

There are no CCHE guidelines for non-office space in the other administrative and general space category. Findings at other major research universities range from 2 to 15 ASF per student. This master plan uses a figure of three ASF per student. For 1997, a need of about 14,000 ASF was shown, in 2003 there will be a need for about 18,000 square feet more than existing space, and for 2008 the need will be over 19,000 ASF.

k. Student Union Space

The student union category consists of the University Memorial Center (UMC), the Book Store, student government, and a variety of student clubs. The Book Store reports separately from the UMC, but book stores are normally located in or near the campus union and are included in the two widely used student union guidelines referenced below.

No CCHE guideline exists for this category. The most widely used factors are 9 square feet per full-time equivalent student suggested by the CEFPI, or 10 square feet per student suggested by the Association of College Unions-International. The CEFPI figure is used in these calculations. It produces a need of approximately 53,000 ASF of additional space for 1997, 64,000 ASF for 2003, and 67,000 ASF for 2008.

l. Physical Plant Space

This category by function consists of space occupied by the Departments of Facilities Management, Public Safety, Environmental Health and Safety, the Distribution Center, and the Transportation Center. The CCHE abolished its guideline in this category. Guidelines

range from 5 percent to 8 percent of other space. A figure of 6 percent of the General Fund space is used in this master plan. The calculated additional need is about 66,000 ASF for 1997, 87,000 ASF in 2003, and 108,000 ASF in 2008.

Facilities Management space is located primarily within the Stadium and Grounds buildings. Public Safety space is located primarily in the Police and Parking and Transit Services Center. Environmental Health and Safety, the Distribution Center, and the Transportation Center each have their own buildings.

m. Athletics Space

The CCHE has never had guidelines for this category. No widely used physical education/recreation guidelines include athletics space since the intensity of athletics programs varies dramatically from campus to campus. As a member of the Big XII Conference, the University of Colorado at Boulder has a major commitment to athletics.The existing space assigned to athletics programs is just under 237,000 ASF. This includes office space as well as all other types of athletics department space. Information was gathered on comparable assignable square footage at three of the University of Colorado's longtime conference peers. The University of Oklahoma has about 617,390 ASF of indoor athletics space. The University of Missouri has 369,795 ASF of indoor athletics space. The University of Nebraska has 518,068 ASF of indoor athletics space. This master plan uses the average of existing space at these three institutions, which is 501,750 ASF.

The University of Colorado has substantially less space than the indoor athletics space of its rivals. This analysis shows a need of almost 265,000 ASF for indoor athletics space, with multipurpose fieldhouse space the greatest need. The figure is carried forward for the target years, since the number of intercollegiate competitive athletes does not remain directly proportional to the total student population. Although the University of Colorado participates in somewhat fewer sports than these other institutions, the differences are not that substantial. Colorado has 15 intercollegiate sports, compared with 19 at Oklahoma, 17 at Missouri, and 20 at Nebraska. The most extensive space needs are created by the football and basketball programs, which exist at all these institutions.

n. Recreation Space

Although CU-Boulder has phased out formal physical education activity courses, a very strong program of recreation activities is growing.

The CCHE has never had a guideline for recreation activity. The most applicable guideline was found in University Space Planning by Harlan D. Bareither and Jerry L. Schillinger (University of Illinois Press).

Bareither and Schillinger provide a methodology to calculate the needs for recreation space separately from instructional activity. They assume: that 12.1 net ASF of recreation space should be provided for each undergraduate student; that the same amount of space be made available for 25 percent of the graduate students, since they do not normally participate as intensively in recreation; and that 12.1 ASF per person be made available for 15 percent of the academic and nonacademic staff.

This formula applied to the CU-Boulder produced about 284,000 ASF for fall 1997 students and staff. The Bareither and Schillinger recreation guideline shows a need for over 100,000 ASF in the base year, 115,000 ASF in 2003, and about 120,000 ASF for 2008.

o. Housing Department Office Space

The CEFPI guidelines for administrative office space are applied by job category to calculate housing department office space. Housing offices show a need of almost 14,000 ASF at the base year, 16,000 ASF in 2003, and about 17,000 ASF in 2008.

p. Campus Housing Space

The conservative assumption used in this master plan is that CU-Boulder is currently short 250 housing beds, based on a February 1993 study. Another 250 beds will be needed by the year 2003 to accommodate the projected increase in freshmen. Another 400 beds are proposed by 2008.

The total 450 ASF per additional bed needed reflects a change from traditional dormitory rooms to suite-style or apartment-style living, because apartments are in much greater demand by students. This factor also includes the support services needed in residence halls, ranging from lounge areas, computer labs, building service and office areas, kitchenettes, and laundry facilities.

Housing maintenance services and dining services are included in the existing and proposed housing numbers. Based on these assumptions, the need for additional housing space is 112,500 ASF, increasing to 225,000 ASF for 2003, and 405,000 ASF in 2008.

If affordable housing becomes more difficult to find in Boulder and its environs, additional CU housing beyond these figures should be considered.

q. System Agencies Space

These units have a multicampus role and report to the president of the university or the Board of Regents. They include the President's Office, University Counsel, the secretary to the Board of Regents, Internal Auditing, Central Accounting, Central Data Management, Central Payroll, Policy and Planning, Staff Counsel, University Management Systems, University Controller's office, University Relations, the vice presidents, the Center for Academic Enrichment, and the Silver & Gold Record, a university newspaper.

These units occupy 82,640 ASF on the Boulder campus. No attempt was made to quantify a guideline need since these units are not administered by CU-Boulder.

r. Non-institutional Agencies Space

During the past 25 years, CU-Boulder has developed several research buildings primarily on the East Campus, that have provided space not only for university research but also for federal government and nonprofit research units. These include portions of the National Center for Atmospheric Research (NCAR), the Western Interstate Commission for Higher Education (WICHE), and others. These units are paying rent to the university for space currently occupied, and this rent is being used to maintain the buildings and retire financing.

This space totals just under 174,000 ASF and is included here because the university is directly managing the space.

The U S West and Sybase buildings in the Research Park, and the future non-university development of other pods in the park, are not listed in this category since this development consists of long-term land leases to U S West, Sybase, and other future tenants and is neither intended to address CU-Boulder space needs nor does CU-Boulder directly manage it.

Some of the space occupied by non-institutional agencies has become available to partially address some of the identified deficits of CU-Boulder space. In particular, about 78,000 ASF of space occupied by the National Oceanic and Atmospheric Administration (NOAA), a federal agency in Administrative and Research Center-East Campus during this base data period (fall 1997) is now available because NOAA occupied its new off-campus Boulder facilities earlier this year. This space will be renovated to address some of CU-Boulder's research and administrative office space deficits.

B. Academic Facilities Needs

Academic facilities needs are those most integral to the mission of the university. Academic facilities include classrooms, instructional and research labs, academic offices, assembly and exhibit spaces, libraries, and academic support spaces. Academic programs in residence halls are addressed in the residential section (III.F) of this plan.

Academic uses occupy 110 acres (19.3%) of the three-campus area, as shown in Exhibit III.B.1. Academic spaces account for almost half (48%) of all building space, about 2,398,000 assignable square feet.

1. Academic Land Use and Facilities Objectives

The campus planning goals that are most important for academic land use and facilities planning are as follows (excerpted from Section I.A):

- Provide high-quality facilities to meet institutional needs. This includes the need to: renovate or replace obsolete facilities; facilitate improved ways of teaching and learning; and accommodate research that is increasingly interdisciplinary and technologically sophisticated.
- Provide more experiential learning opportunities for students.
- Use technology to improve learning, teaching, and research.
- Accommodate a projected enrollment growth of 7.2 percent (through 2008-09).
- Facilitate increased graduate student enrollment to reverse a downtrend in the percentage of graduate students enrolled.
- Retain the 10-minute class change period possibility for most undergraduate courses.

The changes in academic facilities proposed in this plan are designed to help meet these goals and help ensure a total learning environment.

a. Land Use Objectives

The Main Campus of CU-Boulder is a compact academic village, which has facilitated communication. Most academic facilities are located

within reasonable walking distance of each other. Arts and humanities are concentrated on the west part of the Main Campus. Laboratory sciences are concentrated on the east part of Main Campus. Teaching and research activities benefit from the physical proximity of related disciplines. Proximity increases opportunities for the desirable interchange of students and faculty between related disciplines, and has contributed to the creation of many interdisciplinary centers and institutes, thus furthering the institution's prominence in research. Interdisciplinary institutes and centers are often located literally between their related disciplines.

Undergraduate classes are concentrated geographically, most within a 10-minute walk, allowing for as many class periods during the day as possible. The principal factor in locating new academic buildings should be to continue this combination of efficiency and synergistic interaction. This plan endorses retaining the 10-minute class change period for the 10-year planning period. This means that space for undergraduate classes needs to be given priority within the 10-minute walking area shown in Exhibit III-B-2. However, greater flexibility in scheduling policy may be needed in the future. With the advance in computer systems it may become possible to tailor each student's schedule to take into account the distance between each individual's classes.

The university's most important functions-teaching and research-are best focused upon the Main Campus even though it is largely built out. In order to manage the facilities growth that is necessitated by the expected growth in demand, more efficient and appropriate use of the Main Campus is necessary, giving priority to academic uses in the campus core. In addition, plans made for academic use expansion in the adjoining Grandview area will need to be implemented. Research activities with fewer student contacts can find greater space available on the East Campus, where several of the life sciences and space sciences institutes have located.

b. Facilities Objectives

Academic institutions need to address both the quantity and quality of their academic facilities. Facility needs, both backlogged and projected, were quantified in the preceding space needs analysis (III.A). The projected 7.2 percent enrollment growth over 10 years is a major factor in the need for more facilities. Academic facilities also need to grow to address backlogged space deficiencies, and to accommodate increasing research activity.

Focus on the quality of academic facilities at CU-Boulder is perhaps even more important. Higher education is in the midst of a significant transformation of its mission, its market, and the way in which it delivers its services. Interactive, participatory, project-based team learning has grown in importance, and requires different educational facilities. Technological change is having a major impact on what is taught, on how teaching and learning occur, and on how information is developed, stored, and disseminated. Technology is changing space needs. A worldwide library is available to anyone with Internet access, causing universities to reexamine the role of their libraries, which traditionally have been the great storehouses of information. Given the climate of change, academic facilities must be versatile, adaptable, and flexible to ensure the university's ability to provide all of its services.

A task force, composed largely of faculty members, was charged by

the chancellor with reassessing the kinds of facilities needed to meet changing teaching and research needs, considering the potentialities of educational delivery and technology. The group presented, listened to, and discussed a variety of faculty, administrator, and undergraduate and graduate student points of view on CU-Boulder's teaching and research missions. In addition the task force assessed the facilities needs implied in the Academic Strategic Plan. This task force's recommendations were incorporated into this section.

One of the goals is to increase graduate students as a percentage of total student enrollment. This percentage is relatively low compared to other research universities. To support an increase in graduate students will require more seminar rooms, better-specialized laboratories and discipline-specific facilities, and more graduate student office carrels.

CU-Boulder's instructional and research outputs are the products of its faculty. Facilities of all kinds are a major factor in attracting and retaining faculty. For planning purposes, it was assumed that the student/faculty ratio will remain nearly constant and that the ratio of temporary and research faculty to permanent faculty will continue to rise slightly. The faculty's facilities needs are detailed throughout this section.

Supporting and increasing diversity among faculty, students, and staff is one goal of the desired campus growth. For example, no academic discipline is limited to students of one gender. Yet only 30 years ago the Engineering Center was built with an assumption that almost all engineers would be male. Facilities are also being added on campus to accommodate diversified academic interests, such as women's studies, Native American studies, ethnic and foreign cultures, and studies of people with various physical limitations.

Academic land use planning is not limited to addressing the needs of traditional students. A wide range of non-traditional and community audiences is served through evening classes, concerts, presentations, conferences, and other continuing education activities. These lifelong learning opportunities afford broad access to CU-Boulder's educational resources, enhance diversity, and advance economic vitality and quality of life. Educational resources of CU-Boulder also extend beyond the borders of its physical campus through the Internet and distance education activities. The use of campus buildings for continuing and distance education, evening, weekend, and summer activities is included in academic facilities planning.

2. Classroom and Instructional Lab Space

About 758,000 assignable square feet are devoted to classrooms, instructional labs, and related instructional facilities at CU-Boulder. The space needs analysis (III.A) indicated that there is a shortage of classrooms. A shortage will remain even after completion of the Humanities Building, underway as this plan is being written. A number of buildings already in the planning stage will address the balance of the need. These buildings (enumerated as academic capital improvements later in this section) will add to both the quantity and quality of instructional spaces.

The university has 157 centrally scheduled classrooms with 9,025 seats available in fall semester 1999. Many additional specialized classrooms, teaching labs, and seminar rooms are departmentally controlled. Seventeen classrooms of various sizes with a total of

1,059 seats have been constructed in the new Humanities Building. If the current classroom inventory is not reduced, and the buildings in planning stages are built, it appears that there would be a sufficient number of centrally scheduled classrooms to accommodate the 7.2 percent enrollment increase planned in the next 10 years. Additional specialized classrooms and labs may still be needed in several disciplines.There are, however, concerns with the mix of classroom sizes. The existing classroom inventory includes:

- "small" classrooms (57 classrooms of 30 and fewer seats-about 1,600 seats),
- "medium" classrooms (63 classrooms of 31 to 50 seats-about 2,400 seats),
- "large" classrooms (15 classrooms of 51 to 90 seats-about 1,000 seats),
- "lecture halls" (14 classrooms of 91 to 200 seats-about 1,600 seats), and
- "auditoriums" (8 classrooms of 201 and greater-about 1,900 seats).

Several "large" classrooms, which are appropriate for lectures and which are also very economical as a credit generation system, are coming on line for the Humanities Building, but more would be desirable. In addition, the campus should not fall below the current level of eight auditoriums. For economic and pedagogical reasons, it is important not to lose any classroom inventory, especially at the large end of this scale.

To facilitate the desired increase in graduate students, more small classrooms will be needed, particularly seminar rooms, and this need has been recognized in the recent design of buildings, including the Humanities Building. There are 11 small classrooms in the Humanities Building, but 4 small classrooms in Ketchum will be converted to offices concurrent with the opening of Humanities in spring 2000, for a net gain of 7 small classrooms. The Humanities Building opening will increase total classroom seats to 9,514 for the spring 2000 semester.

Some of the faculty see a need for an auditorium-style classroom with a lecture capacity of between 600 and 800, incorporating feasible technological advances. A very large auditorium would economically accommodate instruction and could create a facility for many non-course-related activities such as general colloquia, public lectures, and movies that can fill such a large space. An alternative to very large classes is individualized computer-based courses, which are being developed. This bricks-and-mortar vs. individualized computerized instruction is a debate raging in higher education. An additional large auditorium is not justifiable under space standards, but if built to replace existing classroom seating could be a room with advances in layout and equipment which are difficult to retrofit into existing auditoriums.

The Colorado Commission for Higher Education (CCHE) has adopted guidelines to encourage greater scheduling efficiency and avoid capital costs. The campus registrar's office needs to maximize the scheduling efficiency to help meet the utilization guidelines.

More important than the quantity and mix of classroom space are concerns about the quality of the classroom inventory. Only about half of CU-Boulder classrooms are currently media equipped and, of these, only about 20 are "smart" classrooms prepared for the display

of computer-based data. Significantly more classrooms should be equipped for media and/or computers as soon as possible. The program to upgrade some classrooms each year should continue and be expanded. The need to proceed is especially acute in the small classroom category. In addition, CU-Boulder should be moving to provide classrooms with technologies even more advanced than those in the "smart" classrooms; these facilities should be available at the teachers' and students' option.

The inherent diversity of the university mandates that a variety of teaching and research modalities-ranging from the traditional to the most novel and modern-must be accommodated on campus. Lectures and traditional experimental labs will exist side by side with interactive classrooms and computer simulations.

Innovative learning environments already include individualized personal computer instruction, facilitation of collaborative group learning, simulations, and distance learning. The best example of these innovative learning environments on the Boulder campus as of the writing of this plan is the undergraduate engineering Integrated Teaching and Learning Laboratory (ITLL) which does not follow the conventions of traditional spaces such as classrooms, labs, offices, corridors, etc. Instead, the entire building is a learning environment, with open "lab plazas" containing interactive exhibits, computers, and hands-on experiments. Also included are group study rooms, small gathering places for "just-in-time" instruction, combined classroom/labs, simulation facilities, and other flexible spaces. The proposed ATLAS facilities will extend these concepts, creating innovative learning environments and integrating a wider variety of disciplines. These higher-technology facilities will require a higher level of budgeting and staff support than traditional educational facilities.

The wide variety of instructional laboratories and other instructional spaces also needs continual upgrading to stay current with disciplines, knowledge, and technology. Students benefit greatly from experiential learning. Educational laboratories, studios, and other spaces need to reflect or even lead changes in their fields. For example, CU-Boulder facilities for fine arts were built before photography and computerized arts were taught, and before the health and safety consequences of many traditional media were known. The obsolete and even potentially hazardous facilities should be replaced.

3. Office Space

CU-Boulder has about 723,000 assignable square feet of academic office and service space. This is the largest single category of academic space. Existing office space is 87 percent of the recommended space standard, and the magnitude of the shortage is substantial: 110,000 square feet, projected to grow to 230,000 square feet in the year 2008 if enrollment grows as projected. It is already very difficult to find office space for new faculty and staff. Office and service space shortages have implications for research as well as teaching.

New office space in the Humanities Building will help, but much more is needed. The capital projects listed at the end of this section include a substantial amount of office space.

Space for graduate students is frequently compromised when new

building projects have tight budgets. Carrels for graduate students should be raised in priority in order to facilitate the campus goal of encouraging an increase in graduate students.

4. Research Laboratories

The campus has 524,000 assignable square feet of research labs and related service space, which is inadequate. A considerable amount of additional space would be needed for the campus to reach its full research potential (see Section III.A). Sufficient space to house research being conducted on campus is essential in order to attract and retain faculty at a research university. It is possible that the shortages of office and research space will impact classroom space because needs have sometimes been met by converting classroom space to office and research use.

The research space shortage has three causes. First, existing research needs more space on an ongoing basis as, for instance, new equipment is added to existing space or new computational stations and data storage facilities are required. Second, more research is being undertaken on campus than ever before. Third, while the relative growth of demand for research space varies considerably from unit to unit, most research space is allocated at the unit level, making for large differences in the relative intensity of the space shortage between units. Solutions to this problem are not simple. Initially, additional space will be generated by adapting existing space in the Administrative and Research Center-East Campus.

The amount of research is not related to enrollment, but rather to the productivity of the faculty and research associates. The University of Colorado at Boulder has less research space per research dollar than comparable institutions (See Exhibits I-B-1 and III-A-5).

Research activities are essential within the academic area. It is desirable to keep much of the regular faculty's research on the Main Campus, including Grandview Terrace. Yet some large, space-consumptive research of the space sciences, biological science greenhouses, and animal colonies cannot reasonably be located on the Main Campus and have already been located on the East Campus, where more land is available and where a synergy has developed between the Research Park research units.

Research integrated with undergraduate education identifies first-class research institutions as providers of quality undergraduate education. A good example of increased research space integrated with student instruction will be the Discovery Learning Center in the College of Engineering and Applied Sciences (in design at the writing of this plan). But additional research facility provision on the Main Campus will be very limited unless nonacademic uses of the Main Campus are limited. The relocation of many nonacademic offices is underway as selected service functions move to vacated space in the Administrative and Research Center-East Campus, thereby making space in the Armory and other buildings available to academic uses.

Research is increasingly interdisciplinary and technologically sophisticated. New building program plans should incorporate more research flexibility by considering multiple research needs rather than single programmatic focuses.

5. Assembly and Exhibit Space

Certain academic spaces are cultural resources for the community and state populations. These include major performance halls, such as Macky Auditorium and the University Theater, and museums, such as the natural history museum in Henderson and the art gallery at Sibell Wolle. These spaces are vital for the education of students, who may perform in a music or theatre event, prepare or study a museum exhibit, watch a play, hear a concert, or attend a guest lecture. About 81,000 square feet of major public venues have been classified in this category, which does not include classrooms or laboratories.

The Boulder campus has less major assembly and exhibit space than other major public research universities. In part, this reflects a dependence on cultural facilities off campus, such as Chautauqua Auditorium in Boulder and the Denver Center for Performing Arts. But it also reflects a true shortage of space in which to perform and exhibit. For example, potential audiences for the excellent music and musical theatre programs at CU-Boulder often exceed the 500-seat Grusin Music Hall or the 250-seat Lyric Theatre, both of which severely limit performance revenues. On the other hand, the 2,000-seat Macky Auditorium is too large for most theater or student voices. A roughly 800- to-1,000 seat performing arts facility with backstage and support facilities would greatly strengthen the university's programs and revenue. Because Boulder also needs such a facility, the university and the community have, at various times, considered joint or cooperative cultural resources planning. Renewed collaborative efforts in the future are a recommendation of this master plan.

The university's substantial holdings of natural history and fine arts materials are only partially seen in small, temporary exhibits, due to the lack of exhibit space. For natural history collections, rather than focus on gallery needs in this planning period, the focus will be to relocate them from Hunter Science Building, which has health and safety problems for both people and collections, to the building vacated by the Geological Sciences Department. Also, many universities have a fine arts museum, which certainly would be an asset for CU, the state, and the local community. A study of the fine arts program and gallery is underway and will begin to address the needs for fine arts gallery space. One concept raised in this plan (Section V.D) is to explore cultural facility opportunities to revitalize the Hill, an adjoining commercial area.

6. Libraries

In the Jeffersonian tradition, a university's library is at the heart of the campus. Libraries have served as the central repository of information and the place to learn how to access information. Large numbers of people use libraries for research and study. But changes in technology mean an evolution-if not revolution-for libraries. The Internet increases the need for qualitative changes in campus libraries. Alternatives to print media now abound. Users are faced with an often confounding proliferation of media, technology, and information.

The library system on the Boulder campus includes Norlin Library and its five branch libraries. The University of Colorado Law Library is administered separately. In addition, there are a number of departmental reading rooms and specialized collections. The rapidly changing technological environment for research and publishing impacts the libraries of the Boulder campus. According to the space

needs analysis (III.A), CU-Boulder library space will only be 66 percent of CCHE guidelines, after taking into account the book storage facility being developed at the CU Health Sciences Center Fitzsimons campus.

a. Norlin Library

Norlin Library is a major resource not only for CU-Boulder but also for the State of Colorado. With specialized collections and electronic networks, an increasing number of scholars are served. The extensive Norlin collections and services range from historical archives to multimedia. Norlin is approximately 330,000 gross square feet (210,000 assignable square feet). Campus wide, there are approximately 313,000 total assignable square feet in all library facilities.

The plan is to convert Norlin Library to an information concourse, where all who visit can access and "shop" the world of information. The retrofitting will:

- create the learning library of the future, with new collaborative learning spaces;
- provide for the demands of current and evolving information technology;
- make the building a more inviting home for its many users;
- create a better-organized, more efficient library and collateral facilities;
- improve ease of use and clarify how to circulate throughout the building;
- upgrade the building's east face to be a more inviting presence; and
- preserve and enhance the building's architectural integrity in terms of its historic exterior and interior spaces.

b. Branch Libraries

The branch libraries outside Norlin (and proposed plans for them) are:

- Leonard H. Gemmill Engineering Library (no proposed change since it is relatively new).
- William M. White Business Library (inadequately sized; proposed to be relocated and expanded as part of larger College of Business capital project).
- Oliver C. Lester Library of Mathematics and Physics (no change is proposed).
- Jerry Crail Johnson Earth Sciences Library (no change is proposed since it is relatively new).
- Music Library (inadequately sized; so, additional space will need to be found but no specific proposal has been set forth yet).

c. The Law Library

The University of Colorado Law Library is a unique resource within the University of Colorado system and the State of Colorado. It is the largest law library, public or private, in the state and the region, and provides legal information resources to the university community and the state. The Law Library presently occupies approximately 39,600 assignable square feet, plus a reference collection for the faculty known as the Lasky Library, both in the Fleming Law Building. The Law Library will relocate to a new Law School building, occupying

approximately 52,000 assignable square feet. This is needed to accommodate growing collections, since more than most disciplines, law requires older materials to be retained and to be readably accessibly.

The new Law Library will be a more efficiently organized and technologically sophisticated facility. It will include space for instruction in book and computer-based resources, extensive computer facilities, and group and individual study. Staff spaces will reflect the dramatic impact technology has brought to library operations. The entire facility will feature flexible spaces and will be designed to accommodate technological tools as they evolve.

d. Fleming Building Conversion

When the Law Library moves into a new Law School building, the Law Library space in the Fleming Building will become available to house other library collections. Special collections (a.k.a. rare books) and the archives may be relocated from Norlin to Fleming. Many people come from off-campus to use just these unique collections, so relocation to Fleming, on the periphery of campus, could be convenient. The final selection of which collections to move to the Fleming building will be made as part of programming the renovation of Norlin Library.

Redeployment of selected collections to the Fleming library space will create some much-needed space planning flexibility in Norlin Library. Space in Norlin will need to be reorganized to accommodate growth in remaining collections, to house new and expanding user services, and to reflect the redeployment of other materials to a remote storage facility.

e. Remote Storage Facility

Due to insufficient space and floor weight-loading limitations in Norlin, a large number of volumes have been moved off site. Rather than occupy valuable real estate and limited library space on the Boulder campus, infrequently used information resources will be housed in a permanent storage facility on the Fitzsimons campus of the Health Sciences Center. On-campus facilities will be devoted to housing user services and frequently accessed and specialized collections.

f. Departmental Reading Rooms and Specialized Collections

The following are among the largest departmental reading rooms and specialized collections which are administratively separate from the University of Colorado at Boulder libraries (with proposals for changes indicated):

- Women's Studies Reading Room (no change proposed since it is relatively new).
- Media Library of Informational Technology Services (may be combined with other media resources).
- Fine Arts Slide Library (inadequately housed, proposed to be relocated to a new Fine Arts Building).
- Anthropology Reading Room (no change since it is relatively new).
- Humanities Reading Room (under construction).
- INSTAAR Map Library (no major change proposed).
- MCD Biology Reading Room (no change since it is relatively

new).
- Institute for Behavioral Sciences Library (inadequately housed; proposed to be relocated to new IBS facilities).

Space Planning Principles

The following space planning principles are set forth for libraries on the Boulder campus:

- A robust campus information technology network and infrastructure will be in place.
- Libraries will continue to provide a core of basic services, for example reference, information instruction, and information resource development services; although the media through which information is carried, packaged, and transmitted will change.
- Experimentation in electronic publishing, while encouraging, has not resulted in a substitute for local collection, development, and physical storage; the design of new library space should, however, project growth of paper-based collections at lower rates than in the recent past.
- Dependence on the printed word will decrease, but will not disappear. Many print resources will not be available in electronic format, at least in the foreseeable future. Libraries will continue to preserve and provide access to the plethora of print materials that are needed for research and instruction at a research university.
- The library's responsibility to teach students to be continuous learners will not decrease with new facilities. New or renovated construction should house instructional facilities designed specifically for access to, and retrieval of, the scholarly record. Dedicated areas for quiet study, group study, group instruction, individual instruction, use of facsimile equipment, and use of electronic information resources and technology are implied here.
- The seating capacity guidelines of the Colorado Commission on Higher Education will be used in all library designs so as to accommodate the populations being served.
- Almost all library space will be designed to be flexible, so that when a space use change is needed, it can be met with as little modification and expense as possible.
- Space planning will take into account furniture and workstations to support computer hardware and software.
- Building and renovation plans will include noise and environmental controls.
- The increase in technology will require a corresponding increase in information technology budgeting, support staff, and space for this staff.
- Many materials will be stored off site with on-campus user access services provided. New on-campus storage designs will accommodate movable compact storage wherever possible.

7. Academic Capital Improvements

Based on the preceding analysis, the space deficits identified in III.A, and the need for up-to-date facilities, many academic capital projects are needed. The following lists include projects over $500,000 proposed for this planning period (through 2008-09). Location, timing, square footage, and cost estimates for these projects are detailed in the Building Plan (IV.A). Most projects address both the need to upgrade existing facilities and the need to accommodate the

projected growth.

a. Major Projects Underway (in alphabetical order):

- Administrative and Research Center-East Campus Renovation: About 40 percent of this building (formerly "RL-3") is being renovated for research (the remainder is for service uses).
- Discovery Learning Center: A 45,000 square foot facility has been funded and is in design at the writing of this plan. It is to house hands-on learning, applied technology, and industrial partnerships for the College of Engineering and Applied Sciences.
- Ekeley Sciences East Wing Renovation: This renovation has been funded and is in design at the writing of this plan.
- Environmental Engineering Renovation: A renovation of Civil and Aerospace Engineering is under construction at this writing.
- Former Geology Building Renovation: This renovation has been funded and is in design at the writing of this plan. It will re-house museum instructional and collection functions now located in the Hunter Building, which is slated for demolition.
- Humanities Building: This new 59,000-gross-square-foot building is under construction, including renovation of the attached Woodbury Arts and Sciences building.
- Porter Biosciences Renovation: A multiple-phase renovation has been funded and it is under construction at the writing of this plan.

b. Proposed Renovations

The Boulder campus is relatively old for a Colorado higher education institution; thus renovations are a greater need than on newer campuses. There are too many older academic buildings in need of renovation work to list each individually. The extent of such renovations varies considerably. Typically, buildings approaching 100 years old or with a major change of use require complete reorganization of space and replacement of building systems such as electrical, plumbing, and heating/cooling. Carlson Gymnasium is an example. Older science buildings often have a deficiency of suitable space. Chemistry facilities are an example. Many science buildings built across the country in the early 1970s need significant renovation. Porter Biosciences is an example. Most academic buildings will also need to be retrofitted for informational technology equipment in light of technology's short cycles. Norlin Library is an example. Renovations are also necessitated by the move of functions. Fleming Law will be an example, when a new law building is constructed. Minor renovations are handled in a number of ways, including controlled or deferred maintenance programming. Major renovations are likely to include (in alphabetical order):

- Carlson Gymnasium Renovation: If replacement athletics facilities are completed in the time horizon of this plan, conversion of the centrally-located Carlson building into an arts and sciences educational facility may be feasible. Very preliminary concepts are for a teaching and research facility for allied health sciences, given Carlson's adjacency to the Life Sciences Laboratory Complex.
- Fleming Law Renovation: When a new Law School building is built (see next list), Fleming will be used to house the university writing center, academic centers, continuing education including classrooms, and selected library collections.

Norlin Library Renovation: Norlin Library has about 210,000 assignable square feet, much of which is becoming antiquated by rapidly-evolving information technologies. Renovation of Norlin as an information concourse will be a major capital project.

c. Additions and New Buildings:

Major additions proposed for academic (including research uses) are in alphabetical order:

- ATLAS Center: A building to house the Alliance for Technology, Learning, and Society has been proposed, to contain 65,600 gross square feet of technology-enhanced teaching spaces, production studios, offices, and exhibition space. The Hunter Science Building would be demolished to make room for this new building.
- Business Addition and Renovation: A College of Business addition of approximately 54,000 gross square feet is proposed to house outreach centers, new programs, and relocated library space. An Executive Education Center may be part of this project, or may be built as a separate project.
- Duane Physical Laboratories "H" Wing Addition and Renovation: A substantial addition, planned since the construction of Duane in 1971, could accommodate the physicists now located in an obsolete and remote building on the East Campus, and help meet the needs of physicists and astrophysicists for academic/research space.
- Engineering Center Additions: A space study of engineering sciences has demonstrated a need for substantial additional space. This space might be located adjoining the Discovery Learning Center and/or the Drescher Undergraduate Engineering Building (which houses ITLL).
- Grandview Research/Academic Buildings: New research space in Grandview is being considered for the Institute for Behavioral Sciences (IBS) (now dispersed in 10 older buildings, most of which are in Grandview), environmental and social sciences, and other institutes and centers.
- Imig Music: As the College of Music outgrows the Imig Music Building, more intensive use of the site should be considered in place of one-story portions of the building. Planning for this might start in the 10-year period but it is unlikely to be completed in that time, and so will not appear on the capital projects list. Performing arts facilities jointly developed with the community may also be explored.
- JILA: This research institute is running out of space, and the south wing of the existing building was built to accommodate a vertical addition, doubling the height of the building.
- Journalism Building: A new building for the School of Journalism and Mass Communication is currently being studied.
- Law School: The School of Law will be relocated from Fleming, which is increasingly inadequate, to a new building of approximately 160,000 gross square feet.
- Research Park Multi-Use Building: To address the deficit of research space, a multi-use building in the Research Park would accommodate many disciplines, centers, and institutes.
- Sibell Wolle Fine Arts: The existing fine arts building has substantial safety deficiencies and insufficient space for the department. A new, larger visual arts building is planned on the same site.

Location, scheduling, square footage, and estimates for these proposed capital improvements are detailed in the Building Plan (IV.A).

C. Services and Administration Facilities Needs

Administrative units of the university provide essential support to the students, faculty, and staff. On campus during the 1999 fall semester were an estimated 25,656 students and 6,471 staff. With this campus constituency of over 32,000, the University of Colorado at Boulder is, in essence, a "city within a city."

Services and administrative uses occupy 59 acres<10.4 percent of the developed three-campus area in Boulder. See Exhibit III-C-1. These spaces account for 9 percent of all building space, about 472,000 assignable square feet.

1. Services and Administration Objectives

For the 10-year planning period, the University of Colorado at Boulder is projecting an enrollment growth of 7.2 percent. This increase will drive the need for additional faculty and staff in order to maintain an appropriate level of support services. The university must undergo a significant restructuring of its existing service delivery system if it is to meet current and future demands to provide services in a convenient and efficient manner. Particularly, the campus must improve the processes of:

- conducting student transactions (registration, financial aid, etc.) in a seamless, integrated, efficient and effective way;
- realigning services, now scattered around campus, to create centralized front-office, high-touch administrative and student services within the campus core (high-touch services are those requiring frequent in-person contacts);
- identifying the back-office, low-touch administrative services to be relocated to the East Campus or to the campus perimeter;
- improving existing facilities, and planning new facilities, to accommodate efficiently the space needs of administrative and student services staff;
- meeting needs for a variety of student and employee services, including food and health, in an efficient and customer-oriented manner;
- incorporating new technologies into the service delivery systems in order to support the intellectual, personal, social, cultural, and physical well-being of students, faculty, and staff;
- improving the services, transportation, and communication systems linking the campus properties in Boulder.

Improved service delivery supports the following principles of the Total Learning Environment outlined in Chapter I of this plan, namely being more responsive to students and other constituents, and enhancing the university's infrastructure.

2. Office Services for Students, Faculty, and Staff

Office services for students, faculty, and staff are dispersed across campus and are frequently located in inadequate and inefficient space. The decentralization of services results in multiple administrative contacts by campus clientele and redundancies in

information systems, personnel, and space allocations. Particularly impacted are student development and services offices located in the Regent Administrative Center, Willard Administrative Center (a partially converted residence hall), and the Environmental Design Building. Student development and support services are a critical factor in the recruitment and retention of high-caliber students, faculty, and staff. According to the space needs analysis (III.A), there is a 22 percent shortage of office space for services and administration, compared to the guideline.

Campus services are organized in the following manner:

Vice Chancellor for Student Affairs (VCSA)The mission of student affairs is to provide progressive, high-quality, student-centered programs and services while fostering an inclusive campus community in support of the educational mission. These services are designed to help students identify and achieve their academic, personal, health, and career goals. A wide variety of office service units report to the VCSA, including Career Services; Counseling Services; Cultural Unity Student Center; Disability Services; the Gay, Lesbian, Bisexual, Transgender Resource Center; Greek Liaison and Leadership Development; Office of International Education; Office of Judicial Affairs; Parent Relations; Registrar; Student Academic Services Center; Student Organization Finance Office; and the Women's Resource Center. The University Memorial Center, Wardenburg Health Center, Housing Department, and Student Recreation Center are the principal auxiliary units that report to the VCSA (the first two are discussed later in this services section, and the latter two are discussed in the residential and recreation land use sections of this chapter).

The majority of the student affairs office services are located in Willard Hall, a student residence hall in which half of the space was converted for student services and administrative uses. The residence hall-sized rooms in Willard were not designed for service use and students would be better served if these spaces were converted back to needed student housing. Other student office services are located in the University Memorial Center, the Environmental Design Building, and Regent Administrative Center. These buildings are characterized by inefficient floor plans, aging mechanical systems, a significant lack of office and storage space, and, generally speaking, are not customer-friendly environments. Re-allocation of service spaces is needed.

It is important to provide convenient access services to avoid wasted time and inconvenience for students. A one-stop shopping concept of service delivery is an important goal during the upcoming planning period. One-stop shopping can be characterized as the collection of a broad range of student services in a single location. A student may receive admissions information, register for classes, pay bills, and receive financial aid from a single contact. Satellite multiple-service centers located in high-traffic areas around campus are planned as part of the "Student Odyssey" initiative.

Key to the success of the realignment of service is the completion and implementation of the Student Odyssey Project. This project consists of examining a broad range of student experiences, beginning with their application for admission, through their entire time at CU-Boulder, until they graduate and become alumni. The project will address all facets of student services, and students will be direct participants in all phases of the project. More than 40

processes are being evaluated. They include admissions, financial aid, orientation, and registration. The project also will be coordinated with the current revamping of undergraduate advising in the college of Arts and Sciences.

The student services redesign may lead to changes in organizational structure, facilities, staffing, training, technology, and student information systems, while maintaining accountability and good business practices.

Vice Chancellor for Academic Affairs (VCAA)

Service units reporting to the VCAA include Undergraduate Education, Graduate School, Academic and Campus Technology, Academic Affairs, Admissions, Academic Budget and Planning, Diversity and Equity, Enrollment Management Services, Faculty Affairs, Information Technology Services, Office of Contracts and Grants, and Summer Session/Continuing Education.

Many of these services are located in Regent Administrative Center, the administrative center of the campus. Regent Administrative Center cannot currently meet the minimum space requirements of many of the services located in the building. This is demonstrated by employee workstations and office storage materials which are now encroaching on corridor space. This shortage of campus administrative and student service space in Regent Administrative Center is due primarily to the following factors:

- the need to house several offices of Central Administration there;
- the presence of Mailing Services;
- the presence of low-touch (back office) support personnel who need not be located at the point of service;
- the increasing demand for additional services as enrollment and research activities expand;
- the need to co-locate existing services to take advantage of organizational affinities; and
- the increase in state and federal regulations.

The plan is to address these problems through a series of strategic relocations, concentrating high-touch student services and campus administration in Regent Administrative Center, and locating many low-touch services on the East Campus. The Telecommunications Building is to be the one-stop center for in-person access to many Information Technology services.

Vice Chancellor for Administration (VCA)

Service units reporting to the VCA include Facilities Management, Distribution Services, Financial and Business Services, Human Resources, the Book Store, and Public Safety.

Human Resources, located in the Armory Building in the Grandview area of campus, is scheduled to relocate to the Administrative and Research Center-East Campus, allowing the School of Journalism and Mass Communication to occupy the Armory. Financial and Business Services are located in the Regent Administrative Center. Some of their back-office functions are also to be relocated to the East Campus to enhance Regent Administrative Center as an administrative and services center. The Environmental Health and Safety Center located on the eastern perimeter of Main Campus is scheduled to be expanded to allow the three Public Safety units-

police, parking and transit, and environmental health and safety-to consolidate in that perimeter location. These relocations are underway at the writing of this plan and will allow improved service and more efficient operation for these service units.

Chancellor's Office, and Vice Chancellor for Budget and Finance

Service units reporting to the Chancellor include Institutional Relations and the Ombudsman. Planning, Budget and Analysis reports to the Vice Chancellor for Budget and Finance. These units are located largely in Regent Administrative Center. Other locations include Willard Administrative Center and the Administrative and Research Center-East Campus. Descriptions of these buildings were provided earlier in this section.

3. Student Center, Dining, and Health Services

The University of Colorado at Boulder provides the campus community with essential support services at the University Memorial Center (student center), the Wardenberg Health Center, and a variety of dining services. These facilities are conveniently located on Main Campus.

Student Center

The student center was constructed in 1953 and dedicated as the University Memorial Center (UMC) to Colorado citizens who died during World Wars I and II. The UMC serves the campus community by providing space for student organizations and programs, meeting/conference rooms, the bookstore, catering services, recreational activities (bowling, billiards, game room, etc.), study areas, dining services, a credit union, and miscellaneous retail shops and kiosks. An addition built in 1964 increased the size of the building to just over 200,000 gross square feet. At that time, the UMC served a student population of 11,000. The last major renovation occurred in 1986.

Student enrollment has grown to over 25,000 with an accompanying growth in faculty and staff and without a similar increase in student center space. Not only is the facility undersized, but the needs and expectations have changed as well. The UMC lacks teleconferencing facilities with broadcast and reception capabilities for distance learning and remote conferencing, and up-to-date audiovisual equipment, telephone, and campus-wide network infrastructure hook-ups. The modern university environment demands that access to personal computers, laptops, and the Internet be available where students and other campus constituents congregate. At best, the UMC provides limited access to technology at the time this plan is being written.

The UMC is the primary gathering place on campus, as well as a point of contact between CU-Boulder and the Boulder community. A wide variety of programs, events, and facilities serve the diversified Boulder community. In 1998, students approved increased fees to remodel and expand the UMC. Design of the improved facility is getting underway as this plan is written. The proposed addition of 32,500 assignable square feet will eliminate half of the 64,000 ASF deficit for the year 2003 as projected in the space needs analysis (III.A). In addition, a future expansion over the east wing is shown on the Long-Term Potential Development Areas map (Exhibit IV-A-1), if and when additional growth of this facility is warranted.

Dining

Dining facilities serve an important function in the academic community beyond providing a necessary place to purchase and/or eat a meal during the day. Dining facilities should serve as vital points of contact between students, faculty, and staff. They should also encourage the exchange of views, opinions, and ideas, serving as places where students of diverse backgrounds can gather and interact together. This is the essence of a university.Dining services are available on and around campus in several forms. Large-scale dining facilities exist in the UMC, several residence halls, and the University Club. Smaller "satellite" cafes and dining areas are located in some buildings around campus.

The UMC offers several campus-run and private-vendor dining options. The UMC also has a catering kitchen that provides services for the many meetings, conferences, and miscellaneous events around campus. Most of the food facilities were updated in the mid-1980s, but seating is in short supply. UMC renovation programming includes expansion of seating, but it is unrealistic to accommodate all campus noon hour food service at this one location.

Satellite cafes are presently located in the Engineering Center, the Business Building, the Porter Biosciences Building, the Student Recreation Center, and the Administrative and Research Center-East Campus. These cafes are ideal for encouraging student/faculty interaction as they tend to be small and are located in buildings with higher concentrations of students and faculty operating in specific academic disciplines (engineering, business, biology). This concept should be considered in other buildings around campus as a means of accommodating dining needs, and encouraging interaction between students, faculty, and staff. One possibility noted in the Open Space Plan chapter is a food facility at Fieldhouse Plaza, accommodating stadium event food service as well as daily needs. One means of expanding food services would be privatizing some of the new services.

The CU Department of Housing Dining Services operates dining services for 6,000 students in six of the campus's residence halls: Darley Commons, Libby, Cheyenne Arapaho, Sewall, Farrand, and Kittredge Commons. The Department of Housing is in the process of developing a Master Plan for the renovation of its residential, dining, and program spaces. At this time, Dining Services would like to expand its services to include students living off campus, faculty, and staff. Preliminary plans are to provide more "grab and go" services for those individuals who would like to take prepared meals home, and more a la carte options for those diners who do not want full course meals.

The Department of Housing also operates the University Club. The Club has lodging facilities for 20 to 40 people, mostly individuals or small groups visiting the campus. It includes a dining facility that can serve over 100 people. Dining at the Club is available to members, their guests, participants of groups meeting at the Club, and the campus community. This is a dining alternative to the crowded student center, and provides group accommodations not available elsewhere on campus, but it has been a financially marginal operation and alternatives should be explored to ensure continuation of these services.

Off-campus dining options exist, although not close enough for most

of the campus community to use, given limited time during the day. West of campus is the "Hill" commercial area. The Hill offers the campus community an eclectic mix of coffeehouses, casual dining, and ethnic restaurants. Limited food service options are available elsewhere on the campus perimeter as well.

Health Center

The Wardenberg Health Center is a fully accredited, comprehensive, outpatient, health-care facility. Services are available to the campus constituent base of students, faculty, staff, retirees, and their families. The 56,000 gross-square-foot facility was built in 1959 and renovated in the early 1990s.

Outpatient care is offered in general and internal medicine, minor surgery, women's health, dentistry, orthopedics, allergy, dermatology, chiropractics, neurology, pediatrics, podiatry, and gynecology. The Center also includes a psychiatry clinic that offers individual and group therapy, stress management, biofeedback training, and drug, alcohol, and sexual health counseling. Additionally, the Center conducts health education programs on acquaintance rape awareness, sexual health peer education, nutritional counseling, stress management, and stop smoking programs.

The Health Center has greatly expanded services since 1989, when a modernization effort began. It currently averages approximately 600 patient visits per day during the school year. Despite recent renovations, services are operating at capacity in many of the departments; therefore, any increase in student enrollment will have an adverse effect on the ability to deliver services. The third floor has yet to be renovated and improved air movement is needed there.

The ability to provide quality health care services impacts the overall quality of the university. A 1997 undergraduate survey notes that Boulder students are less likely to use student health services than students at other institutions, and those that do are less satisfied. These statistics may be due to the Center's limitations to deliver services in a timely fashion. The university is engaged in on-going studies of its student, faculty, and staff health benefit options.

4. Physical Plant Space

At the writing of this plan, physical plant space is about two-thirds of the space typically provided for such functions (per the space needs analysis, III.A).

The Stadium Building and adjoining Grounds Building house most of Facilities Management. Satellite space is located in various campus buildings, including the one building located at the newly acquired CU-Boulder South, located two miles southeast of the Main Campus. Facility Management's shop functions are not an optimal utilization of valuable space in the core campus. Most of Facilities Management should be moved off the Main Campus to a consolidated facility that would house Facilities Management, Mailing Services, transportation, and other functions requiring significant storage capacity, sorting, or repair-shop space. Such a facility would provide certain efficiencies because loading docks, equipment, and shop and repair space would be shared. The vacated space in the Stadium Building should be converted either for academic use or Intercollegiate Athletics.

The Distribution Center is located in the Flatirons Industrial Park in a

leased facility approximately two miles northeast of campus. The center stores furniture and other supplies necessary to operate the campus. Given the size of this operation, it is uncertain whether it can be accommodated in the consolidated facility on East Campus discussed in the preceding paragraph, but a feasibility study will be conducted to see if that desirable goal is attainable.

5. Services and Administration Capital Improvements

Based on the preceding analysis, the space deficits identified in III.A, and the need for up-to-date facilities, several projects to accommodate various services and administration are needed. The following lists include projects over $500,000 proposed for this planning period (through 2008-09). Location, timing, square footage, and cost estimates for these projects are detailed in the Building Plan (IV.A). All projects address both the need to upgrade existing facilities and the need to accommodate the projected growth.

a. Projects Underway

Three significant projects are underway at the writing of this plan (listed alphabetically):

- Administrative and Research Center-East Campus: Construction is underway to covert about 60 percent of the building (formerly known as RL-3) into administrative and services offices, of which many are moving from the Armory and some from Regent Administrative Center.
- Environmental Health and Safety Center Addition: Construction is underway on an addition to the Environmental Health and Safety (EH&S) Center to consolidate services now in antiquated facilities at three locations. EH&S is discussed in the Environmental Management Plan (IV.D).
- University Memorial Center: A significant renovation and expansion is being designed, in order to catch up with previous student population growth and accommodate desired services and technologies.b. Proposed Renovations, Additions, and New ConstructionSeveral projects are proposed in order to provide needed services (listed alphabetically):
- Facilities Management and Distribution Center Building: A consolidated service center housing Facilities Management and Distribution Services functions is planned. The proposed Athletics Fieldhouse will necessitate moving Facilities Management functions in and around the Grounds Building (which is to be demolished). The Distribution Center is in a leased building off-campus.
- Koenig Alumni Center Addition: The Alumni Center is out of space to accommodate services to alumni, and could be expanded if resources (perhaps a donor) become available.
- Miscellaneous renovations for service and administrative functions: As the Student Odyssey project is implemented, various office services will be relocated and multi-service centers created. "Low-touch" services in the Regent Administrative Center will be relocated elsewhere to make best use of this central administrative/service building. Additional renovation for satellite food facilities is desirable (but limited by revenues from food services). Also, the renovation of the Wardenburg Health Center (particularly the third floor) may be completed.
- Transportation Projects: Transportation projects are considered

in the Transportation Plan (IV.E) and may include additional structured parking and a transit center.
- Utility Infrastructure Projects: Utility services are considered in the Utilities Infrastructure Plan (IV) and may include improvements to the civil utilities (water, sewer, etc), communications infrastructure, utility generation capacity, and initial utilities at CU-Boulder South.

D. Intercollegiate Athletics Facilities Needs

Organized sports activities at CU-Boulder occur within either Intercollegiate Athletics or Recreation Services programs. Both offer students training and competition in a variety of sports. There are also relationships with a variety of academic disciplines, most notably kinesiology, which is the study of muscles and their movements related to physical conditioning.

Athletics and recreation activities occupy 80 acres, which is 14.1 percent of the three-campus area. See Exhibit III-D-1. Within campus buildings, Intercollegiate Athletics occupies about 237,000 assignable square feet, 4.7 percent of the building area for all CU-Boulder uses. Compared to comparable institutions, there is only 47 percent of the indoor space which is typically devoted to athletics.

1. Athletics Objectives

The University of Colorado is a member of the prestigious Big XII Conference, which sponsors varsity intercollegiate athletic competition for both men and women. The CU men's football team is often nationally ranked. Other men's varsity sports are basketball, cross-country, golf, skiing, tennis, and track and field. The women's basketball team is often nationally ranked. Other women's varsity sports are cross-country, skiing, tennis, golf, soccer, track and field, and volleyball.

The mission of the Intercollegiate Athletics Department is to "advance the winning spirit and drive that characterize great institutions." The department promotes a total person concept for student-athletes, stressing students' abilities to excel in both athletic competition and academic achievement while developing positive character traits that will be of sustaining value to them and to society.

2. Athletics Facilities

Facilities for athletics events include the stadium complex with approximately 52,000 seats for Folsom Field (primarily for football), the 11,200-seat Coors Events/Conference Center (primarily for basketball and volleyball), plus indoor and outdoor track and field facilities. Tennis teams practice on the 12 Kittredge tennis courts and also have the use of a local indoor facility. Golf team members use Boulder and Denver area golf courses for practice. The ski team practices at Eldora Ski Area, which is about 40 minutes west of Boulder. The women's volleyball team uses Balch Fieldhouse for practice and plays its competitive games at Coors Events/Conference Center. In general, facilities are only marginally adequate to support intercollegiate competition. Many facilities are antiquated relative to peer institutions, and some sports rely on off-campus facilities controlled by others. Furthermore, compliance with federal Title IX

requirements will likely require the addition of women's sport teams and associated facilities. Consequently, this campus master plan includes major capital investments for athletics.

a. Stadium Complex

Folsom Field was originally constructed in 1924. Upper seating sections were added with the Stadium Building in 1956, and partial renovations occurred in 1968 and 1976. The field itself is approximately 1.8 acres. The playing surface was replaced in 1999 with a combination natural and synthetic turf system, underlain with a steam heating system. New scoreboards were also added in 1999. The stadium serves as the primary competition and secondary practice facility for the football program, and it also hosts other campus and community events.

The university intends to keep the existing Folsom Field as the premier venue for collegiate football in the Rocky Mountain region. Concerns have been raised over the years about how much land the stadium complex takes up in close proximity to the academic core of the campus. But there are synergies keeping the stadium on campus: stadium event parking uses existing on-campus and off-campus parking and recreational fields, alumni revisit the campus while attending games, and concurrent campus events reunite groups and promote other university activities. The rationale for keeping the stadium on the Main Campus is similar to that for building Coors Field in downtown Denver: convenient central location, multi-use parking, proximity to related services, and community image. Since there are no plans to relocate the stadium, it makes sense to program the facility for a variety of events, make needed stadium improvements, and help ensure access to it by all transportation modes.

The Stadium Building and Balch Fieldhouse contain support facilities for field events. Support facilities in the Stadium Building, especially restrooms and concessions, are inadequate and should be expanded, displacing some offices and facilities shops. Balch Fieldhouse press box has six levels of club, box, and press facilities overlooking the field and has been significantly upgraded in recent years, including the addition of an elevator. Balch Fieldhouse, a 65,662 gross square foot multipurpose facility, opened in 1936. In addition to providing needed access, concessions, and restrooms for football games, it is the primary practice and competition facility for the men's and women's track program and serves as a practice facility for the football program during severe weather. Other uses of Balch Fieldhouse include concerts and recreation activities.

Once a new fieldhouse is built, improved use of the Balch Fieldhouse site should also occur. The west side of the stadium complex should be studied to increase general and/or box seating, improve circulation around the stadium and egress for spectators, and improve support facilities (restrooms, concessions, media support facilities, food service areas). Optimal use of existing office space in this centrally located property needs additional study, recognizing the need for additional academic space. Not just the relationship to Folsom Field should be considered, but also the relationship to surrounding campus development.

The 104,165 gross square foot Dal Ward Athletic Center, which overlooks the north end of Folsom Field, was built in 1991. This first-rate facility houses sports medicine and locker facilities for several

intercollegiate sports teams, a banquet facility, academic support services, administrative offices, football coaches' offices, and a strength and conditioning facility. It is used primarily by the Department of Intercollegiate Athletics but also accommodates campus special events in its large training room and auditorium.

b. Other Indoor Facilities

The Coors Events/Conference Center, constructed in 1979, is a 146,276 gross square foot facility with an arena that accommodates approximately 11,000 people and conference facilities located on the second level. It is used primarily as a practice and competition facility for men's basketball, women's basketball, and women's volleyball. Other uses include concerts, conferences, university events, and trade shows.

Carlson Gymnasium, a 56,446 gross square foot facility, was built in 1924. It houses sports medicine and locker facilities for several of the Intercollegiate Athletics teams; it also serves as a practice facility for the women's volleyball team and a secondary practice facility for the men's and women's basketball teams. The Department of Kinesiology and the Student Recreation Center house some of their research, academic, and recreation functions in Carlson.

Upon completion of a proposed fieldhouse, Intercollegiate Athletics uses in Carlson may relocate so that all of this centrally located building can be used for academic purposes. The College of Arts and Sciences is considering using the building for teaching and associated research in allied health sciences, given the proximity to existing kinesiology and MCD biology departments.

c. Other Outdoor Facilities

Football practice fields across Boulder Creek north of the stadium were originally developed in 1968. These three fields occupy approximately 5.6 acres and serve as the primary practice facility for the football program.

Potts Field on the East Campus was originally constructed in 1968. It includes a 400-meter running track, restroom facilities, and seating for approximately 3,000 spectators. It serves as the primary practice and competition facility for the men's and women's outdoor track programs as well as a recreational amenity for the Research Park, which surrounds it.

Prentup Field, CU-Boulder's only baseball field, was constructed in 1968 on the East Campus. It offers seating for approximately 500 spectators. It served as the primary practice and competition facility for the men's baseball program until 1980, when the program was discontinued. Currently, the field is used by the CU Baseball Club team and several community organizations. However, the site is "Pod B" in the Research Park, and may ultimately be developed for Research Park uses. Users of the site will be affected by the planned extension of Discovery Drive.

The 12 tennis courts in the Kittredge housing area of the Main Campus serve as the primary practice and competition facility for the men's and women's tennis programs. This facility has seating for approximately 500 spectators. It was refurbished and seating was added in 1997, although additional surfacing work remains to be done. The tennis courts site has been considered as a possible future

location for a new CU law school building. If the tennis courts need to be relocated, a site of this size is unlikely to be found on either Main Campus or East Campus, suggesting that location at CU-Boulder South may need to be considered, and that transportation to that site addressed.

3. Athletics Capital Improvements

The space needs analysis (III.A) identified a shortage of at least 170,000 square feet of indoor space for athletics programs. The primary project to address this shortage is a new fieldhouse, and a number of other projects are also proposed to upgrade or add facilities:

- New Fieldhouse: An indoor practice facility, primarily for football and track, is envisioned north of Franklin Field, adjoining the stadium complex. About 400 to 600 structured parking spaces are planned to be included. Uses now in Carlson Gymnasium and Balch Fieldhouse may be relocated to the new fieldhouse. Relocation of Facilities Management grounds and recycling operations on the new fieldhouse site will be necessary as part of the project.
- Stadium Complex Improvements: Nighttime lighting is being designed as this master plan is written. Also planned are upgrades and additions to restrooms, private boxes, gates and plazas, and concession facilities. Concession facilities may include an indoor/outdoor cafe on the adjoining Fieldhouse Plaza. Additional seats at the northeast corner of the stadium will replace those that were removed due to unstable soil.
- Coors Events/Conference Center: Renovation of Coors may need to include new scoreboards, a new sound system, installation of the acoustics package deleted from the original construction due to limited budget, improved restrooms and concessions areas, and additional lower-level storage. Future additions might include a basketball practice floor and/or additional conference space.
- Potts Field: Renovation and addition to track and field facilities is proposed; a field within the track may also be included, perhaps for soccer.
- Prentup Field: As long as the site is used by Intercollegiate Athletics, refurbishing this field could help accommodate the addition of women's softball as an intercollegiate sport team, and/or the field may be converted to a soccer field for women's soccer.
- Other Outdoor Fields and Courts: Substantial improvements to existing outdoor facilities, and some new construction, will be necessary in order to remain competitive in the Big XII Conference and the NCAA as a whole. Depending upon which sports are added, additional facilities and land will be required. CU-Boulder South is the most likely site for new outdoor practice facilities.
- Indoor Tennis Facility: This may be developed in cooperation with Recreation Services. If the Kittredge tennis courts are displaced by building on that site, there will be a need for replacement tennis courts either indoors or outdoors. A site or sites have not been chosen.

Location, timing, square footage, and cost estimates for these proposed capital improvements are detailed in the Building Plan (IV.A). Most of these athletics capital projects are not related to the projected student growth, with the notable exception of the

additional stadium seats (northeast corner) which may be needed to help accommodate the student body at stadium functions.

E. Recreation Services Facilities Needs

Organized sports activities at CU-Boulder occur within either Intercollegiate Athletics or Recreation Services programs. Both offer students training and competition in a variety of sports.

Athletics and recreation activities occupy 80 acres, which is 14.1 percent of the three-campus area. Within campus buildings, recreation occupies about 164,000 assignable square feet, 3.3 percent of the building area for all CU-Boulder uses. The lack of indoor tennis courts accounts for most of the approximately 100,000 assignable square foot deficit of space.

1. Recreation Objectives

The Boulder campus offers a wide variety of indoor and outdoor recreational opportunities to challenge and stimulate students, contributing to their physical and psychological well being. Involvement in physical recreation activities helps students achieve a healthy balance between body and mind, enhancing the overall quality of student life. The student recreation program has become a factor in attracting and retaining students, particularly due to the variety and quality of facilities at the Student Recreation Center. Programming includes instruction on topics related to exercise, sports, and physical well being. Recreation programs provide opportunities to develop social and leadership skills. They also provide employment for about 300 to 350 students per year.

Student fees for recreational programs are mandatory, allowing each student the option of participating in a wide range of activities. Recreation has proved far more popular than the required physical education courses of past eras.

Recreation facilities and programs are also available, by optional fees, to faculty, staff, and others associated with the university.

2. Recreation Facilities

a. Indoor Facilities

The Student Recreation Center is a modern, well-equipped 213,000 square foot complex, built in 1973 and added to in 1990, which includes a wide range of sports, conditioning, and meeting facilities.

Recreation Services uses additional indoor facilities when available to administer its programs. These facilities include:

- Carlson Gymnasium: The gym, swimming pool, and exercise room are shared among Intercollegiate Athletics, Recreation Services, and the Department of Kinesiology.
- Clare Small Arts and Sciences Building swimming pool: There is an underground connection between the Student Recreation Center and the Clare Small pool, making access convenient.

b. Outdoor Facilities

Playfields overseen by Recreation Services on campus are:

Business Field	2.3 acres
Farrand Field	3.8 acres
Williams Village Soccer Fields	2.5 acres
Kittredge Field	7.9 acres
Observatory Field	2.2 acres
Franklin Field	4.2 acres
Total	22.9 acres

In addition, Recreation Services schedules:

- The lawn south of the Student Recreation Center for martial arts and other activities; and
- Eight tennis courts: four at the Recreation Center, and four at Williams Village.

The Department of Housing has an additional 3.9 acres of field space located at Williams Village, which Recreation Services generally does not use due to the distance from the Main Campus and poor condition.

Student recreation has five types of programs that use the playfields:

- Core Services: those program services and facilities that do not require an additional fee or service change beyond the mandatory student fee;
- Club Sports: a wide variety of activities ranging from clinics and training sessions to intercollegiate competitions;
- Instructional Program: a variety of noncredit sports- and health-related courses;
- Intramurals: men's, women's, and coed sports; and
- Outdoor Program: outdoor experiences, with trips and events, emphasizing adventure, environmental awareness, education, safety, and a sense of community.

Some outdoor space needs are not met because of limited recreational playfields and courts. Many students find themselves on long wait lists to participate in outdoor programs.

Outdoor playfields require ongoing maintenance. Two days per week are, or should be, reserved for maintenance and rejuvenation of the natural turf. During these days, any scheduled use of the fields is prohibited because overuse will have a negative impact on the surface.

There are no current standards for playfields established by either the National Recreation and Parks Association or the National Intramural Recreational Sports Association. Both organizations feel each community or college campus is unique and that each should establish its own standards in accordance with surveys and special needs. A program plan to further quantify the needs may be developed in the future.

3. Recreation Capital Improvements

The emphasis for recreation facilities will be to upgrade existing playfields and begin adding new ones. The campus space needs analysis (III.A) noted an indoor recreation space shortage of about 100,000 square feet, which will be addressed in part if enclosed tennis courts are developed. Adding onto the Student Recreation

Center is not anticipated within the next 10 years, except for minor changes to keep the facilities up-to-date.

Improvements needed for recreation facilities include:

- Existing playfields: Renovation of all field surfaces is needed on an ongoing basis.
- Franklin Field: Major reconstruction of Franklin Field is needed due to intensity of use, including parking that occurs for stadium and other special events. Fencing on the south side is proposed (maintaining events parking access as well) to ensure safety and better use of the space.
- Playfields at CU-Boulder South: Since there is no room for new fields on developed properties, the newly acquired CU-Boulder South is the best place to begin adding needed playfields. Transportation issues will need to be addressed.
- Tennis courts: A bubble over existing courts would extend the seasons during which play could occur. A joint indoor facility with intercollegiate athletics may be possible.
- A "Ropes" training course: This is a desired activity not now provided.
- Satellite recreation facilities: On the East Campus, Williams Village, and possibly other remote properties, recreational services will be desired as populations increase on those properties. These needs and facilities are not yet well defined.

Location, timing, square footage, and cost estimates for these proposed capital improvements are detailed in the Building Plan (IV.A). These improvements are closely related to the size of student enrollment.

F. Residential and Conferences Facilities Needs

On-campus housing at the University of Colorado at Boulder is provided in residence halls (rooms for single students) and family housing apartments, operated by the Department of Housing. Residence halls accommodate the freshman class and some additional students, for a total of 5,919 beds. There are 861 family housing apartments, with at least one student in each apartment. Approximately 6,780 students are housed in these two types of facilities. In addition to sleeping rooms and apartments, space and facilities are provided in housing areas for classrooms, dining, studying, meetings, recreation, and other student activities.

Out of the total 25,125 students (fall 1998), 27 percent are housed by CU-Boulder. The balance of the student population lives off-campus. During the summer term, many of the residence halls are used for conferences, so the Department of Housing also operates the Office of Conference Services.

Residential uses presently occupy 124 acres, which is 21.9 percent of the acreage of the three developed campuses in Boulder. See Exhibit III.F.1. Residential buildings include about 1,775,000 assignable square feet, which is 35 percent of all campus building space.

1. Housing Objectives

The knowledge and concepts acquired in the classroom are challenged and shaped by experiences and opportunities outside of

the classroom. Housing opportunities at CU-Boulder are intended to create a living-learning environment, helping students gain skills in problem solving and critical thinking. Facilities, programs, and partnerships of faculty, staff, and students need to be committed to supporting this living-learning environment.

Affordability is a principal reason that CU-Boulder provides housing. According to the Office of Off-Campus Services, the average price of an efficiency apartment in Boulder during 1998-99 was $520 per month, while a four-bedroom apartment would rent for an average price of $1,500 per month. Single-family home rental is also expensive, with a two-bedroom house renting for $1,100 per month, and up to $2,000 per month for the average five-bedroom house. Residence halls provide an affordable alternative at $2,454 per student per semester for a double room, including 19 meals per week (in 1998-99). Family housing rates average quite a bit less than the Boulder market, creating strong demand for the units. The Housing Department maintains a waiting list for family housing, with about 400 names on the waiting list early in the fall term during recent years.

Campus housing is generally full, in part due to the freshman residency requirement, which requires freshmen to live in the residence halls. Students may petition the Department of Housing for an exception to this requirement if they are married, or reside with parents or guardians in the local area.

Through the master planning process, CU-Boulder solicited input from various campus groups on residential life. The Task Force on Creating Living-Learning Environments recommended several objectives that are adopted in this plan:

Provide housing that enhances the living and learning experiences of students.

This goal will require that the physical, intellectual, and social environments of residences be structured to become centers of learning. Programs will need to provide educational breadth, with emphasis on intellectualism, service, leadership, diversity, and building community. All residence facilities need to have the flexibility to provide lounges, meeting spaces, and computer networking. Academic settings, including classrooms and faculty offices, need to be integrated within residential facilities to enhance the intellectual environment.

Provide housing that is both affordable to students and economically feasible for the university.

Financial concerns are paramount in creating housing on campus. CU-Boulder needs to seek out non-traditional ways of financing new construction and renovation in residence halls and family housing. Public/private partnerships need to be sought to reduce the financial burden on the university. A balance needs to be sought between the demand for housing and available space.

Provide housing that is attractive, modern, and appealing to today's changing students.

The amenities provided in CU-Boulder's housing options

need to be more consistent with students' expectations. Almost all residence hall rooms are two-occupant or greater, and look like what most people recall as "dorm rooms." Consideration will be given to diversifying the types of housing available to appeal to a broad range of students. Dining service facilities need to be modernized to meet current programming goals, support a community experience, and become flexible to adapt to future changes.

Provide open space, recreational, and childcare opportunities that enhance and support the living-learning experiences of students.

Merely housing students is not sufficient. Students need passive and active recreation spaces near housing. Common community spaces enhance the housing experience. Childcare facilities and other facilities for youth need to be created and enhanced for the children of students living on campus. Meeting these needs is tempered by the finite land resources of the campus and financial requirements of the Department of Housing.

Maintain housing capacity that is no less than the current percentage of undergraduate student enrollment.

The goal is to house at least the same percentage of students (27% currently) into the future. With the present enrollment projection of 1,800 additional students in 10 years, CU-Boulder will need to assure a minimum of 500 new beds over the next 10 years. Approximately 300 of these new beds will need to be for freshmen, based on the enrollment projections. The remaining 200 beds could be used for family housing or single students. Provision of more beds is highly desirable.

Provide facilities for student activities that promote personal growth and social interests.

Recognizing that learning occurs through a variety of means, facilities need to be integrated into residential life that provide opportunities for students to socialize, practice leadership skills, and participate in activities. Outdoor recreation needs to be planned into new development. Program opportunities need to be sought for students to become more involved in the Boulder community through internships, service-learning, volunteer organizations, and other programs.

Address the high cost of housing in Boulder for faculty and staff.

Housing availability affects CU-Boulder's ability to recruit and retain the best faculty and staff. It is also desirable to have faculty available close to campus to create a supportive educational community. A wide variety of options including mortgage assistance, university-owned houses, new facilities, and public/private partnerships should be considered to meet this demand.

2. Student Housing

a. Living-Learning Programs

Organized learning opportunities programs are organized through the Council on Academic Programs in Residence Halls (CAPRH). Informal events are also organized by CAPRH, developed around the common interests of faculty members and students. Each program includes at least one faculty member, who discusses issues with students and facilitates the small group environment in an informal setting.

Residential Academic Programs (RAPs) are a growing manifestation of the living-learning environment commitment. These programs typically occupy space in residence halls. Themes and locations change over time. For example, the current Sewall Hall Residential Academic coeducational program in American Culture and Society is designed for first and second year students. The Farrand Hall liberal arts RAP has a similar targeted population. Each program has between 300 and 400 students. Current RAPs are listed in Exhibit III-F-2.

Existing housing was not built to accommodate RAPs. The physical environment is very important to the success of these programs, so renovations have been made and more will be required.

Residential life also offers informal opportunities for learning. Student government, students themselves, and housing staff organize the programs, based on the expressed needs and interests of residents. These activities fall into four broad categories of academic support, social activities, personal development, and recreational activities.

Academic support programs are facilitated in a variety of ways. The drop-in study labs provide residents with access to trained graduate students and assistants to improve their writing, math, and general study skills. The tutoring program offers free tutorials in a wide range of subjects for three or more residence hall students. Most residence halls are equipped with their own computing facilities.

Social activities promote interaction among students. The activities include dances, theme parties, movies, and campouts.

Personal development activities are designed to enrich students' lives outside of the classroom environment, installing a sense of worth, responsibility, self-reliance, community, and leadership. These activities include speakers' forum, drug and alcohol information, self-defense, and photography workshops.

Recreational activities include intramural sports, field days, and tournaments.

b. Existing Residence Halls

The 5,919 single student beds are in 23 residence halls, grouped in clusters on the Main Campus and Williams Village. Most of the rooms available in these halls are traditional single, double, triple, or quad arrangements with common restroom facilities off the corridors. Approximately 64 apartments for single students at Williams Village are part of the residence halls system.

The Housing Department will extensively renovate the residence halls during the 10-year planning period. These renovations will fall into three general priorities: maintenance backlog, accessibility and code improvements, and dining service improvements. The renovations will

be self-funded by the Department of Housing, an auxiliary operation, and will take place as funds become available.

The Department of Housing estimates that renovation needed for residential buildings approaches $75 million. Normal operational maintenance during the planning period would be approximately $20 million. This leaves a $55 million shortfall, for which bonds may be issued. Of this money, approximately $18 million may be needed for dining center renovations and the remaining $32 million dedicated to deferred maintenance, accessibility, and code compliance projects.

Maintenance related projects are designed to catch the Department of Housing up to a point where normal operational maintenance can keep pace. These projects include replacement of selected plumbing, heating and electrical systems. Repairs to building structural systems are also necessary. Other projects to be considered include replacement of windows, re-caulking, and energy conservation improvements.

Accessibility improvements will be made in many of the residence halls. Some improvements were made in the years preceding this plan, improving accessibility into Hallett Hall, the Kittredge complex, Cheyenne-Arapaho Hall, Williams Village complex, Baker Hall, and Libby Hall. Accessibility of remaining facilities will be improved as maintenance projects occur in each building. This will provide greater flexibility to locate programs, such as residential academic programs.

All students in residence halls can purchase meal plans that allow them to eat in any of the six dining centers on campus. In addition to these traditional food service facilities, there are a few specialty service food areas, such as a coffee house in Farrand Hall and a "cyber-café" in Kittredge Commons. Upgrades to food service facilities are necessary to modernize dining operations. Many of the facilities were built before or just after World War II. In that era, food was delivered in bulk service lines. Today's student demands greater variety. A 1999 survey of students indicated that 31 percent want more convenient food service, such as take out or "grab and go" type of food delivery; 43 percent want more choices; 14 percent specifically requested vegetarian, organic, and other healthy foods; and 12 percent are primarily smokers who want convenient food to take with them to eat outside of the dining centers, since smoking is not allowed there.

Food will most likely will be delivered in a scramble system or "food court" arrangement within existing dining areas. If designed correctly, the dining areas can be made into multi-purpose spaces where studying, socializing, or other interaction can take place. Outdoor seating opportunities should be investigated. There are opportunities for outdoor seating areas, resembling sidewalk cafés, at Darley Commons, Kittredge Commons, and near a dining center in the Farrand Quadrangle area.

The food court system can lead to greater efficiency in food service operations. Food courts are easier to operate and can stay open longer. This means that one of the six dining centers, most likely one of the three centers around Farrand Quadrangle, will likely close and space be converted to other uses.

c. Existing Family Housing

The Department of Housing houses 1,890 students and family

members within 861 family housing units. Faculty, staff, and visiting scholars who are employed full-time on campus are also eligible for limited stays in family housing. The 861 units include 318 one-bedroom, 528 two-bedroom, and 15 three-bedroom apartment units.

The demographics of family housing are very diverse. International students representing 64 different countries make up 57 percent of the family housing population. Of the total population, 19 percent are undergraduate students, 66 percent are graduate or doctoral students, and 15 percent are faculty, staff, post-doctorate, and visiting scholars. Families with three or more members constitute 42 percent of the households in family housing.

Family housing is concentrated in two general areas-north of Boulder Creek and on the East Campus. There are five major complexes north of Boulder Creek. These include Newton Court, Marine Court, Athens Court, Athens North, and Faculty and Staff Court. In addition, the university has acquired a small apartment building and several houses that add a few more units.

The area north of Boulder Creek has several infrastructure issues that should be addressed during the planning period. Boulder Creek is immediately adjacent to Athens Court and Faculty-Staff Court. Portions of these complexes are in the floodway. The hazard is greatest in Faculty-Staff Court, which could be several feet under water in a 100-year flood. There may be ways of mitigating this hazard. Removal of a small enclave of non-university homes on the north bank of Boulder Creek, immediately east of 17th Street, and re-contouring the grade to accommodate flooding would likely help. The City of Boulder is pursuing the acquisition of these houses so as to remove them, given the flood hazard. Replacing the three small Boulder Creek bridges on campus between 17th and Folsom with break-away bridges (used elsewhere in the area for creek crossings) would also help. The net result of these changes should be studied to see if the hazard to campus residences could be sufficiently addressed. Ultimately, the housing adjoining the creek should be redeveloped, perhaps through a public/private enterprise arrangement.

Also in the floodway is a steam pipe and station. The increasing Main Campus demand for steam may make it necessary to construct a new, dedicated steam plant in the area.

Family housing on the East Campus is in one complex, Smiley Court. There will be continual renovation to buildings in this complex but no new structures are planned. Ultimately this area may also be redeveloped.

Family housing involves services in addition to providing apartments. The Family Housing Center for Children is a non-profit organization that provides childcare for children of families residing in Family Housing apartments, and children of staff, faculty, and students. This service is provided on a fee-for-service basis to campus housing tenants and on a space available basis to non-tenants. Presently, there are two childcare facilities, one at Newton Court and one at Smiley Court. The Smiley Court facility is in two structures retained after the demolition of the adjoining Colorado Court housing, now a Research Park site.

The childcare facilities serve 118 children ages 12 months to 6 years. There is always demand for spaces, and it is possible that these existing facilities will expand during the planning period. The two

existing facilities are located adjoining existing family housing, suggesting that if new housing was built at Williams Village, a new childcare facility there may be appropriate.

Facilities are also needed to create a sense of community. Residents have noted the need for a Family Housing Community Center that would serve as a common place for meetings, recreation, and other services. Such a facility was created north of Boulder Creek in a former house. This may be usable until a new facility can be built during the planning period. Others centers will be considered at Smiley Court, and at Williams Village if family housing is constructed there.

d. Proposed Student Housing

New student housing is needed for a larger freshmen class, increased percentage of graduate students, and to help meet demand for family housing. The primary location for new campus housing during the next 10 years will be at Williams Village. The master plan for the site proposes an ultimate build-out for 1,900 additional student beds. This density will be achieved in a series of phases. Predominantly apartment-style living units will be built. The 1,900 new beds represent the approximate site capacity west of Bear Canyon Creek, given all of the program and design goals.

Open space areas will be integrated into the housing developments, with active recreational areas concentrated on land near Bear Canyon Creek which floods occasionally. Academic and conferencing space will be developed to promote the academic mission.

Housing at Williams Village will provide a transition between the existing towers and the surrounding neighborhoods, both in a physical and programmatic sense. Physically, the buildable area is located between the tall towers on the west and the single-family houses on the east and north. This suggests that building massing will be taller and larger on the west, and of smaller scale on the east.

Similarly, the program needs to accommodate transition across the population. The existing towers predominantly house freshmen undergraduates. New housing needs to accommodate freshmen undergraduates, other undergraduates, graduate students, family housing, and faculty housing on the east. Each of these groups needs to be given its own territory while promoting areas for interaction.

Academic and conference space will be added at Williams Village to further the living-learning environment and to augment income to the Department of Housing. Presently, the Williams Village towers are under-utilized in the summer due to lack of meeting space. The master plan for the site proposes that an academic and conference facility be constructed near the existing Darley Commons building.

To support this residential growth, the infrastructure needs to be expanded. A loop road is proposed that will connect Apache Drive with the intersection of 35th Street and Baseline (see Exhibit IV-E-8 and plans for other transportation modes in IV-E, "Transportation Plan"). The loop road will allow for transit stops to be developed where pedestrian routes cross the road. Full build-out of 1,900 student beds may require that parking structures or remote surface parking areas with shuttle service be created, but this is not

anticipated to occur in the near term.

Likewise, the utility infrastructure will need development. The existing powerhouse was designed to be expanded for additional towers. It has never operated at full capacity, and this plan intends to utilize its potential capacity. This will require that the tunnel system be expanded to bring steam and chilled water to new buildings. Storm water systems are sized for existing drainage patterns and will need expansion as development occurs. Existing electrical, water, and sanitary sewer systems are also sized for existing buildings requiring additional services to be built. A telecommunications backbone will also be needed in the area to support both the academic needs of the multi-purpose center and residents' apartments.

A project of this magnitude has significant financial implications. Alternative financing to construct these projects is likely. This may include ground leasing to private companies, establishment of a non-profit corporation to oversee construction and operation of apartments, and/or other methods appropriate to the type of development.

e. Cooperative Housing

The University of Colorado at Boulder currently does not own or operate any cooperative housing. Cooperative housing is a living arrangement in which students live in a large house, sharing fiscal and social responsibilities, and common spaces. Cooperative houses can be designed after various themes including special interests, cultural diversity, or educational focus. Other universities around the country have instituted cooperative housing systems with some of the most successful at the University of California-Berkeley, the University of Texas, and the University of Michigan. Students on the CU-Boulder campus passed a student fee in April 1998 to establish such a system. CU-Boulder might acquire, renovate, and/or build cooperative housing, on or off campus, but no specific plan has been developed at the time this master plan was written.

3. Faculty and Staff Housing

There is not currently housing dedicated solely to faculty and staff on the campus, but there are faculty and staff living in family housing. Faculty and Staff Court, despite the name, is used for family housing.

The University of Colorado at Boulder is committed to recruiting the best faculty and staff to the campus. This is a competitive process made more difficult by the expensive Boulder housing market. To remain competitive for the best faculty, CU-Boulder needs to consider ways of assisting new faculty.

Approximately 75 new faculty are hired each year. Most of their contracts initially specify a four-year term. This translates to approximately 300 faculty on their first contract each year. The Office of the Vice Chancellor for Academic Affairs estimates that up to one-third of these faculty will need housing support. Therefore, CU-Boulder would like to provide at least 100 faculty housing units.

New housing units on university property are being considered, perhaps under public/private partnerships. During the 10-year planning period, the most likely initial location for faculty housing is at Williams Village. In the future, depending on need and resources, other sites such as CU-Boulder South are possible.

Also, arranging housing for faculty and staff in existing off-campus residential areas is being investigated, to help assure an adequate supply of more affordable and conveniently-located faculty and staff housing. Various forms of subsidy may be considered in the future.

4. Conference, Lodging, and Specialized Dining Facilities

The Office of Conference Services assists other departments in the planning, development, and presentation of conferences and professional meetings. It also aids the local community with cooperative sponsorships of youth activities and other non-profit organization events, and works with the private sector to provide conference facilities and services for state and national organizations.

Conference Services provides lodging for 200 people on a year-round basis at the College Inn Conference Center. This center provides meeting, lodging, and dining space for attendees. The adjoining Athens North is sometimes used for overflow conference lodging.

Seasonal conference programs occur when most students are not on campus, primarily in the summer. Up to 4,500 visitors at one time are accommodated during the summer through the use of campus residence halls, meeting in many campus buildings when available. The lack of adequate meeting rooms, particularly at Williams Village, restricts the type and number of conferences that the Boulder campus can accommodate. A new multi-purpose facility, primarily designed to support academic needs at Williams Village, would help alleviate this need for meeting space.

Conference facilities have also been proposed, either as an addition to the existing Events/Conference Center or at some other unspecified location(s). A task force has been established to examine all conference programs on campus. These programs will be studied in greater detail and a report is tentatively scheduled in the year 2000.

The University Club organization was formed in 1939 to promote greater interaction and understanding between members of the university community. It is housed in a particularly fine building, the last that Charles Klauder designed. The University Club building is being used as a faculty/staff meeting and dining facility, and a lodging facility of 16 rooms and 2 apartments for university guests. It is heavily used for receptions, meetings, and other events, usually with food service. The Club also provides facilities and services to local community organizations, contributing to better "town-gown" relations. The University Club will seek out opportunities with various campus programs, services for visitors, and service to the greater community. To enhance this mission, improvements to the University Club building are needed. The food service operations will be renovated as a part of the housing renovation project underway at this writing. Improvements in the building infrastructure such as air conditioning and electrical improvements are needed.

5. Housing Support Facilities

A variety of other facilities support the operations of the Department of Housing. The primary administrative functions of the department are located in Hallett Hall, in about 13,000 assignable square feet of office space renovated in 1999. Family Housing offices are located in Marine Court, and Conference Services are located in Williams

Village. Maintenance and service centers are located in two structures on the East Campus, most of it (31,500 assignable square feet) in the Housing System Maintenance Center (HSMC). Several other service buildings are located in housing areas to provide grounds and maintenance support.

Since the HSMC is relatively new, maintenance facilities for the Department of Housing are adequate, but some may need to relocate or add space as additional housing is developed and the service center area develops north of Boulder Creek on East Campus.

6. Residential Capital Improvements

Based on the preceding analysis, the space deficits identified in III.A, and the need for up-to-date facilities, many residential capital projects are needed. The planned growth in student enrollment raises the need for additional housing. The following list includes projects over $500,000 proposed for this planning period (through 2008-09). Timing of the several projects at Williams Village (both listed here and in Exhibit IV-A-4 "Proposed Capital Projects") may change so as to address shortages in housing (and related facilities) as soon as possible through quasi-public or private financing.

First Five Years

- **Housing Renovation Phases I-III**
  Description: This will occur in many residence halls, family housing units, and dining centers. Renovation includes repair and replacement of deteriorating equipment and systems.
  Added GSF: 0 Added ASF: Minor loss possible, c. 8,000
  Est. Cost: $30.7 million
- **Co-op Housing Off-Campus**
  Description: Potential acquisition, lease, renovation, or new construction for a student-run cooperative housing program.
  Added GSF: 5,000 Added ASF: 4,000
  Est. Cost: $700,000 (This project may be realized through privatized development.)
- **Williams Village Housing Phases I & II**
  Description: Construction accommodating approximately 900 new beds in new apartment-style housing units.
  Added GSF: 270,000 Added ASF: 183,000
  Est. Cost: $42.4 million (This project may be realized through privatized development.)
- **Williams Village Infrastructure**
  Description: Utility and street infrastructure to support housing development on the site, to be phased as needed throughout 10 years.
  Added GSF: 0 Added ASF: 0
  Est. Cost: $15 million (This project may be realized through privatized development.)

Five to Ten Year Period

- **Housing Renovation Phases IV-VIII**
  Description: Continued renovation in many residence halls, family housing units, and dining centers, including repair and replacement of deteriorating equipment and systems.
  Added GSF: 0 ASF: Minor loss possible, c. 8,000
  Est. Cost: $25.4 million
- **Williams Village Housing Phase III and IV**
  Description: Construction of up to another 1,000 new beds for

students, in apartment-style housing units
Added GSF: 300,000 ASF: 204,000
Est. Cost: $46.8 million (This project may be realized through privatized development.)

- **Williams Village Parking Structures**
  Description: Structured Parking to support Phases III and IV student housing.
  Added GSF: NA ASF: 0
  Est. Cost: $17 million (This project may be realized through privatized development.)
- **Williams Village Multi-purpose Center**
  Description: New multi-purpose facility to support residential academic programs and conferences housed at Williams Village.
  Added GSF: 60,000 ASF: 36,000
  Est. Cost: $19 million (This project may be realized through privatized development.)
- **Faculty Housing**
  Description: Construction of 100 to 200 units of housing for faculty. The plan is to construct most of these east of Bear Canyon Creek at Williams Village.
  Added GSF: 150,000 ASF: 120,000
  Est. Cost: $15 million (This project may be realized through privatized development.)

IV. Land and Facilities Plan

A. Building Plan

"Can we plan in ways that maximize good options for future generations?" A faculty member suggested that this was a key question to be addressed in this section, the "Building Plan." This section begins by looking at how much land remains developable or re-developable without irreparable harm to one of America's most beautiful campuses. This look at potential development areas is from a long-term perspective, one often termed a "build-out" scenario. The analysis shows that quite a few good options do remain, although there are a lot of constraints for the remaining Main Campus sites.

This section also contains the master plan for capital construction. Capital construction is defined as building projects costing at least $500,000. Smaller projects usually do not meaningfully change the utilization of space on campus, which is the focus of this master plan. Questions addressed in five-year (through June 2003) and 10-year time frames (through June 2008) include:

- How will the plan address space deficits?
- What specific facilities projects are envisioned? How much might they cost?
- Where will the specific projects be placed?

This section also addresses questions regarding characteristics of building development such as:

- How dense is the campus today, and what future density is planned?
- What makes the architecture distinctive? Will it be used for new buildings?
- What can help assure building safety and accessibility?

1. Potential Long-term Development

The University of Colorado at Boulder campus is a treasured resource of Colorado. Some people are concerned that too much development on the Main Campus may diminish the quality of this beautiful campus. Other people are concerned that the growing programs of the university, and the obligation to meet statewide needs, may be unduly constrained in the future by limited Main Campus availability. A compromise needs to be found between growth and preservation on the Main Campus. Part of the answer is greater utilization of CU-Boulder land off the Main Campus.

The long-term development planning explained in this section is intended to channel needs and resources into a desirable campus land-use arrangement, rather than ad-hoc development planning.

With renewed enrollment growth in the next decade, dynamic

departments, and increasing research activities, additions to existing buildings and new buildings will be needed. For the three campus properties in close proximity, the areas appropriate for long-term development are identified on Exhibit IV-A-1. The purpose of mapping these areas is to guide new uses onto building sites that can be developed while retaining or even enhancing campus quality.

Areas suitable for development were identified taking into account the following goals:

- Retaining the desirable campus architectural character, and desirable open spaces;
- Providing sufficient sites and convenient sites so as to address facilities space deficits;
- Accommodating the diversity of uses, including housing and recreation;
- Moderately increasing density;
- Developing within the capacity potential of the land and infrastructure, and
- Assuring mobility by accommodating the many transportation modes, as well as parking.

The proposed distribution of developable areas is sufficient to accommodate projected growth in the broad range of campus functions over the next decade. This mapping recognizes that new uses will need new locations, that many existing uses are best expanded adjoining their existing facilities, and that the growth of yet others is already constrained by existing development and will need to consider new locations.

Utilization of all potential development areas would indicate a built-out condition, which is unlikely to be reached. The available sites are increasingly limited and expensive, and the university has wisely continued to expand its land resource, notably with the acquisition of CU-Boulder South. The purpose of Exhibit IV-A-1 is to help assure that inappropriately located new development does not occur.

Identifying long-term potential development areas is a flexible approach to guiding development on the three adjoining campus properties. The development planning recognizes that resources, priorities, technologies, and higher education programs evolve and change in ever-shorter cycles, creating a need to provide guidance but not create a static plan.

a. Interpretation of Exibit IV-A-1

The indicated development areas on Exhibit IV-A-1 should be interpreted as follows:

- Construction of new enclosed space is to occur within the designated development areas or on existing building "footprints."
- The designated development areas are not projected building footprints; building is expected to occur within these areas. They are building growth boundaries.
- Only above-grade sites are shown. Underground building, which is not disruptive of surface use, should be permitted through the normal development review process.
- Provisions of this exhibit apply to capital construction projects-each new building and addition that exceeds $500,000. Smaller projects should be evaluated through the normal development

review process, without the need to amend this plan.
- Constructing buildings outside of the designated development areas, if that appears necessary, can occur through amending this plan.
- The boundaries of the development areas are not intended to be precisely located on the map. They are not intended to stifle good project design.
- Arrows on the map extending from an existing building indicate that the adjoining development site may be needed to expand the use. These particular sites are initially "reserved" for expansion of the adjoining use, and only upon a determination that the adjoining use will predictably never need its adjoining expansion should these sites be used for an unrelated purpose.

There are 94 acres within the potential development areas on all three developed Boulder campuses. Overall, about half (49 acres) are earmarked for expansion of adjacent uses, with the other half (45 acres) for unspecified uses.

b. Main Campus Potential

The Main Campus has no substantial undeveloped acreage remaining. The usable real estate has been developed with buildings, parking lots, and improved open space. Nevertheless, in the five- and 10-year time frames of this Campus Master Plan, infill development on the Main Campus will remain essential to meeting space needs. During that time the infrastructure on other campus properties should be developed since properties other than the Main Campus will be in greater demand beyond this initial 10-year time frame.

There are 37 acres on the Main Campus designated as developable areas. Several of these sites are currently surface parking lots. Building construction on these sites will likely create a demand for new parking garages. New parking garages will increase the cost of parking on campus. Areas sufficient for future structured parking are included on Main Campus, outside the academic core, notably the two sites listed in the 10-year plan, on Folsom and in Grandview. Beyond 10 years, there are several potential development areas that could be used for additional structured parking if necessary, including development areas adjoining Regent Autopark, along Regent Drive east of Regent Hall, and north of the Humanities Building (the later probably below-grade). However, as considered in more detail in the Transportation Plan (IV-E), financing for additional parking structures would be very difficult.

About half (18 acres) of the potential development sites on Main Campus may be needed for expansion of adjoining uses, and are so indicated by an arrow on the map.

There is sufficient development potential near the academic core so that most undergraduate classes can continue to be held within the 10-minute class change period. However, the next master plan may need to revisit this scheduling concept depending on the realized growth and projections of student enrollment.

Several Main Campus "potential development areas" are more accurately redevelopment sites. Sites where buildings may be removed for redevelopment include the Hunter and Sibell Wolle Fine Arts buildings, the Grounds Building area, much of the Grandview area, Faculty/Staff Court, and Athens Court. The buildings to be removed are an under-utilization of the land resource and none are

in the campus style of architecture (Tuscan vernacular).

Additional building sites on the natural areas (most prone to flooding or with steep slopes), or on the remaining recreational fields needed for undergraduate life, would be inappropriate, compromising both safety and campus qualities. This plan does suggest relocating both Observatory Field and Kittredge tennis courts to accommodate expansions of the College of Business and School of Law.

c. East Campus Potential

The East Campus has the largest remaining development potential of the three developed campuses. It is increasingly needed to accommodate CU-Boulder needs, as recommended by the Task Force on East Campus/Research Park Planning Principles. Several Research Park "pods" are available for development. A site for relocation of facilities services has been identified in the service area north of Boulder Creek, but most of this site is currently the Nuclear Physics Building and ancillary parking. Consolidation of Nuclear Physics with the rest of Physics would free up land needed for the service area, and the possibility is included in a 10-year project.

In total for the East Campus, 30 acres are potential development sites, largely in the Research Park, with only 3 acres earmarked for expansion of existing uses.

d. Williams Village Potential

There is substantial undeveloped or underdeveloped acreage at Williams Village. Even after taking the Bear Canyon Creek flood hazard into consideration, approximately 27 acres have been designated for future development at Williams Village. Of these, 23 acres are west of Bear Canyon Creek and have been designated (on the map by an arrow) for expansion of student housing and related uses. About four developable acres lie east of Bear Canyon Creek, and might be used for faculty and staff housing.

e. CU-Boulder South, and Mountain Research Station Potential

Initial planning studies are underway at this writing for the purpose of strategically locating athletics and recreation fields as well as the limited infrastructure necessary to support the fields.

More is known about the Mountain Research Station, so potential development sites on that property are identified in the next section (IV-B) of this plan. Future planning for CU-Boulder South is also discussed in that section.

f. Building Siting

In keeping with the Klauder vision, which has served the Boulder campus so well over the last 80 years, precepts to follow when locating new buildings at CU-Boulder include:

- Locate uses in functional relationship with adjoining uses;
- Site buildings with respect to the natural environment, accounting for topography, solar access, and Boulder's winds;
- Reinforce mountain and campus views, bordering or terminating view corridors;
- Respect the massing of neighboring buildings, providing a transition to greater or lesser heights as necessary;

- Border edges of open spaces so as to enclose quadrangles, plazas, courts, and other open spaces;
- Form a variety of such open spaces, from intimate to large.

Frederick Law Olmsted, perhaps American's best-known landscape architect, defined a campus as a university in a park. Buildings must relate to neighboring buildings, the planting scheme, and circulation paths in a most caring way.

Exhibit IV-A-2, Axial and Spatial Organization on Main Campus, shows the pattern in which buildings are sited on the Main Campus, which helps identify the remaining building sites. This pattern creates a variety of "outdoor rooms." Outdoor rooms are defined open spaces framed by well-sited buildings. These distinct outdoor spaces are a key quality of the Main Campus and were shown on Exhibit II-D-3. Axes help orient people on campus. Terminations create a sense of arrival and may be meeting points, perhaps at a forecourt. Axes often terminate at an important building façade or a significant outdoor areas focal point. Consideration should be given to strengthening some termination points, with sculpture perhaps. The outdoor areas plan (IV.C) elaborates on these ideas.

Recent buildings have been successful in framing large and medium-sized open spaces. More of the smaller, intimate outdoor spaces, as found on the older parts of Main Campus, need to be created in new building development.

East Campus, Williams Village, and the Mountain Research Station are not built on axial alignments (so there is no comparable axial mapping). The arrangement on these sites is planned to be of a village character: less formal, often fronting on curving roads.

2. New Buildings Envisioned within 10 Years

The long-range plan shows where development would be appropriate. Planning for what specific development is needed begins in the 10-year time frame.

Exhibit IV-A-3 maps new buildings and major additions planned for the next 10 years on the three adjoining campus properties. This map should be interpreted as follows:

- Building footprints shown are illustrative. Actual footprints will vary as the buildings are designed, but what is shown on this map gives a reasonable approximation of size.
- As noted on the map, the list of projects and hence this map may be updated periodically based on new programs plans and funding.
- Renovations are not shown on this map (but the major ones are listed in the next section, IV-A.3).

a. Main Campus Projects

Twenty capital construction projects that are new buildings, major building additions, or parking structures may potentially be built on the Main Campus. Most of these are for academic uses (see the list on Exhibit IV-A-3). Significant work is planned by Intercollegiate Athletics to improve the Stadium complex, including a new fieldhouse. Two parking garage projects are shown, one in conjunction with the fieldhouse and one in the Grandview area, as explained in the Transportation Plan (IV.E). Two significant projects

for academic and/or research use are shown as possibilities in the Grandview area in this 10-year period.

b. East Campus Projects

The remaining Research Park "pods" may develop in the next 10 years, although the number is highly dependent on leases with outside research tenants and/or financing of CU research. Also possible within 10 years is completion of Discovery Drive, with a new bridge linking the north and south sides of East Campus. Consolidation of facilities services is envisioned north of Boulder Creek.

c. Williams Village Projects

Additional student housing with ancillary uses is planned for Williams Village within 10 years. Faculty housing is envisioned east of Bear Canyon Creek. The housing section (III.F) provides more details about projected development of Williams Village.

d. CU-Boulder South and Mountain Research Station Projects

Two of the largest unmet needs for land (identified in III.D and E) are recreational fields to accommodate student demand, and intercollegiate athletics practice facilities, particularly for sports other than football. Topographic information is available, so it is known that there is sufficient flat land, and water rights were conveyed with the property. Consequently, sports fields, other sports uses such as a cross-country running course, and other outdoor uses are included for the site. Development of infrastructure to support these functions and to support future development will proceed during this initial phase for this property.

Projects envisioned at the Mountain Research Station include completion of the hostel, winterization of additional buildings, additional lab space, and possibly additional living and support spaces (see The Mountain Research Station plan, in IV.B).

e. Construction Impacts

Construction activity often has a jarring impact on the tranquil campus environment. In addition to the need for a relatively quiet area for academic pursuits, a substantial portion (27 percent) of the student body resides on campus and needs a reasonable residential environment. During much of the 1990s, the campus was impacted with multiple construction projects, which has led many in the campus community to oppose further growth impacting the Main Campus.

With higher education needs continuing to evolve, construction will remain part of campus reality. But the cost of new facilities and renovations is going up in part because new construction is on restricted sites between existing buildings, construction yards are constrained, and parking and access for contractors is inconvenient. The constricted development potential will moderate enrollment growth for CU-Boulder. Increasingly, development will be redirected to more readably available sites at the East Campus, Williams Village, and CU-Boulder South.

To mitigate concerns about infilling the campus and the impacts of

construction, "Design Guidelines for Construction Sites and Temporary Facilities" have been adopted in the CU-Boulder Construction Standards Appendix 1. These are excellent guidelines, but their success will depend on constant vigilance to implement them with a variety of contractors on campus.

3. Proposed Capital Projects List

Exhibit IV-A-4 is a comprehensive listing of all projects included in this plan. Each of these projects was discussed in the facilities needs chapter (III), organized by major land use categories-academic, service, athletics and recreation, or housing. Within these same categories, this exhibit indicates:

- whether a program plan has been prepared,
- whether the project has been funded,
- approximate square footage (gross and assignable) that would be added,
- approximate renovated square footage,
- estimated cost in 1999 dollars, and
- whether the project is planned to be completed in five years (through June 2003) or 10 years (through June 2008).

This Master Plan list catalogues all anticipated capital projects within the 10-year period. This list creates a pool of possibilities from which the five-year CIP (Capital Improvements Plan) and the annual funding requests can be drawn.

Exhibit IV-A-4 should be interpreted as follows:

- This list reflects needs, not the financial resources. CU-Boulder is committed to accomplishing as much as possible, but recognizes that the need and plan exceed likely resources by approximately 25 percent. Which of these projects can be completed depends on which funds can be raised.
- Only CU-Boulder projects are listed; University Central Administration, and governmental and private tenants projects on campus are to occur within potential development areas, but are not capital projects of CU-Boulder.
- Projects may be added without amending the Master Plan if there is a space need identified in this plan and a site available within the potential development areas.

This list of proposed capital projects should be compared against the space deficits identified in Section III.A, Space Needs Analysis. Specifically, Section III-A-3 shows anticipated deficits for the comparable 10 years to 2008. The analysis includes both backlogged needs and needs for added space based on projected student enrollment. The projected Academic Space deficit of approximately 1,713,000 Assignable Square Feet (ASF) compares against the projected response (in the Proposed Capital Projects List) of 518,000 new ASF. This substantial difference is due in large part to the tremendous potential for additional research.

A similar comparison can be made for the other categories of space. The projected Services and Administration space deficit of 237,000 ASF (for 2008) compares with the projected projects of 104,000 ASF. Some of the remaining deficit of administrative space may be addressed by proposed plans to consolidate certain administrative services at the CU system level, removing them from the CU-Boulder inventory. Proposed projects in student union space and physical plant space may largely remedy the existing deficits of space in

those categories, but may fall short of keeping up with the projected student enrollment. This need should be addressed in the next master plan based on the actual enrollment. For now, CU-Boulder is taking a conservative approach for these types of space.

The projected deficit in Athletics and Recreation space is 385,000 ASF; proposed projects are 260,000 ASF, eliminating about two-thirds of the deficit. The Residential and Conference deficit in 2008 is estimated at 422,000 ASF; proposed projects at 371,000 ASF would eliminate over half of the deficit.

Five-year capital planning is a requirement of the Colorado Commission on Higher Education (CCHE). Exhibit IV-A-4 goes beyond five years because it is a list based on when projects may be completed, requiring funding requests to be made earlier. The five-year CIP, as discussed in Chapter V, selects those projects from the master plan list that are most timely. It indicates the proposed source of funding. The five-year CIP is revised annually as required by the State of Colorado.

Capital construction funding is allocated on an annual basis from fluctuating State of Colorado capital funding, from internal university resources, from funding from other governmental units, and from gifts and grants fundraising efforts. The five-year plan may be achievable but depends on successful competition for limited resources. A feasibility study or program plan should already be underway in order for a typical project to be completed in five years. Within the 10 years, about 75 percent of the entire list may be achievable, depending on assumptions about future revenues.

4. Renovations

The University of Colorado at Boulder is one of the oldest institutions in the state. Many of the campus buildings date back a century or more. Yet facilities needs for higher education are based on today's programs and technological sophistication, to teach better and conduct state-of-the-art research. It is possible to accommodate today's needs while maintaining the architecturally significant campus.

There are two major renovation considerations: functional obsolescence and physical obsolescence. If functional obsolescence analysis determines that a building is too small for today's needs, it is time to build an addition or replacement building. Which of these to do depends on the condition of the building, site availability, and programmatic aspirations. Physical obsolescence is assessed by facility audits.

Building renovations are needed for several reasons, varying in size and complexity to address:

- routine maintenance,
- maintenance costs through upgrading conditions,
- safety deficiencies (e.g., lack of sprinkler systems or presence of potentially hazardous materials);
- replacement of building systems and equipment (which are often dysfunctional after 20 to 30 years),
- functional updating of space (e.g., keeping labs up-to-date),
- changes in use, and
- major facility renewal including more suitable arrangement of space (usually required for buildings over 100 years old).

Many renovation projects are designed to address several of these needs at one time.

The need to demolish one of the larger institutional buildings on the CU-Boulder campus is rare, as most are functionally useful, repairable, and contribute to the attractiveness of the campus. Hale Science, for example, is a building more than 100 years old that has become a first class academic building following its renovation to accommodate anthropology. CU-Boulder is committed to making the best use of resources through renovation wherever possible. Demolition of a campus building occurs only when it is in irreparable condition and/or where the building is a very poor use of valuable land. The Hunter Building, for example, fulfills both criteria. Before a major building is demolished, a photograph and basic information need to be retained for a historical record, as has already been done for the buildings to be demolished in the Grandview area.

It is noteworthy that four of the six academic capital projects which have been funded, which are in the process of design and construction as of the date of this plan, are renovations. Of the two new building projects funded, one also includes the complete renovation of Woodbury. Many of the future capital projects on the list are also renovations. Renovations costing more than $500,000 (capital construction) are included in the list of capital projects on Exhibit IV-A-3.

Based on funding due to the strong economy of the late 1990s, a major amount of renovation activity will occur during the first five years of this plan:

- Renovation of the historic Woodbury building will be completed.
- Adaptive re-use of RL-3 for service departments and adaptive re-use of the Armory Building for the School of Journalism and Mass Communication will occur.
- Functional renovations will help keep Porter Biosciences, the Engineering Center, and other buildings current.
- Maintenance and renewal of residence halls will be underway.
- Systems maintenance projects will occur in record amount.

5. Density

Consideration of density is an important part of campus planning. Proximity of uses is desirable up to a point, as relatively high density facilitates movement between classes and other activities, and can facilitate communication between academic disciplines. Where to draw the line for desirable density varies by location and personal preference.

Density is usually expressed in terms of "Floor Area Ratio" (FAR), which is the ratio of the total (gross) square footage of buildings compared to the square footage of an indicated land area.

Exhibit IV-A-5 shows the density for the developed Boulder Campus properties. The average density for the three developed campuses in Boulder is 0.32 FAR.

With building types typical of CU-Boulder, some structured parking becomes necessary between 0.4 and 0.5 FAR if the same percentage of people continue to drive.

a. Main Campus Density

Within the three proximate campus properties, density varies widely as shown on Exhibit IV-A-5. At 0.45 FAR, the Main Campus is much denser than the East Campus and Williams Village.

The increasing density of Main Campus over time has not gone unnoticed. Many people feel that traditional tree-lined walkways and lawns are much preferable to a highly urban approach. More of the campus floor is needed for circulation as density increases, leading to large hard-surface areas. This campus plan envisions a moderate increase in Main Campus density, not to exceed 0.5 FAR within the 10-year period, a mixture of soft and hard environments, new building heights more typically four to five stories rather than the traditional two to three stories, and attention to compatible design. Because conveniently located building sites are a limited resource, the footprint of new buildings should be minimized and the amount of layered space maximized within program, budget, and site constraints.

Development in the Grandview area on Main Campus is planned to be higher density. Additions to some of the larger buildings are planned, and structures built as single-family homes will be replaced over time by larger institutional buildings. The maximum build-out at 550,000 square feet would mean a FAR of 1.47 (there are 8.61 acres, or 375,052 square feet, in Grandview, including university and privately owned parcels, excluding city rights-of-way.) While the Main Campus as a whole is not built at such a density, the area around the UMC is approximately 1.4 FAR, which will increase with the proposed UMC addition. The proposed Grandview density will eventually mean that much of the parking in the area, initially in surface lots, will need to be in structures.

b. East Campus Density

The Research Park, occupying most of the East Campus, is only partially developed. Development of the remaining pods is planned over time. The goal set forth in the Research Park Master Site Development Plan was for a campus-like development at 0.38 FAR. Individual lot development in the Research Park has been about 0.28 FAR. The higher original goal would be a better utilization of this valuable land resource, so the original goal is re-affirmed. Increased density will facilitate more walking and transit service. The density is not expected to require structured parking in the foreseeable future.

Density north of Boulder Creek will increase somewhat when the consolidated facilities services development occurs.

c. Williams Village Density

Williams Village is planned as the site for new housing and related development. Much of the site is undeveloped or underdeveloped at present. A relatively compact village-like development is planned, facilitating walking, bicycling, and transit use. A large amount of acreage will be devoted to outdoor recreational areas and the Bear Canyon Creek floodway. The existing FAR may increase from 0.16 to at least 0.42 (existing development is 440,000 GSF; an additional 724,000 GSF is proposed; the site is approximately 64 acres, or 2,787,840 square feet). Additional development may occur (see III.F.6 and IV.B.2). Ultimately, some structured parking is anticipated as detailed in the Williams Village Micro-Master Plan.

d. CU-Boulder South and Mountain Research Station Density

The existing density of CU-Boulder South is near O FAR, as there is only one building on over 300 acres. The density of the Mountain Research Station is also very low. The density of CU-Boulder South has yet to be planned, pending studies of site suitability and programmatic uses. The Mountain Research Station cluster of buildings is planned to infill modestly, probably facilitating increased winter use of the station.

6. Architectural Character

Charles Z. Klauder, leading architect of his day for many university campuses, developed the "Tuscan Vernacular Revival" style for the University of Colorado, designing 15 buildings from 1919 to 1939. Klauder explained his concept of a university campus as follows:

[A campus] should be a homogeneous, clearly to be apprehended scheme, in which there is a studied and happy balance of things, of buildings located with regard to their functions, importance and architectural effect, of natural views conserved and topographical advantages skillfully exploited. Indeed, the development plan not only conserves views, it creates new ones in the form of delightful vistas projected between rows of buildings and ending at an imposing architectural mass embellished with entrance, tower . . . or else the view may be flung far into a magnificent distance or a lake, a river, a valley or toward a distant mountain.

Functional arrangement of buildings, while preserving and creating views, is a defining characteristic of all of the CU-Boulder properties. One of the goals of CU-Boulder planning is to assure continuity of the Tuscan vernacular architectural style on Main Campus. There is also the intent to assure contextual architectural quality on the other CU-Boulder properties.

The quality of the University of Colorado at Boulder as an institution of higher education is reflected in its buildings-their quality, beauty, consistency, and permanence. The Main Campus is known and admired for its uniform architectural style and building materials palette. Sandstone walls, red tile roofs, limestone trim, and black metal accents are set in a verdant landscape against the mountain backdrop, providing an appealing sense of perpetuity.

a. Architectural Style

Klauder tended to design buildings symmetrical in plan. Succeeding architects have often designed asymmetrical campus buildings, while retaining the characteristic complex assemblage of forms, which is part of the delight in walking through the Main Campus. Roofs are gabled and hipped, cascading down from the higher building forms to the edges of buildings, respecting a human scale. Floor plates are narrow to capture cross ventilation and sunlight. Building wings often spread out from a central core, creating charming courtyards and forecourts. Recent buildings have built on the basic recipe for form, emulating some themes, but avoiding direct copying. Shed, pavilion, and flat roofs have been added to the Tuscan vernacular style, stretching the visual experience and reflecting a contemporary functionality.

Klauder's design principles often suggest a transition from high forms near the center of a building to more modest forms at the periphery. A variety of heights and forms, without this pyramidal transition, has

also been successfully employed. Most building designs have been successful in keeping the scale of building in human proportions.

The textural building landscape for the Main Campus is one that retains much from Klauder's work. Klauder utilized a palette of building materials that includes:

- Sandstone walls, quarried along the front range from Boulder to Loveland in colors from deep red to buff, stained with iron oxide, laid in a distinctive pattern (including flat stone "shiners");
- Clay barrel-tile roofs, laid with red pans and covers of multiple hues which, from a distance, appear red;
- White limestone trim surrounding doors and windows, usually from Indiana quarries, sometimes from Texas and Kansas;
- Elaborate rustication of the limestone around major entrances;
- Ornamental limestone accents, including vertical oval "cartouches" (scrolled panels);
- Copper gutters (which over time oxidize to black); and
- Black metal accessories, including wrought iron balustrades and decorative light fixtures.

Some precincts of Main Campus have developed distinctive adaptations of Klauder's style, such as the board-formed concrete of Engineering Center buildings, or the unique cut of stone in the Kittredge Complex.

Materials should remain honest. There are many imitations of sandstone, limestone, clay tile, copper, and wrought iron, that when substituted result in a diminution of quality and substance. Substitutes should always be thought of as backup materials. When budgets do not permit the use of limestone, carefully specified and crafted poured-in-place concrete walls and precast concrete panels and trim have been successfully used.

Brick has generally not been successfully used on Main Campus, despite several attempts, but brick is well employed as the dominant building material on the East Campus (including the Research Park) and Williams Village. Exterior wood is generally an inappropriate material for the buildings on the campus properties in Boulder. Yet wood is the dominant and appropriate exterior material for Mountain Research Station buildings.

Tuscan vernacular style has proved remarkably adaptable in housing the great variety of university programs, from parking garages to a planetarium. In response to new technology, unusual programs, advances in handling or storing materials, utilities operations, or special program offerings, building forms are both functional and continue the architectural distinctiveness of the Boulder campus. The versatile Tuscan vernacular style has been successfully adapted for twentieth century uses.

The masonry walls, pedestrian scale amenities, and open space variety on the East Campus and Williams Village create a family resemblance for all Boulder properties, but allow variation in materials, style, and cost. More references to the Main Campus style on these proximate campus properties would be appropriate.

New buildings, alterations, and additions are designed by institutional architectural firms, and reviewed by the Campus Architect and the University Design Review Board to assure continuity. While written architectural guidelines don't exist for the Main Campus, standards

for materials and colors are in place. For Main Campus design guidance, architects are urged to read Body and Soul by Campus Architect William R. Deno, AIA. Written design guidelines are in place for the Research Park. The Williams Village micro-master plan provides architectural guidance for Williams Village. New buildings in the Grandview extension of Main Campus should utilize Tuscan vernacular, but vary it with the then remaining buildings when the bungalows are removed, demolished or restored, as has been done for Norlin Quadrangle buildings.

b. Historic Buildings

Norlin Quadrangle Historic District buildings are of importance to the State of Colorado, documented by their placement on the national and state registers of historic places. In the designated district are both building designed by Klauder and those that pre-date Klauder. Alterations require advice and counsel from the Colorado Historical Society, in addition to the usual reviews that take place for all campus buildings. Most of the Main Campus buildings pre-dating Klauder are highly valued and fit nicely with what has become the predominant style.

There are many other buildings by Klauder outside the Norlin Quadrangle Historic District that are of equal or greater significance. Over time, many of the older campus buildings are becoming significant to Colorado, local, and campus history. Any alterations to valued buildings on the campus deserve careful consideration. Building additions should generally continue the architectural character of the building to which they are added.

c. Design for Ancillary Functions

The stylized roofscape of the Main Campus strongly suggests that rooftop mechanical and technological equipment preferably be fully enclosed, or at least hidden from view from the ground. Chillers, heat exchangers, and other equipment that is usually exposed on rooftops in commercial and industrial development should be fully enclosed or completely screened on Boulder campuses. Exhaust stacks should be minimized, consistent with safety requirements, and integrated into the architecture. On flat-roofed buildings on all campus properties, mechanical equipment should be screened from view from the ground. These design goals have not always been met, which suggests the need for thorough design review.

Ancillary needs include service operations, adaptations to grade such as steps and ramps, all sorts of utility appurtenances, and identification signage. These often pose design challenges. CU-Boulder has adopted standards and review policies for some of these functions, such as for telecommunication appurtenances. Checklists have been prepared to help assure that program plans and schematic designs adequately address service functions.

Many ancillary elements are further discussed in the outdoor areas plan (Section IV-C).

7. Fire and Life Safety Considerations

Safety must be considered as development occurs. Increasing density increases the need for close attention to fire and life safety considerations. The level of life safety and fire protection of most CU-Boulder buildings is generally above normal for buildings of similar

age, but below that of buildings built to current standards. The durable materials of campus buildings, including masonry walls and tile roofs, contribute to fire safety. But the wide range of building uses, including the widespread use of chemicals in research, inherently raises life safety and fire protection concerns.

Fire safety objectives include the protection of people and property, and continuity of operations. In order to help ensure that these fire safety objectives are met, the fire safety features of many campus buildings should be upgraded.

Provision of fire sprinklers is increasingly emphasized, even in cities such as Boulder where professional fire departments can reach the scene in minutes. Fire detection and sprinklering technology, and its availability, has improved greatly in recent years. Sprinklers provide a faster response and are especially important as the development of CU-Boulder properties becomes denser, which increases the consequences of a fire spreading. Campus policies require inclusion of fire sprinklers for all new construction, renovation, and addition projects unless specifically waived by the Campus Fire Marshal.

Issues that are considered regarding the fire defense of campus buildings tend to fall in the following categories:

- adequate emergency egress;
- full sprinkler protection;
- adequate detection and warning systems;
- code compliant original construction and remodels over time;
- proper fire barriers to subdivide larger buildings or to protect exit paths;
- localized water supply availability either in terms of water flow/pressure or with regard to hydrant locations;
- adequate access for emergency apparatus; and
- appropriate use of the building and its systems, such as proper storage of combustibles or proper use of ignition sources.

Exhibit IV-A-6, Fire Safety Status, indicates the status of fire sprinkler protection for all campus buildings according to available records. Buildings in which inadequate emergency egress has been identified as an issue are also indicated on the drawing. The plans to address emergency apparatus access are covered in the Transportation Plan (Section IV-E).

The university as an entity of State government is not bound by local height restrictions. When constructing high-rise university buildings, care should be taken to provide built-in fire and life safety protection systems to the extent feasible, since the responding fire department (City of Boulder for most CU-Boulder properties) may not have expertise and equipment for high-rise situations.

Large building complexes, such as the Engineering Center, also warrant especially careful review. Fire sprinklering these complexes is highly desirable. The building size and complexities increase both the potential hazards and response time. Renovations or new construction should be arranged to minimize response time, and take advantage of modern fire detection and suppression technologies.

Bridges between buildings, and below-grade spaces, are also of concern. These building features have increasingly been used to increase campus density. There are two emergency access and fire protection issues with such features: (1) limitations on fire department access, and (2) potential fire spread from one building to

another building. Some bridges are designed for fire department access underneath the bridge, which is usually preferable, while others are not. An example of a below-grade space lies under the sidewalk between Cristol Chemistry/Biochemistry and the Sibell Wolle Fine Arts building. This underground space is part of the chemical stores facility, a good example of creative densification, but one that does limit access and raise fire propagation risk. To address the fire and emergency access, new construction should be designed such that there is always an alternative fire apparatus access route around a bridge or below-grade space. To address the potential fire spread potential, there should be fire separation walls and doors between buildings.

A process is in place to ensure plan review. Architects and engineers submit written code reviews for construction projects. Campus authorities review construction documents and help ensure that code requirements are met. Compliance with code requirements includes interior building systems such as fire barriers, means of emergency escape, fire suppression, and fire detection; as well as exterior site requirements such as separation of buildings, emergency apparatus access, and water supply. New buildings are required to be fully code compliant. Renovation and remodeling activities are to meet the same standards to the extent practicable.

A comprehensive fire prevention program is being planned in order to reduce fire defense weaknesses attributable to misuse of the buildings and their systems, such as improper storage of combustibles or improper use of ignition sources. This comprehensive fire prevention program is intended to start as this plan is being written, to provide occupant training as well as notification of code violations.

The Mountain Research Station has distinctive fire protection issues, since it is somewhat remote, surrounded by forest, with buildings constructed largely of wood. The Facilities Management Department is undertaking efforts to upgrade utilities for this property, and the plan for the site (in IV.B) proposes improvements to several structures, even though available resources are very limited for work at this site.

8. Accessibility

"No otherwise qualified handicapped individual in the United States . . . shall, solely by reason of handicap, be excluded from participation in, be denied the benefits of, or be subject to discrimination under any program or activity receiving federal financial assistance." (Section 504 of the Federal Rehabilitation Act of 1973.) The University of Colorado at Boulder is committed to making all of its programs physically accessible for all persons. This requirement was extended to all branches of state and local government by Title II of the Federal Americans with Disabilities Act (ADA), which identifies rights of accessibility, for which building design standards have been implemented.

The University of Colorado at Boulder recognizes the advantages of integrating disabled students into programs and facilities. Requirements of the ADA are often exceeded to assure program and building accessibility. All new facilities on campus are designed to be accessible. Thanks largely to $11.2 million in State funding since 1993, many of the academic buildings have received major ADA renovations. Additionally, significant cash funds have been spent

making auxiliary facilities accessible.

Exhibit IV-A-7 indicates the accessibility status of campus buildings on the three adjoining campuses (in 1998). Generally, there are four levels of accessibility on campus:

- Fully Accessible: These are new buildings or buildings that have had all accessibility renovations to essentially comply with the new standards, i.e., ADA Accessibility Guidelines (ADAAG) or the Uniform Federal Accessibility Standards (UFAS).
- Functionally Accessible: Many of these buildings have had substantial renovations for accessibility but have some areas that remain inaccessible. These are several small tower or mezzanine areas where full access is not possible, so functions or programs are duplicated in accessible areas.
- Limited Accessibility: These are facilities where accessibility is provided to one or more floors but large portions of the building do not comply with ADAAG. In these buildings and programs, significant program accommodations are made to ensure that access is maintained under Title II.
- Not Accessible: These buildings are not required to be accessible due to their function or because similar programs are provided in other buildings. For example, not all of the Family Housing units are accessible.

The university is committed to providing accessibility to all programs on campus. Accessibility provisions are part of all new construction and renovation projects on campus. Future improvements within existing buildings will be made as a part of other renovation projects. For example, when classrooms are renovated for technology, they should address requirements for accessible seating and assistive listening devices. Most remaining ADA improvement projects on campus will be part of the housing renovation project.

B. Micro-Master Plans

During the preparation of this Campus Master Plan, there was a focus on those areas of the campus where the greatest changes are likely to occur, and for which there was not a current area plan. These areas include:

- Grandview, part of the Main Campus, redeveloping from an area previously a mix of fraternities, sororities, and single-family homes, into academic land uses, including research units. A micro-master plan was prepared by Shapins Associates.
- Williams Village, an area acquired for student housing, but on which no student housing was built after the two high-rise complexes built in the 1960s. A micro-master plan was prepared by Design Workshop.
- CU-Boulder South, 308 undeveloped acres initially planned for use by Intercollegiate Athletics, Student Recreation, and other outdoor uses. The university will explore compatible, shared uses of athletics facilities with the Boulder Valley School District and other community interests.
- Mountain Research Station, an often forgotten asset of CU-Boulder where unique scientific research takes place. A micro-master plan was prepared by the Facilities Planning Office.

1. Grandview

The University of Colorado identified the Grandview Terrace area north of University Avenue as a logical area for expansion of the Main Campus, and began acquiring the properties in the early 1960s. In 1990, the Long-Range Facilities Master Plan for the campus suggested that most of the acquired buildings in Grandview should be demolished and replaced with new, larger buildings in order to provide needed academic and research spaces. The 1990 plan has been reconsidered in this Campus Master Plan. A plan has evolved preserving some of the 1910 - 1930s era bungalows in the area, retaining useful buildings for institutional use, and identifying sites for the needed new buildings.

a. Setting

The Grandview area, located on the northwest edge of the Main Campus, is bordered by Broadway to the west, University Avenue to the south, and 17th Street to the east. To the north are the Andrews Arboretum, Boulder High School's football and track facility Recht Field, and an enclave of single-family homes along Hillside Drive. Grandview is perched above the bluff rising from the Boulder Creek floodplain.

As of December 2000, approximately 168,000 square feet of interior building space exists in Grandview. The university owns 31 of the 40 principal buildings, contracts are pending to purchase two more. One is owned by the CU Foundation. Six others are privately owned. Only one owner-occupied residence remains. Buildings are generally of modest size, including a few mid-sized buildings (a sorority, and others used as office space) and two dozen smaller 1910-1930s era bungalows (most of which have been used for various university offices). The bungalows generally are in poor condition and not easily accessible to mobility-impaired persons.

Although the Grandview area comprises less than 11 acres, not a large portion of the total campus, it is of strategic importance to the university because of its proximity to the campus core. Grandview is within a reasonable walking distance from the existing academic buildings on campus, and much of Grandview is within the "Ten Minute Class Change Area" (as shown on Exhibit III.B.2). Other than in Grandview, there are very few options to add academic and research spaces, that can be accessed from the campus core by a reasonable walk.

b. Building Plan

Exhibit IV-B-1 is the micro-master plan map for Grandview. The Grandview long-term potential development area (as shown on Exhibit IV-A-1) has been divided into two sub-areas: an area generally to be preserved, and area generally to be redeveloped.

In recognition of historic preservation concerns and pursuant to its Memorandum of Agreement with the City of Boulder, the university will covenant with the City of Boulder to create a 25-year preserve for bungalows it owns facing Grandview Avenue between 13th and 15th Streets. Under the covenant, the university will not demolish or relocate bungalows within the preserve except as specified, during the term of the covenant. The bungalows in the preserve may be used in a number of ways, including university academic/research uses and housing rentals.

The rest of the university-owned property in Grandview is a

redeveloping area. This includes both new and renovated buildings to provide needed academic space, including research. Incidental non-academic space uses are also possible, including day care, food services, housing, and transportation facilities such as structured parking. Under the Grandview Agreement, three of the university buildings on the perimeter of Grandview will be retained during this planning period: 1505 University Avenue (Continuing Education), 1511 University Avenue (the Armory, housing the School of Journalism and Mass Communication), and 1546 Broadway (housing a research institute).

Ultimately, the Grandview area could accommodate over half a million gross square feet of buildings if it were to be fully developed, but that is not planned during this planning period. The Proposed Capital Projects List (Exhibit IV-A-4) lists building projects within the Grandview area totaling180,000 square feet, plus structured parking spaces. Taking into account buildings removed, the net change in space will be less.

Suitable transitions between the campus and the surrounding city are included in the building plan. Redevelopment at the corner of Broadway and University Avenue is desirable to help create a more appropriate corner and entrance to the campus (this depends on whether 1402 Broadway is acquired by the university). New building design in Grandview will reference the Tuscan vernacular architectural style of the Main Campus, which helps define CU-Boulder. In summary, the building plan retains aspects of Grandview's historical development, proposes an increasing synergy with the Main Campus north of University Avenue, and provides for new, more functional university spaces.

c. Transportation

Many modes of transportation serve the Grandview area. Pedestrian access is safer due to improved crossings of University Avenue developed during 2000 in a joint City and university effort. In the future, a new pedestrian overpass of 17th Street is envisioned to provide an improved link to Macky Auditorium and the Main Campus. In the Grandview Agreement the City has agreed to vacate 13th Street from its intersection with University Avenue north to the southern boundary of Grandview Avenue and from the northern boundary of Grandview Avenue north to the northern boundary of Grandview area. Certain public alleyways in the Grandview area will also be vacated. This will permit an increase in the size of building footprints and facilitate the conversion of some land from vehicular-oriented use to pedestrian-oriented use. Where there is now an unsightly alley between Grandview and University Avenues, a new west-to-east landscaped pedestrian spine is envisioned. Pedestrian corridors within the potential development area are illustrated on Exhibit IV-B-1. Trees will enhance these pedestrian environments.

Improvements for bicycling and mass transit are also proposed, as outlined in the transportation section (IV-E) of this Campus Master Plan.

To improve vehicular access and parking for university uses, under the Grandview Agreement, CU-Boulder Parking and Transit Services will assume responsibility for managing the on-street parking in the area including spaces along University Avenue. There will be a maximum of 470 parking spaces in the Grandview area between Broadway and the Armory during the life of this Campus Master Plan,

including non-University spaces, but not including spaces along University Avenue. Consulting traffic engineers have concluded that the roadways in the area have the capacity to serve more than the number of parking spaces planned. Some of the parking will need to be in structures as parking demand grows and as surface parking is eliminated by development. Parking will be integrated into academic or housing development where feasible to minimize the visual impact of parking.

d. Phasing

Some structures will be removed. Where buildings are removed, there may be interim land uses such as parking lots and/or landscaped spaces. The university likely will continue to acquire some of the remaining privately owned buildings shown on Exhibit IV-B-1. The pace of redevelopment will depend on many things: acquisition of land, usage of existing buildings, timing of demolitions, identification of space needs, consideration of site suitability for identified needs, and availability of funding.

2. Williams Village

After a study of alternative sites for student housing, the Board of Regents selected Williams Village as the preferred site for new student housing. The Williams Village Micro-Master Plan sets the overall development framework for the site.

a. Setting

The 64-acre site has two high-rise residence hall complexes, a commons facility, two soccer fields and four tennis courts, and other recreational facilities. Much of this relatively flat site is underdeveloped. Bear Canyon Creek and the associated floodway bisect the site, with a public bikeway/walkway along its west bank. The former residence of the CU President is on the east bank.

b. Building Plan

At full development of the site, there is the potential of about 1,900 additional student beds, all in apartment-style living units. This could accommodate the projected growth in campus enrollment in the next decade and provide relatively affordable, conveniently located housing. The housing proposed will help meet the backlog for family housing.

East of Bear Canyon Creek, about 100 units of faculty/staff housing are planned. The goal is to ultimately maximize the faculty/staff housing that can be developed on the site, maintain a lower profile compatible with the adjacent neighborhood and within the site capacities, and keep all residential buildings out of the floodway.

Conference and residential academic program space will be provided, to be used in conjunction with the housing. Recreational facilities for all students will be maintained although relocated, including two soccer fields and four tennis courts, plus recreational fields and facilities provided for the on-site student population.

The location, mass, and demographics of housing development will transition between the existing tall towers and single-family housing to the east. Facilities housing undergraduates will be situated near the existing towers. Lower density faculty/staff housing will be next

to the Frasier Meadows subdivision to the east. Between the two will be housing for graduate students and students with families. Exhibit IV-B-2 shows the relative arrangement planned for the different housing types. In all, there is the potential for about an additional 800,000 additional interior gross square feet.

Centrally located recreation fields, and outdoor areas for more passive uses, are proposed. Open space within the housing areas is based on a hierarchical system of courts and plazas, recalling elements of the Main Campus.

c. Transportation

An extensive network of walkways, including links to the Main Campus, will serve pedestrians and bicyclists. Apache Drive will be looped back to the intersection of Baseline Road and 35th Street. Minor streets will collect traffic onto this loop road. Faculty/staff housing will be accessed from this loop assuming new bridges over Bear Canyon Creek prove feasible. The loop road will accommodate a bus shuttle to other parts of the campus and city.

Within the planning period to 2008, parking may largely be accommodated in surface lots. Ultimately, to accommodate the projected housing and to maximize open space, structured parking will be necessary.

d. Phasing

The goal is to have the first phase of student housing ready for occupancy by fall 2002. Initially, 450 to 900 student housing beds are planned, with more possible within the planning period if there is demand; developer interest and construction do not detract from the institution's ability to fund academic, research, service, recreation, and athletic priorities. Private development on university land is a development approach being pursued in order to minimize university debt incurred.

3. CU-Boulder South

The purchase of the CU-Boulder South property in 1997 was a strategic acquisition to help ensure the long-term viability of CU-Boulder, which already does not have enough land to meet all of the institutional needs. The property acquisition was a part of ensuring Front Range locations for higher education services for the citizens of Colorado.

a. Setting

The CU-Boulder South property, previously known as the Flatirons or Gateway property, is a five-minute drive along U.S. 36 from the Main Campus, at the intersection of U.S. 36 and Colorado 157. See Exhibit IV-B-4. The property consists of 308 acres in unincorporated Boulder County, contiguous to the southeast boundary of the City of Boulder. CU-Boulder South is not far from other Boulder County cities and lies along the rapidly developing U.S. 36 corridor between Boulder and Denver. Louisville is two to three miles east. Urban services are nearby, including those of the City of Boulder and the City of Lafayette (which has part of its water system, Baseline Reservoir, one mile northeast).

Gravel mining occurred on the site previous to its purchase. At the

writing of this master plan, the property is still being reclaimed and re-vegetated under a permit issued by the Colorado Mined Land Reclamation Board. It is anticipated that this permit will remain in effect for several years. The mining eliminated much of the original natural character of the property, in contrast to the largely undisturbed adjoining City of Boulder open space east of the property. CU-Boulder South adjoins existing urban development to the north and west, and a good portion of the site is essentially flat. A warehouse building is located on the property, part of the acquisition. At the writing of this plan, this building has office and storage space for university users, with a portion rented to a non-university tenant.

South Boulder Creek adjoins the property. Most of the property is outside of the South Boulder Creek floodplain according to FEMA (Federal Emergency Management Agency) mapping. The portion of the property south of an existing berm is likely to remain in the 100-year floodplain of South Boulder Creek. Cooperative efforts are underway with the City of Boulder, Boulder County, and the Urban Drainage and Flood Control District on a consultant's study to update flood hazard mapping and develop a new floodplain management plan for the South Boulder Creek watershed. A master plan for South Boulder Creek will include the hydrologic information and other facilities and appurtenances needed to provide mitigation of flood hazards within the South Boulder Creek study area. It is anticipated that the flood study will be completed in 2000. A local drainageway, Viele Channel, also crosses the property and should be studied further.

b. Building Plan

A conceptual land use assessment for CU-Boulder South will identify site opportunities and constraints for the purpose of strategically locating athletics and recreation fields.

During the short-term, CU-Boulder expects to use the property for outdoor intercollegiate athletics facilities, recreational fields, pedestrian and bicycle trails, grazing, storage, and a cross-country running course. Outdoor research projects may also occur at CU-Boulder South, for example those related to plant ecology and environmental biology. Recreational fields and courts (such as tennis courts) are needed for the student population, especially for typical college students in the 18-to-23 age group, and there are no alternative locations for the approximately 75-85 acres of athletics and recreation facilities needed. Due to new building projects on the Main Campus and Williams Village, some recreation facilities may be relocated to CU-Boulder South. This site appears to be ideal for this specific use. Minor spectator facilities may be included, but the major spectator facilities such as the stadium will remain on the Main Campus. Compatible scheduling of the facilities for community recreation will be considered.

c. Transportation

The site has one developed vehicular access, at a traffic signal on Table Mesa Drive just west of U.S. Highway 36. Local and regional bus routes serve this access location, with nearly direct access to Main Campus. There is a developed open space trail crossing the south portion of the property. Additional options for access will be evaluated.

d. Phasing

Environmental, flood, wetland, and species mitigation studies are underway at the writing of this plan. These studies will help identify any limitations that should be addressed, respected, or mitigated.

For this planning period, the only infrastructure improvements which are planned relate to flood protection, drainage improvements, wetlands management, and development of athletics and recreation facilities.

This property can play a significant role in providing land for CU-Boulder needs during the term of this Campus Master Plan, by providing the site for new and relocated athletic and recreation facilities. Planning for the property is already underway. Some development will occur during the life of this master plan. The property is an increasingly important strategic asset to help ensure that CU-Boulder can continue to provide quality education for the citizens of the State of Colorado.

4. Mountain Research Station

The Mountain Research Station (MRS) is located at an elevation of 9,500 feet in the mountains west of Boul-der. The MRS site contains approximately 192 acres and is completely surrounded by the City of Boulder Watershed, Indian Peaks Wilderness Area, and Roosevelt National Forest. Development consists of approximately 65 buildings, including laboratory and office space, housing, a dining hall, bathhouse, field shelters, storage, and a garage. The total gross square footage of these buildings totals only 25,600 gross square feet (23,900 assignable).

The master plan for the MRS recognizes that the station is one of the premier alpine research centers in the world. It is the premier site for research and teaching about alpine ecosystems in the nation, and places CU-Boulder at the forefront of research into the impacts of global warming. The goals for the MRS are designed to enhance CU-Boulder's leadership position in this area of research by:

- increasing the amount and types of teaching and research supported by the Station;
- increasing the public outreach programs of the Station, particularly to K-12 institutions and organizations;
- continuing the conversion of the Station from a summer-only to a year-round facility;
- improving the technological infrastructure to support the programs of the MRS;
- improving the public image of the station commensurate with the educational experience;
- enhancing the relationship between activities at the Station and activities on the Main Campus, in part by integrating research with Main Campus research; and
- developing stronger connections to the rest of CU-Boulder by diversifying the activities offered at the Station.

a. Setting

The developed portion of the Station sits on a south-facing sub-ridge below Niwot Ridge. Exhibit IV-B-5 shows the entire property and highlights the developed portion, which appears in more detail on the next exhibit. Most of the older buildings are sited along the 9,500-

foot contour along the ridge, stretching the developed area out in an east/west line. The highest building is the water collection building at an elevation of 9,575 feet, and the lowest is the sewage treatment plant at an elevation of 9,390 feet. The MRS topographic map is in the earlier campus topography section of this plan (Exhibit II-C-5).

The site slopes steeply to the south. Almost all areas exceed a 1-to-8 slope. Many of the level areas are boggy and have springs, suggesting high ground water. Future development will likely occur in areas with a slope. Care must be taken to minimize cut-and-fill and to provide proper drainage around structures.

Como Creek traverses the site from northwest to southeast near the developed portion of the site. This creek is part of Boulder's water source and is home to the Greenback Cutthroat Trout (oncorhynchus clarki stomias). The creek has one of nine original populations for the trout, which is listed as a threatened species.

The University of Colorado at Boulder is committed to maintaining and improving the habitat for the Greenback trout. The station is installing a new wastewater treatment plan and has worked extensively with the U.S. Fish and Wildlife Service, Colorado Department of Game and Fish, Boulder County, and the City of Boulder on management strategies. The university will soon construct experimental riparian wetlands to filter water entering the creek.

New development must recognize the sensitive nature of Como Creek during design and construction. No new structures should be located within 50 feet of the creek and only limited improvements should be made to existing structures within this zone. Construction techniques must minimize soil erosion and prevent deterioration of stream quality.

The soil characteristics of the Station site vary across the site. In 1997, excavation for the new hostel revealed 10 to 14 feet of glacial till in the center portion of the campus. The eastern side of the site has a much thinner deposit of till, with large rock outcroppings, suggesting bedrock much closer to the surface. The western end of the campus has numerous springs and it is likely that glacial till in this area has a high water table.

b. Building Plan

The following table shows how space is used at the MRS and what additional space is required to meet programmatic aspirations. The usual space standards are not designed for such a unique site, so this table has been prepared based on the specific programs conducted at the station.

The existing utility infrastructure and topographic setting determine where development can occur. The proposed land use plan reinforces the existing land use and corrects some land use anomalies.

As shown on Exhibit IV-B-6, six potential building sites are proposed within the year-round lower shelf area. The four western sites (Sites A, B, C, and D) are located where a logging mill was demolished and are relatively level. Two sites are reserved for the more public functions of the station, including classrooms, computer labs, and research facilities with public interface. Two sites are reserved for researcher housing. Site E, located east of Marr Laboratory, is appropriate for expanded research functions similar to the existing Marr and Kiowa Laboratories. Site F is located at the top of a ridge

and ideally suited for an astronomical observatory. One building site is proposed within the service zone. Site G is suitable for a garage and maintenance structure.

The existing seasonal-use upper shelf area will remain essentially intact. Several cabins adjacent to the existing hostel may be winterized for researcher housing. The existing teaching space is in the Megaron Building, a timber structure constructed in 1928. A new teaching and lab facility should be built, better located on the lower shelf area. Dining facilities would remain unchanged.

Nearly all the structures within the residential zone constitute the original camp settlement. Many of the structures are over 50 years old, some of which date back to the original camp. This creates a unique character to the buildings that adds to the experience of students and researchers. Capital development should consider the architectural richness of existing structures during planning and design of new and renovated structures.

One of the greatest assets of the station is the experiential educational programs. Developing nature trails throughout the site could strengthen these programs. The trails could also be used to improve site circulation, separating pedestrian and vehicle circulation.

The buildings at the station are aging and small by institutional standards. Most of the needed renovation and additions can be done as small projects, falling below the $500,000 threshold for capital construction. A high priority among the projects under $500,000 is completion of the hostel (3,600 ASF) as a year-round residential facility, estimated to cost $380,000.

Some capital construction projects have been identified for the later years of the planning period (to 2008), if resources become available. These include:

- A new maintenance garage, perhaps 3, 600 gross square feet (GSF) (2400 assignable square feet, ASF), estimated to cost $800,000;
- A new research building, estimated at 3,000 GSF (2,400 ASF), $1,000,000;
- A new classroom and computer laboratory, estimated at 3,000 GSF (2,400 ASF), $1,200,000; and
- A new observatory building, estimated at 4,000 GSF (3,200 ASF), $2,000,000.

These four projects should be considered opportunities rather than as yet proposed capital projects. They would be added to project lists and the five-year CIP only after full programmatic review. An observatory building is a unique opportunity given that the site is outside of the developed areas of Colorado, including the Main Campus, where astronomical telescopes are affected by metropolitan lighting.

c. Circulation

The site is accessed almost exclusively by vehicles using Boulder County Road 116. Vehicles coming to the station park in one of four small parking areas. Once on site, most visitors walk about the campus. During the winter, the main road is closed at the Marr Lab and during the summer at the "borrow pit."

At the main station campus, pedestrians share the roads with

automobiles. Currently, there is not enough vehicle traffic to warrant separating the flows but it should be considered in the future as more development occurs. Other pedestrian flows are related directly to research operations. Researchers usually follow the power lines up the hillside until they come back to the road, then hike the road onto Niwot Ridge.

d. Utilities Infrastructure

The Mountain Research Station is in a remote location thereby requiring it to provide many of its own utilities. The station has its own water and wastewater plants, and relies on the Public Service Company of Colorado for its electrical power.

Water is collected from a spring above the developed portion. The spring delivers 40 to 60 gallons per minute into a raw water storage reservoir with a capacity of 8,000 gallons. The raw water is treated chemically and then stored in potable water storage tanks with a capacity of 3,000 gallons. The potable water is distributed to 10 buildings through two trunk lines.

The wastewater treatment plant is being replaced. The new plant will be a tertiary plant with a summertime capacity of 16,875 gallons per day (GPD) and a winter capacity of 1,688 GPD. After the water has been treated, it is held in a pond before being released into Como Creek.

These two utilities create upper and lower boundaries to development at the station. In addition, agreements were necessary with the City of Boulder, Boulder County, and the National Forest Service regarding water use and discharge that essentially cap utilities at these levels. These factors must be considered in planning and design of new structures and ways of maximizing their potential must be used. Sustainable design techniques should be considered as development occurs on the campus, such as composting toilets, gray water systems, and raw water distribution systems for fire protection.

Electrical service comes from an overhead Public Service Company of Colorado transmission line that crosses through the site. Telecommunications systems are as good as those on the Main Campus. A U S West fiber optic cable (T1) is provided to the site. The Marr and Kiowa labs have full university voice and data systems. A separate fiber optic line was installed to the D1 site on Niwot Ridge to provide real-time data feeds from the measurement equipment. Capacity exists to expand this system as the campus grows.

Propane gas is the main heating fuel for winterized buildings at the station. Surface tanks are located near the buildings they serve. The propane distribution system was recently upgraded to meet current demand, but it is likely that new development will need to provide an independent service.

e. Phasing

Utilities infrastructure work is underway at this writing. A telescope is now available from another project in Boulder. Phasing of the building plan is highly contingent on funding. Completion of the hostel is an immediate opportunity to get much needed year-round space: it is unused at present, until funding for finishes can be found.

5. Other Micro-Master Plans

Periodically, other micro-master plans are prepared for campus areas, such as the four discussed in this section, and campus topics, such as outdoor lighting. Micro-master plans have a narrower focus and greater level of detail. Micro-master plans are usually adopted by CU-Boulder, rather than by the Regents representing the entire university, but some have been approved by the Regents.

Other still applicable micro-master plans as of this writing include:

- Research Park Master Site Development Plan, 1987, by Downing Thorpe James & Associates.
- Fischer Field Physical Sciences Micro-Master Plan, 1989, by Peter Heinz
- Mary Rippon Theater Micro-Master Plan, 1991, Midyette/Seieroe & Associates
- The Norlin Quadrangle Historic Area Micro-Master Plan, March 1999, by Design Concepts, Landscape Architects.
- Lighting Master Plan, March 1999, by Clanton & Associates.

Material from these micro-master plans has been used throughout this Campus Master Plan.

C. Outdoor Areas Plan

A campus is a university in a park.
-Frederick Law Olmsted

1. Overview

a. Purpose of the Outdoor Areas Plan

Campus outdoor areas help shape institutional image and campus activities. Quality outdoor area design has implications not only for the campus's visual appearance but also for how the university and the surrounding community relate, how social interactions occur, how people move about campus, and how the environment is sustained. Good outdoor area design includes making the campus a welcoming environment for the campus community and for visitors. The campus should be inviting, safe, and designed so everyone can find destinations on campus.

Outdoor area planning and design help ensure that the campus has a consistent, high-quality appearance. A study completed by *Time* magazine and *Princeton Review, The Best Campuses for Year 1997*, showed that there is a strong correlation between campus appearance and happy students. According to national surveys, prospective students make up their minds about attending a school within their first 15 minutes, and CU-Boulder students rate campus appearance as one of the university's three most significant assets. Such studies confirm that campus appearance can result in larger numbers of student applicants, higher retention rates, and ultimately greater alumni donations.

This outdoor area plan is written for campus administrators, to support and guide decision making; for project planning and design consultants, to ensure that their specific designs are part of a consistent whole; and for maintenance and construction staff, to coordinate incremental campus improvements.

Because the CU-Boulder campus is largely developed, it requires a

different planning approach than a new campus. Addressing concerns that are specific to the Boulder campus will enhance the campus rather than completely transform it. By defining selective improvements and unifying elements, this plan seeks to build upon, not radically alter, the campus's rich design heritage.

b. Precedents

This outdoor area plan evolved from:

- The report of the Task Force on Creating Image, which was chaired by Campus Architect William R. Deno in 1998. This report assessed campus image and generated principles and action-oriented objectives for campus enhancement.
- The Campus Open Space Development Plan of 1981, by William R. Deno, architect; with consultant Hideo Sasaki, member of the University Design Review Board. This plan included outdoor area guidelines that established the campus character and provided direction for continuing development of the campus landscape.
- Previous CU-Boulder facilities master plans dating back to 1895, as collected in a reference notebook of previous CU-Boulder facilities master plans prepared by the University Planning Office and the firm Sasaki, Dawson and Demay Associates.
- Patterns discussed in the book *A Pattern Language* by Christopher Alexander, et al., 1977. *A Pattern Language* represents the culmination of years of research that defined 253 frequently occurring problems in a variety of exterior environments and their solutions.

c. Coordination with the Transportation Plan

Outdoor spaces are used by all modes of transportation, so closely related to this outdoor area plan are plans prepared concurrently for transportation (IV-E). This Outdoor Areas Plan emphasizes aesthetic aspects, social functions, and welcoming design. The Transportation Plan emphasizes function considerations for transportation modes (walking, bicycling, transit, vehicular movement and parking).

d. Terminology

Each section describes a "pattern" (see the "Precedents" section above) that occurs in the campus environment, describes issues related to that pattern, and recommended responses to it.

- A **goal** clarifies the appropriateness of the pattern for CU-Boulder outdoor area development. Goals include both functional and visual components.
- A **guideline** is a desired action necessary to reach a goal, guiding planning and design efforts. Guidelines must be applied with discretion to achieve appropriate design.
- A **standard** is a specific product or design detail to be used throughout the campus as a means of achieving goals and guidelines. In general, standards are not included in this master plan but adopted separately.

e. Organization

Patterns are organized into six sections, each of which includes

background, examples, associated functional and economic implications, goals, and guidelines:

- **Community Interface** addresses campus corners, edges, entrances, and connections between campuses.
- **Social Spaces** addresses how spaces are used, how often they are used, and how people enter buildings and outdoor spaces.
- **Pedestrian Areas** addresses what the pedestrian sees and experiences-such things as signs, shelters, and conflicts with vehicles.
- **Vehicular Areas** addresses roadways and parking for cars, emergency vehicles, service vehicles, and mass transit.
- **Landscaping** addresses the relationship between the campus and the natural landscape, drainage, and planting in relation to buildings.
- **Site Accessories** addresses objects located on the site-their style, color, material, and location.

2. Community Interface

a. Campus Corners

Campus corners-located at the intersection of streets-shape the first impression of the campus for most visitors. Consequently, they should let people know they have arrived at a prestigious institution.

Currently, most corners of the CU-Boulder campus form an inconsistent and unimpressive image. For example, existing small-scale landscaping is more characteristic of a smaller campus.

Corner development for the Research Park at Colorado Avenue and Foothills Parkway is a possible precedent for the Main Campus. Image-setting signage at this location has a backdrop of mass plantings and is designed with materials characteristic of the Boulder campus.

Corner improvements will be relatively expensive, but they can be done one at a time as funds permit. Broadway at Baseline and Colorado at 28th are among the important corners needing attention. Additionally, the northeast corner of Broadway and University and the southwest corner of Arapahoe and Folsom should have campus corner improvements if these properties are purchased in the future.

Goal
Landscaping and signage at corners of the campus will create a high-quality, unifying image for the campus.

Guidelines

- Create large-scale landscaping designs at campus corners that are suitable for a large campus.
- Provide mass plantings at campus corners as a backdrop for signage and specimen plants.
- Use consistent, image-setting, vehicular-scaled, durable signage at campus corners.

b. Campus Edges

Boulder campus edges have depth. They almost always include sidewalks, lights, signs, site accessories, and they frequently include bikeways. People move along edges as well as pass through them,

and they are key spaces of community interface.

Some perimeter edges, which provide an interface between the campus and community, are porous and allow views to the interior of campus while others serve as a barrier. Edges range in character from those that suggest a campus actively engaged with the community to those that suggest a cloistered campus. Within this range, different edges of the Boulder campus have different functions.

When arriving from Denver, the first views of the campus are from 28th Street. Efforts have been underway to improve this edge, and work has been proposed with the City of Boulder to fund and improve both sides of the street and the median. Baseline and Broadway edges have been improved in recent years, but these more porous edges would benefit from entrance improvements and conscious attention to the views into and out of the campus. Colorado Avenue, University Avenue, and 17th Street are corridors into the campus and would benefit from processional landscaping and safety improvements for pedestrians and bicyclists. Folsom Street and Arapahoe Avenue edges lack campus identity and should be modified to be more consistent with the rest of campus. In particular, parking lots visible from Folsom Street and Arapahoe Avenue should be well landscaped.

Goal
Aesthetics and functionality of campus edges will be enhanced.

Guidelines

- Provide a sense of continuity along each campus edge.
- Improve campus edge landscaping, signage, site accessories, and material selections.
- Soften views of perimeter parking lots with landscaping.
- Improve safety for all modes of transportation along campus edges by designing for appropriate vehicular speed, safety, and appropriate lighting.

c. Campus Entrances

Well-designed entrances help direct people toward their destination and make visitors feel welcome. They also contribute considerably to the first impression visitors have of the campus.

Campus entrances for vehicles, pedestrians, and bicycles should provide an experience similar to passing through a doorway. The threshold should be indicated by a change in surface materials or details, and the sides of the entrance should be framed by landscaping or other improvements.

Vehicular entrances should have signage identifying the entrance and whether visitor parking is accessed through that entrance. Pedestrian entrances should function as message centers; major pedestrian entrances should provide a campus map. Pedestrian entrances are also appropriate locations for bus stops, kiosks, and flower beds.

A consistent design concept for campus entrances should be developed and implemented.

Goal
Campus entrances will be inviting.

Guidelines

- Create pleasant transitions for those entering or exiting the campus.
- Provide higher than normal lighting levels at campus entrances.
- Provide signage that is simple and functional at major vehicular entrances with a logo, name of the entrance, direction to visitors parking.
- Provide orientation maps for pedestrians and bicyclists at campus entrances.
- Redesign, relocate, or remove signs and site accessories that create clutter at campus entrances.

d. Connections between Boulder Campuses

The functional and visual relationships between the Main Campus and other CU-Boulder campuses are weak. Campus image is undermined because there are multiple campuses. Travel between campuses is not efficient. Logistical cohesiveness should be developed even though the university does not own the land between campuses.

A parkway with unifying landscaping, lighting, and signage should be developed to connect the Main Campus with the Research Park. Consistent signage should be used on and between the campuses. Adequate sidewalks, bike lanes, landscaping, and lighting should also be developed.

Existing conditions should be improved where necessary, and new connections developed where needed. Joint projects with the City of Boulder or State of Colorado for such improvements are the best approach, because roadways and properties between campuses are not owned by the university.

Goal
Connections between the Main Campus and other CU-Boulder properties will be strengthened.

Guidelines

- Enhance pedestrian, bicycle, and vehicular facilities between CU-Boulder properties.
- Create new functional connections between properties in Boulder, where connections are missing.
- Add signage directing users between CU-Boulder properties.
- Use landscaping and lighting to link CU-Boulder properties visually.

3. Social Spaces

a. Active and Passive Spaces

The CU-Boulder campus offers both actively used spaces and quiet, contemplative spaces. A space that is filled with students suggests social interaction, group activities, people watching, public speaking, and vending. Less actively used spaces suggest quiet, reflective behavior, including study and writing. Intensely used spaces are usually located near major buildings such as the UMC, Norlin Library, and larger classroom buildings. Quiet spaces are scattered around campus and include the natural areas along Boulder Creek and Varsity Lake.

The function(s) planned for a space and the design of the space should be commensurate with its population density and intended use. Development of distinctive activity spaces and distinctive tranquil spaces are good candidates for alumni donations. Organized activities occurring in specific spaces should also help fund the development and maintenance of such spaces.

Goal
Outdoor spaces will be designed to facilitate varied activity.

Guidelines

- Provide outdoor areas that accommodate different intensities of use.
- Focus activity nodes along the most heavily traveled pedestrian walks.
- Retain tranquil spaces for reflection and quiet activities.
- Provide a variety of places to sit in both active and passive spaces.
- Consider the solar orientation.

b. Outdoor Rooms for Campus Functions

Buildings and landscaping can form outdoor "rooms" that facilitate various uses. Several rooms in sequence make for an interesting experience as pedestrians travel from one space to another. Such outdoor rooms need definition, features, and signage that gives recognition to them and makes them special.

Outdoor areas need to accommodate many official and social functions. Uses for outdoor rooms vary from very large-scaleÐfootball games in the stadium or commencement in Norlin QuadrangleÐto progressively smaller scalesÐfrom a theater performance in the Mary Rippon Theatre to a single person reading under a tree. Lawns suitable for outdoor classes during good weather should be located close to all classroom buildings. Courtyard fountains create focal points to which people are attracted. The East Campus and Williams Village don't have many well-defined outdoor rooms and would benefit by the creation of such spaces.

Both everyday activities and special events should be considered in outdoor area planning. Security for such activities and events can be enhanced by encouraging the use of appropriate sites, avoiding overgrown landscaping, and providing necessary lighting. Special events can often contribute financially to the development and maintenance of a space.

Goal
Outdoor areas will be tailored to suit a variety of functions.

Guidelines

- Develop outdoor areas to reflect the amount and type of social interaction in each.
- Facilitate functions that are recurring in outdoor areas.
- Orient seating areas for solar warmth and protection against northwesterly winter winds.
- Create a special character for each significant outdoor space.
- Include focal points such as fountains to designate special outdoor rooms.
- Name outdoor spaces and provide identification signage.

c. Entrances to Outdoor Rooms

Entering an exterior space can be as memorable as entering a beautifully designed building and can contribute to the overall campus image. However, if an entrance is ill-defined or unkempt, one's perception of the entire space is undermined.

For example, entrances to the housing quadrangle east of Farrand Hall need improvement. Landscaping, lighting, and signage are not effectively used to enhance entrances to this beautiful quad. Entering the space, pedestrians must pass trash containers, dumpsters, and service vehicles.

If properly designed, entrances to exterior spaces can help with wayfinding. Lighting and landscaping such entrances instill a sense of safety, and such entrances are ideal locations for directional signage. Often, cleaning up the area, relocating or screening maintenance facilities, and providing better site accessories are all that is needed to improve entrances to exterior spaces.

Goal
Outdoor rooms will be designed with an emphasis on how they are entered.

Guidelines

- Better screen maintenance facilities (such as trash/recycling areas).
- Use landscaping to frame and enhance transitions between outdoor spaces.
- Consider changes in lighting to guide transitions between outdoor spaces.

d. Social Spaces for Housing

The recreational fields and other recreational spaces that exist near most of the residence halls serve the needs of all students—especially those living on campus. Such facilities should be enhanced and additional amenities considered. For example, Observatory Field is poorly sized and shaped for organized sports; nevertheless, it is heavily used because of its visibility and its location next to housing.

Basketball courts, volleyball courts, and spaces for events such as outdoor barbecues are examples of facilities that should be convenient to campus residence halls. Outdoor events are opportunities for health and recreation, but even more important, they are opportunities for social interaction. Exterior places to lounge and read also encourage social interaction and studying. Courtyards and forecourts can be good locations for these quiet, passive activities.

Students could be surveyed to determine appropriate functions for residence hall recreation spaces. Housing and student recreation funds are both potential sources of funding for such spaces.

Goal
A variety of social outdoor areas will be located adjacent to residential development.

Guidelines

- Retain the large, open, and relatively flat lawns for a diversity

of recreational and social uses.
- Provide facilities for a variety of sports.
- Facilitate social interaction within outdoor spaces.
- Encourage studying outdoors rather than perpetuating a "keep off the grass" approach.
- Enhance lighting for evening safety and evening use of outdoor space, but avoid lights shining into sleeping rooms.
- Better utilize the many existing forecourts of residential buildings.

e. Building Forecourts

Forecourts are courtyards in front of buildings. They provide useful transition zones between larger outdoor spaces and the building entrances; their designs can also facilitate social interactions or quiet studying.

Outstanding forecourts are a distinctive feature of many Main Campus buildings. Traditionally, wings of buildings, site walls, and/or arched openings at least partially enclose the forecourt. Some new buildings do not have forecourts; others, notably the Mathematics Building, created successful forecourts that have become exciting and heavily used spaces. Several Research Park buildings have appropriate forecourts.

Considerable effort is put into designing beautiful buildings, but this effort is undermined if the forecourt's landscape is poorly designed or inadequately maintained. Several forecourts have excessive barrier rails around lawns. Inappropriate volunteer vegetation should be removed.

An example of a beautifully designed forecourt with opportunities for improvement is at the west entry to Farrand Hall, where the bike parking, paving, and landscaping detract from an otherwise spectacular entrance sequence. Generally, bicycle parking and dumpsters should not be located in pedestrian-oriented forecourts. Campus Master Plan Section IV.E.4 addresses bicycle parking locations. Dumpsters usually should be located in service areas.

Goal
Building forecourts will continue to be developed and enhanced.

Guidelines

- Incorporate forecourts into the design of new buildings.
- Include site walls to change elevation, reduce the scale of buildings, define outdoor areas, and provide seating.
- Use forecourts to accommodate both passive and active functions associated with their respective buildings.
- Renovate landscape to enhance forecourt and building functions.

f. Building Entryways

Entryways may or may not contain a forecourt. Each building entryway includes not just the door to the building but also the surrounding landscape plus site accessories. Entryways, which can be an important place to meet and greet people, should be inviting, safe, and functional. New buildings' entries should be sheltered from the weather with cover over the doorways. Secondary entrances to buildings should be understated to emphasize the significance of the

principal entrance(s).

The considerable effort put into designing beautiful buildings is undermined if the entryway area is poorly designed or inadequately maintained. For example, the west entrance to the Engineering Center benefited from the addition of bollards that prevent service vehicles from blocking the entrance.

Enhancing entryways is one of the least expensive outdoor area goals to achieve. Often maintenance, rearrangement of site accessories, and landscape pruning are all that is needed. Safety is improved by appropriate lighting; litter is reduced by installing trash receptacles; increased visibility enhances safety and wayfinding; and thoughtful selection and arrangement of plant materials increases wind protection and minimizes ice buildup on walks.

Goal
Building entryways will be enhanced.

Guidelines

- Use landscaping to frame and enhance building entrances.
- Arrange site accessories and lighting to improve entryway aesthetics and safety.
- Remove trash containers and dumpsters that visually detract from entrances.
- Remove landscaping that blocks views of entrances.
- Incorporate rain and snow protection when designing entryways.

g. Outdoor Food and Vendor Areas

A street cafe or market has the potential of being a very active and exciting space. Such places have been successful on many campuses. For example, Bruin Walk at UCLA not only serves the campus population but also is a magnet for visitors from the surrounding area. Outdoor vendor areas are located near the student centers of many university campuses.

Dalton Trumbo Fountain Court, Fieldhouse Plaza, and Coors Events/Conference Center entry plaza are desirable outdoor food and vendor locations. The Fountain Court, which has one of the highest daily population densities, is used occasionally for vendors. The other locations are especially appropriate for vendors during special events. A cafe and retail store in the Stadium Building, including tables with umbrellas on Fieldhouse Plaza, would enliven the space, accommodating both daily needs and special events at the stadium and fieldhouse.

A street cafe or market is a place for campus retail; but even more important, it is a place that encourages interaction between people. Funding for facilities improvements and maintenance should come from the retail or event sponsors.

Goal
Street cafes or markets will be facilitated.

Guidelines

- Locate a cafe or market near highest population densities.
- Hold vendors responsible for maintaining their areas.
- Develop vendor areas as a revenue source; include CU-branded

merchandise.
- Provide for lighting, electricity, and shade at vendor areas.

4. Pedestrian Areas

a. Walkways and Nodes

This section guides the design of pedestrian areas. Section IV.E.3 of the Campus Master Plan is more site-specific regarding pedestrian routes.

Well-designed walkways enhance campus image and pedestrian orientation. Walkways also have a social function, channeling the flow of people, resulting in face-to-face contact. Benches and other amenities along walkways enhance this social role.

Functionally, many walks need to be oriented toward building entrances, but orientation toward special views should also be considered. Because poorly aligned walkways encourage pedestrians to create informal paths across lawns, walkways should accommodate desired routes, with barriers provided, if necessary, to protect natural areas or large lawns. Small plazas or nodes are appropriate where significant walkways intersect. At nodal intersections, directional signage is appropriate to aid pedestrian wayfinding.

Some principal walkways are not wide enough to accommodate existing pedestrian flows or snow removal equipment and should therefore be widened. This is especially true in Norlin Quadrangle. But excessive paving is unsightly and increases the amount of storm water drainage.

The number of walkway materials should be limited to concrete in most applications and unit pavers for distinctive nodes and larger plazas. Good repair is essential; controlled maintenance funds are typically used to repair or rebuild walkways. Many narrow, informal footpaths across the landscape, which are not accessible for wheelchairs, are best surfaced in local flagstone, which is an attractive historical reference.

Goal
Walkways and nodes will accommodate and help orient pedestrians.

Guidelines

- Align walkways along pedestrian-desired lines.
- Coordinate walkway location and design with buildings and views.
- Correct existing misalignments of walkways.
- Maintain principal walkway widths appropriate for the volume of pedestrian traffic and not less than needed for efficient snow removal, which is about seven feet.
- Avoid colored concrete walkways, to distinguish reddish-concrete separated bikepaths.
- Provide generous corner radii or small plazas (nodes) where walkways intersect.
- Consider multi-modal use, such as bicycles and service vehicles.
- Use flagstone, preferably, for footpaths not accessible to wheelchairs.

b. Overlooks

As one walks around the campus, the beauty of its natural setting is not fully appreciated. Special seating areas should be created where people have views of the mountains.

The bluff along Boulder Creek (behind Sewall Hall, Clare Small, and the Student Recreation Center) is an excellent location for a promenade overlooking the native landscape along Boulder Creek, and affording vistas to the north and west. A promenade designed as an overlook can also help fulfill the functional need of moving people from place to place. An overlook can be used to define the edges of natural landscapes in such a way as to reduce intrusions into environmentally sensitive areas. Controlled access to natural areas minimizes disruption to fragile ecosystems, avoids erosion and slope stabilization problems, and reduces the need for maintenance, security, and lighting.

Overlooks might be funded through donations or by community interest groups.

Goal
Scenic pedestrian overlooks will be developed.

Guidelines

- Create a promenade on the bluff overlooking Boulder Creek and the city.
- Create places along walkways to observe and appreciate native landscape.
- Create places on campus to appreciate the mountain setting.
- Improve walkways crossing the creek to improve safety, scenic access, and natural area protection.

c. Shelter along Walkways

Colorado has a relatively mild climate. But students and others sometimes have to walk long distances on campus in inclement weather. Providing some relief from the elements creates a level of comfort and well being. All-weather shelters along pedestrian walkways can provide relief from snow, wind, rain, and sun.

Studies have shown that sheltering the pedestrian makes long walking distances much more acceptable. If walks are sheltered, then parking and campus functions can be acceptably located further from user origins or destinations. The use of arcades and shelters also creates spaces for social functions. An excellent example of this is the UMC arcade, which often is enlivened by vendors.

The campus already has many places where walks are sheltered or where people have relief from inclement weather; more should be provided. Future buildings can be designed to allow pedestrians to pass through the buildings (e.g. Benson Earth Sciences and the Humanities Building). Buildings also can be designed with arcades (e.g. Duane Physical Laboratories and the UMC). Such gestures send a strong public relations message about a university that is creative and caring. Landscaping can also shelter walkways.

Goal
Sheltered walkways will be encouraged.

Guidelines

- Construct additional building arcades and other exterior covered

spaces.
- Strategically place all-weather shelters along pedestrian paths, at major bus stops, and at pay parking stations.
- Plan walkways and building circulation so pedestrians can move through buildings to cross the campus.
- Landscape to protect walkways from strong winds and inclement weather.
- Enliven arcades and shelters as social spaces with pedestrian amenities.

d. Directional Signage

Well-designed signs can help unify campus architecture, orient people, and create a sense of order. Signs can also provide color, interest, and detail to enhance campus image.

The campus has reasonably consistent building identification signage but very little directional signage. As a result, newcomers frequently become disoriented, especially because buildings and spaces have a consistent design character. For campus visitors, especially during conferences, paper signs are inappropriately posted throughout campus. A more permanent solution is required. Campus map kiosks are useful to some people.

A system of directional signs, strategically located at key intersections and nodes, would alleviate wayfinding confusion. In addition, places and streets should be given memorable, recognizable names and be identified with signs. The design character and materials for signs should be compatible with those of surrounding buildings, making rustic signs, for example, inappropriate.

Controlled or deferred maintenance funding may be available to keep a signage system up to date.

Goal
Directional signage will be added on campus.

Guidelines

- Provide consistent directional signage at key intersections and nodes.
- Design signs so they can direct people to multiple destinations.
- Place up-to-date maps at campus entrances, parking garages, major buildings, and walkway nodes.
- Identify the bike routes through campus with appropriate signage.

e. Grade-separated Crossings

For years, campus planning has made a concerted effort to reduce conflicts between pedestrians, vehicles, and bicycles: a pedestrian-only zone has been created; underpasses have been constructed below Broadway at College, below 28th Street in two locations, and below Broadway near Kittredge. Several more grade-separated crossings exist on bike paths to the East Campus and Williams Village.

Well-designed intersections, and appropriately designed multi-modal streets, are usually the answer to conflicts between modes of transportation. But some intersections with high use and hazards may warrant grade-separate crossings. Some areas of concern are

the Regent Drive crossing at Fiske Planetarium, Regent Drive crossings east of Engineering, and crossings of University Avenue.

Alleviating modal conflicts can make the campus safer. Transportation funds from off-campus sources often make this possible.

Goal
Create grade separation between pedestrians and vehicles where there are high traffic volumes, safety issues, and where at-grade options don't work.

Guidelines

- Locate grade-separated crossings, preferably where there are existing topographic differences enabling pedestrians to encounter minimal grade changes.
- Design grade-separated crossings as wide as feasible in order to accommodate both pedestrians and bicycles.
- Include full accessibility at grade-separated crossings.
- Incorporate materials from the campus palette into grade-separated crossings.
- Include public art and skylights in pedestrian underpasses.

5. Vehicular Areas

a. Multi-modal Streets

Traditional street design can be inhospitable to bicycles and pedestrians. Consequently, many streets that once crossed the CU-Boulder campus have been eliminated. Campus planners have experimented with innovative designs that accommodate many modes of transportation, such as the pedestrian plaza east of the Engineering Center (at which bicycles, service vehicles, and cars may cross).

The high-density Colorado Avenue and 18th Street corridors are incrementally being converted to a transit mall. These streets today are not the most pleasing part of the campus. Much could be done to enhance the two streets for safer multi-modal movement and improved appearance. Improved surfacing, lighting, signage, bicycle parking, and site accessories (including benches and bus shelters) are needed. Pleasant Street on the campus also needs modification to accommodate major east-west bicycle traffic.

Low-traffic campus roads provide opportunities to better accommodate all transportation modes. In Europe, particularly in Germany and the Netherlands, some roads have been converted to "woonerf" streets, which are specially designed to allow all transportation modes to share the same corridor, but at reduced speeds and giving priority to pedestrians. Designs for such roads include avoiding traditional sidewalks, curbs, and gutters; upgrading surface materials; and meandering vehicular routes to slow traffic.

Funding for multi-modal ways has been difficult to find for the CU-Boulder campus, which has relied on building projects to fund site improvements. The campus will need to find new transportation funding sources.

Goal
Create well-designed, multi-modal roads within the desired campus context.

Guidelines

- Improve crosswalks for traditional streets (such as Regent Drive and University Avenue) by using multi-modal design features such as raised or textured pavement, or meandering lanes, to slow vehicles.
- Give pedestrians and bicycles priority in multi-modal areas.
- Upgrade site furnishings, street trees, surface paving materials, and lighting to enhance transportation corridors.
- Place generously-sized bicycle parking areas along multi-modal streets.

b. Convenient Bus Stops

The bus stop is the transition point where the passenger becomes a pedestrian. It functions as a place to wait and possibly to obtain shelter and information. Too often on the Boulder campus, bus stops are located in out-of-the-way places that are not visible or convenient.

Transit connections near the UMC are very inconvenient. Despite the fact both the Hop and Williams Village buses traverse Euclid Avenue in front of the UMC, neither stops there. A UMC-area transit center is being considered.

Some bus stops, such as the one in front of 914 Broadway, don't have direct walkways to the bus stop, causing pedestrians to cut across lawns and through parking lots to get to their destinations.

Most bus stops on campus lack seating or a shelter, and many (such as the RTD bus stop north of the Engineering Center) are located away from pedestrian concentrations. Providing seating at bus stops would help encourage transit use, and bus shelters would be much-welcomed amenities in inclement weather.

Financial support for improved bus stops would be expected from RTD or other service providers such as the City of Boulder.

Goal
Locate better bus stops at activity centers.

Guidelines

- Locate campus bus stops so they are convenient to the ridership.
- Plan pedestrian walkways so there is a direct connection to bus stops.
- Provide higher-than-normal light levels.
- Add seating at all campus bus stops and shelters at the most heavily used locations.
- Orient shelters to allow view of arriving buses, and to provide shelter from the northwesterly winter winds.

c. Drop-Off Zones

A drop-off zone is a place to drop off or pick up someone or something. Convenient and attractive passenger drop-off areas reduce aggravation, reduce pedestrian walking times, and reduce parking demands. Appropriate vehicular wait zones include signage and seating.

Some areas of the campus, such as the traffic circle in front of Folsom Stadium, are informal drop-off zones. In such situations new signage, better landscaping, and seating are needed. In other areas, new drop-off zone construction is recommended. Drop-off zones should be added or enhanced at Sewall Hall, UMC, Regent Administrative Center, Coors Events/Conference Center, the Student Recreation Center, and the Engineering Center.

Most drop-off zones can be created by minor site improvements, appropriate parking regulations, and by posting adequate signage.

Goal
Drop-off zones will be designated.

Guidelines

- Locate drop-off zones as close as possible to major activity centers.
- Provide convenient vehicular and pedestrian access to drop-off zones.
- Post appropriate regulatory and directional signage at drop-off locations.
- Provide seating for people waiting at drop-off zones.
- Landscape to provide attractive and safe drop-off zones.

d. Parking Lot Design

Parking lots should be creatively designed to appear as part of the surrounding landscape and to contribute to a positive campus image. For example, deciduous trees provide solar protection for vehicles in the summer and allow solar heating in winter. Conifers can be used to screen lots from cold winter winds. Landscaping can be used around lots to integrate them into the campus and can be used within lots to break up the visual impact of extensive pavement and cars.

Most campus parking lots are functional, but they don't typically integrate the paved surface and the surrounding landscape. One of the best campus parking lot designs, Lot 327 east of Regent Administrative Center, includes many of the features discussed here. Parking lots that would most benefit from landscaping are those east of the Engineering Center (Lots 436, 437, and 440), which are often used by visitors.

All motorists become pedestrians once they park, yet frequently sidewalks are not provided for pedestrian access to, and through, parking lots.

Adequate parking lot landscaping could be completed over time with parking funds.

Goal
Parking lots will be better integrated into the surrounding landscape, and pedestrian routes to parking lots will be provided.

Guidelines

- Provide landscaping in and around parking lots to soften appearance and provide shade.
- Provide sufficient landscaped setbacks between parking lots and streets.
- Provide walkways from parking lots to buildings served.

- Ensure adequate parking lot lighting for safety.
- Accommodate car overhangs in parking lots design.

e. Convenient Service Parking

One of the pressing problems on campus is access and parking for delivery and maintenance vehicles. These vehicles frequently park on sidewalks and even lawns because there are not enough convenient service parking spaces. Parked vehicles also frequently block emergency fire lanes. Such actions undermine safety, maintenance, and campus image.

To solve this problem, precast concrete bollards are used to keep vehicles off selected walks and plazas, such as in front of the Engineering Center and Imig Music buildings. Service vehicle parking is in short supply, partly because some areas built for service parking have instead been designated for long-term staff and faculty parking. The solution is to provide service vehicle parking spaces and then limit service parking to those spaces.

Goal
An adequate supply of service vehicle and loading spaces will be designated.

Guidelines

- Provide loading and service vehicle parking spaces near each building.
- Screen or soften (with landscaping) views of service areas where possible.
- Limit service parking to designated spaces.
- Prohibit service parking in plazas, forecourts, and entryways.
- Use curbs selectively along campus walkways to discourage all modes of transportation from crossing or parking on landscaped areas, including lawns.

6. Landscaping

a. Campus/Foothills Relationship

The campus landscape is generally informal, not rigidly arranged. The foothills and associated Flatirons had a significant influence on the design of the campus landscape. When creating Boulder campus designs based on the architecture of rural Tuscany, Charles Klauder include the same vertical conifers as those growing in the foothills. However, many of the original conifers planted on the Main Campus are at the end of their lifespan.

On the newer portion of the campus, vertical conifers have not been used to the same extent as on the older part of the campus. More vertical conifers should be planted throughout the campus, especially in newer areas, to provide much-needed campus unity. They enhance visual interest during the winter, when the campus is most heavily occupied. Vertical conifers planted along the north sides of buildings screen cold winter winds, lowering heating costs. They can also be used as wind breaks to protect walkways and special exterior places. Conifers use less water than deciduous trees and can be added in groups or one tree at a time.

Unit costs for evergreens are low, and tree planting can be tied to maintenance budgets, new construction projects, or donor-funded

tree programs.

Goal
The campus's visual relationship with the foothills will be enhanced by planting more evergreens.

Guidelines

- Place more emphasis on the winter appearance of landscape materials.
- Develop landscape plans that include vertical conifers.
- Use native landscape materials to a greater extent.

b. Natural Areas

Originally, most of the campus was a windswept, shortgrass prairie Ð certainly not the most friendly environment. The university uses its ditch rights (water diverted from Boulder Creek, much of which is eventually returned) to allow trees, plants, and grass to grow, at low monetary and environmental cost. This creates a more usable campus. Creek bed areas still approximate natural conditions and can be good environmental study areas. The abundance of open space around Boulder also provides opportunities for the study and enjoyment of native landscapes.

The most significant campus natural area is along Boulder Creek, which functions as a habitat for many native plants and animals and is an ideal location for academic programs to study flora and fauna in their native environment. Pedestrian infringement into the natural area should be minimized, yet students and others should be able to experience the tranquillity of a flowing creek. Edges should be enhanced, especially along the bluffs above Boulder Creek, and the landscape should be reestablished in some adjoining areas, particularly north of the stadium east of Folsom Street.

The retention or restoration of native landscaping is especially appropriate on land that floods, on steep slopes, and in wetland areas. An excellent example is the wetlands area restored when the Research Park was developed on East Campus. It requires strategic planning to protect these often fragile environments within the urban area while accommodating human enjoyment of them.

Goal
Native landscape areas will be designated and protected.

Guidelines

- Preserve riparian corridors and designated wetlands.
- Preserve flora and fauna habitats.
- Use drought-tolerant plantings (xeriscape) in natural areas and elsewhere, where appropriate.
- Reestablish selected natural areas.
- Create pedestrian routes to minimize disturbance of native landscape areas.
- Enhance the transitions to native landscape areas.

c. Natural Contours

Over the years the campus design has been sympathetic to the site's natural topography. Buildings seem to grow from the site, and there are few obtrusive retaining walls or unnatural grades. This approach should be maintained. The extensive regrading done for the Research

Park is a good example of using natural contouring to assure good drainage and mitigate flooding.

North of the stadium, behind storage buildings, fill abutting Boulder Creek created an unnaturally steep slope that would best be addressed by regrading the area closer to natural contours. In past years, Boulder Creek was occasionally treated as a dumping ground rather than the valued natural resource we know it as today.

Goal
Natural contouring will be the norm on campus projects.

Guidelines

- Regrade where needed so that it appears natural.
- Match streets and parking to topography.
- Avoid unsustainable slopes.
- Avoid retaining walls if possible.
- Create berms only when necessary with gradual, natural-looking slopes.
- Stabilize slopes along Boulder Creek.

d. Sustainable Drainage

A sustainable drainage system accommodates storm water while controlling erosion. Site drainage is an increasing problem as more of the campus is covered with buildings and pavement. In very highly developed areas, it is necessary to pipe storm water. But piped systems generally accommodate only a 10-year storm, at best, so surface and natural drainage systems remain essential. Outdoor areas can accommodate surface drainage systems designed to meet functional requirements, create wildlife habitats and provide landscape features that enhance the campus image. As compared to subsurface systems, above-grade drainage is usually less expensive to install and maintain.

Existing surface drainage systems are in need of landscape augmentation and other improvements to ensure their natural function. Outfalls to Boulder Creek are causing erosion; stagnant water is a problem in some areas; and studies have been completed of the eutrophic condition of the Kittredge ponds. In addition, there are a surprising number of locations where land slopes toward buildings, which often causes water problems after major rainstorms. Controlled maintenance funds should be sought to correct these conditions where possible.

Goal
A sustainable drainage system will be reestablished.

Guidelines

- Enhance detention/retention areas with appropriate landscaping.
- Slope sites to drain away from buildings, sidewalks, and plazas.
- Use landscaping to control soil erosion.
- Use academic resources to study sustainable systems.

e. Planting Variety and Massing

A successful landscape includes ground plane plantings, understory plantings, colorful seasonal plants, shrubs of different sizes, foliage color and change, fragrance, appropriate scale and form, and

characteristics delighting the senses. Landscaping in relationship to the buildings can extend and enhance architectural forms.

Campus buildings are generally large and deserve landscaping of comparably large scale. Planting in mass is more indicative of how plants grow in nature; can be used to define space for outdoor functions; can screen excessive wind, sun, and vehicular traffic; can frame vistas; and can have less intensive maintenance. Some of the many smaller-scale, higher-maintenance planting should be replaced or augmented with mass plantings, with materials ranging from small ground plane plants to large trees. Mass plantings ideally are designed in layers. They can become good backdrops for accent planting, signage, or special places.

Goal
Larger scale planting masses will be emphasized.

Guidelines

- Cluster plant materials for appropriate design scale.
- Compose landscaping to create outdoor spaces in harmony with the architecture.
- Add accent plantings as foreground elements to mass plantings.
- Develop mass plantings at campus corners and entrances.
- Use more drought-tolerant plantings, naturally grouped.
- Plant flowers together in quantity, often in raised beds, for greatest effect.

f. Prominence of Major Buildings

Buildings that house major functions Ð library, student center, administration, intercollegiate athletics and cultural facilities Ð should not be obstructed, because they help orient people, lessen the need for signage, and enhance positive perceptions of the campus. Complementary landscaping should be used to emphasize these buildings and their entrances.

On the Main Campus, major buildings usually terminate axial views. Many of these views have become obstructed as landscaping matures or is planted in inappropriate locations. For example, Norlin Quadrangle should be landscaped to enhance the axial view of the library's west colonnade. The view of the library's east entrance from 18th Street is also obstructed, and the dumpster there should be relocated. At University Avenue and 17th Street, the tree blocking the axial view of Sewall Hall should be removed. Trees blocking the view of Carlson Gymnasium should be pruned so the view of the building isn't obstructed.

Removing obstructions is usually low-cost maintenance work.

Goal
Prominent buildings will be less obstructed.

Guidelines

- Trim or remove landscaping blocking desired views.
- Plant landscaping that enhances buildings and their details.
- Realign walks if necessary for better orientation with major buildings.
- Relocate service facilities (e.g. dumpsters) that obstruct views of major buildings.

- Landscape to compliment nighttime lighting of major buildings.

g. Campus as Arboretum

Over the years a significant variety of trees have been planted on the campus, providing the foundation for an arboretum. To maximize this resource, existing trees and plants should be identified and new ones added. Specimen trees (such as the northern red oak southeast of Hale) should be identified and labeled. Guide maps and videos could be created.

An arboretum enriches academic programs, attracts visitors, and is an asset for public relations. A campus arboretum is a significant statewide asset that could become a teaching tool in grades K through 12. Some campuses establish a specific arboretum endowment to which people can donate money. Many universities even have obtained designation of their entire campus as an arboretum.

Goal
The campus landscape will serve as an educational resource.

Guidelines

- Label major significant trees.
- Continue to increase the variety of tree species on campus.
- Work with the natural history museum and EPO Biology Department to ensure that landscaping is a teaching resource.
- Continue to have specialty, thematic gardens (such as Japanese), and intensive-care gardens.

7. Site Accessories

a. Complementary Accessories and Barriers

Site accessories are essential for functional outdoor areas and include such elements as benches, bollards, kiosks, bicycle racks, light poles, trash containers, and signs. Materials and colors for site accessories should be limited to those that maintain a cohesive campus design.

On the Boulder campus, a strong sense of order and continuity is created by using black metal site accessories to complement the black metal used on campus buildings. The ideal color is "Philadelphia red," a black that has an added dash of red to warm the color. More black metal park benches are needed on campus. Precast concrete, another campus building material, is durable and acceptable for some trash containers and bollards.

Although not considered site accessories, barriers and site walls follow similar guidelines suggesting use of stone, concrete, and black metal. Chainlink fences should be avoided, but where necessary, such as around recreational fields, they should have a black coating and specially designed posts to provide design continuity. Landscape timbers and wood fences are not appropriate materials on campus, and their use should be discontinued.

Accessories in unobtrusive but useful locations should be included with each building and landscape design. Accessories should be placed on hard surfaces, not lawns.

Goal
Site accessories will be complementary to the style of the buildings

and grounds.

Guidelines

- Add more park benches and other accessories to help people make the best use of the campus.
- Standardize site accessories, selecting those readily available, to keep costs reasonable.
- Specify black metal for most site accessories.
- Use the campus materials palette for barriers and walls.

b. Outdoor Art

Some of the most enjoyable site accessories are sculptures. For example, the University of Nebraska-Lincoln campus has the Sheldon Sculpture Garden, Auraria has a agreement with the Denver Art Museum to display the museum's extensive sculpture collection, and CU-Colorado Springs has exciting contemporary works. The Colorado legislature encourages public art by requiring one percent of the construction cost of new buildings to be devoted to art through the Colorado Art in Public Places Act.

A few works of art enhance the CU-Boulder campus, placed either through the Art in Public Places program or by donation, or representing the athletic mascot, the buffalo. A few examples of ornamented artwork date back to Charles Klauder. A much-appreciated work lines the Broadway underpass at College Avenue, developed in cooperation with the City of Boulder's art council. But collectively, campus art works do not live up to CU's status and quality of architectural design.

Additional resources will be required to obtain major art works.

Goal
First-rate public art will be sought for the campus.

Guidelines

- Enliven campus spaces with art.
- Place art at desirable focal points.
- Plan for art on campus, in advance of specific artworks.
- Direct artists to use compatible, durable materials.
- Vandal-proof site art to the extent feasible; appropriate bases help accomplish this.
- Create a protocol for accepting public art, encouraging suitable donations.

c. Damage by Airborne Skates and Skateboards

Considerable damage has been done to the tops and edges of walls, steps, and benches by people using skateboards or in-line skates. Many beautiful limestone wall caps have been defaced and chipped. Concrete benches are especially vulnerable. Damage is most likely to occur on long smooth surfaces. There is also the possibility that someone will be injured trying to maneuver on site features.

Future walls, benches and other site accessories should be specified and/or detailed to discourage damage caused by skates and skateboards. Existing walls and benches should be modified if possible. Deep reveals designed into concrete surfaces appear effective as deterrents. An example can be found on the site wall adjoining the kiosk southwest of the Ekeley Sciences Building.

Minimal extra initial cost is anticipated and lower long-term maintenance costs are expected.

Goal
Site designs will deter in-line skates and skateboard damage.

Guidelines

- Design tops of site walls to discourage in-line skate and skateboard use.
- Avoid the use of concrete benches.
- Provide signage and enforcement prohibiting airborne in-line skates and skateboards.

d. Campus Lighting

The Main Campus is a busy place at night, with activities such as continuing education courses, lectures, concerts, movies, athletics spectator events, theater performances, laboratory use, and studying in the libraries. Nighttime lighting provides the necessary visibility to get to these activities. The campus would be unsafe without lighting potential hazards for the people and vehicles moving about. Security is enhanced by illuminating potentially hazardous locations, enhancing contrast, avoiding glare, and in general by uniform lighting where people need to be present.

Lighting needs vary: for example, lighting in student residential areas needs to facilitate access while maintaining a sleeping environment. The quality of light is more important than the quantity of light. A Lighting Master Plan (by Clanton & Associates, March 1999) was commissioned as part of this Campus Master Plan. Only a brief summary is provided here; the interested reader can review the complete lighting plan at the Office of Facilities Planning on the Main Campus.

In general, a warm, soft white light (color temperature: 3000 degrees Kelvin) is used on campus, usually produced by metal halide or compact fluorescent lamps with a color rendering index of at least 70. This is in contrast to most of the City of Boulder, where high-pressure sodium lamps produce a more orange-colored light, with a color rendering index not appropriate for use on campus. The transition between the city and the campus needs to be considered; for example, perceived edges of campus may change if Regent Drive, University Avenue, and Grandview area streets traversing the campus were relit using the campus standard.

Goal
Appropriate lighting will help create a welcoming, safe and secure, campus image, and enhance wayfinding (orienting people to destinations).

Guidelines

- Ensure that lighting is continuous (without dark gaps) along the pedestrian routes, bikepaths, and streets.
- Light some vertical surfaces (buildings and trees), not just sidewalk and street pavement.
- Use a hierarchy of luminaires to achieve appropriate scale.
- Highlight campus entrances, building entryways, and potentially hazardous crosswalks.
- Provide special lighting to highlight significant building facades and public art.

- Adjust standards for light-sensitive uses, such as observatories and greenhouses.

D. Environmental Management Plan

The University of Colorado at Boulder intends to provide a safe, efficient, and environmentally friendly campus. In order to maintain a safe and healthy environment, and do so efficiently, environmental management is part of campus planning. The administration of CU-Boulder has instituted many programs in recent years to help fulfill institutional responsibilities with respect to the environment.

As in the preceding and following sections of this plan (IV.C and IV.E), broad goals are identified followed by guidelines, which are more specific opportunities to address the goals. Guidelines must be applied with consistency, flexibility, and with an emphasis on cost effectiveness and regulatory compliance.

This chapter covers a wide range of environmental topics. Maintaining environmental quality will continue to pose challenges, which CU-Boulder will need to address.

1. Outdoor Air Quality

Actions taken by CU-Boulder can impact outdoor air quality to some degree. Among CU-Boulder's existing and ongoing efforts to help assure air quality:

- Leading-edge research conducted regarding air quality, including studies at the Mountain Research Station, which affords a unique opportunity to assess atmospheric conditions.
- Cogeneration of electricity and steam (used for heating and cooling buildings), in a natural-gas-fueled power plant. Cogeneration uses less fuel than separate processes. The use of natural gas is cleaner but more expensive than coal, which is used as a fuel source at many Colorado power plants.
- Initiatives to encourage the use of varied transportation modes, including the non-motorized modes of walking and bicycling when these are feasible, reducing vehicular emissions.
- In winter road and walkway ice abatement operations, the shift from use of a sand/salt mixture to a magnesium chloride liquid de-icer. Sand application has been reduced by approximately 70 percent in the five years prior to writing this plan, helping limit suspended airborne particulates, a significant component of visible air pollution.

CU-Boulder should endeavor to minimize pollutants that degrade air quality and/or that contribute to worldwide environmental concerns such as the "greenhouse effect."

Goal
CU-Boulder will identify and implement institutional actions that help address air quality concerns.

Guidelines

- Add new student housing at Williams Village, which helps limit the need for vehicular trips.
- Improve pedestrian routes, bicycle routes, transit service, and transit vehicles.
- Mitigate congestion and idling in traffic, through roadway

construction and improvements, improved directional signage, and parking management.
- Reduce hazardous waste generation (avoiding the need for waste disposal companies to incinerate it).
- Upgrade institutional fleet vehicles with new cleaner-burning diesel buses and (where feasible) with vehicles using innovative technologies for propulsion such as electric and hybrid-electric.

2. Indoor Air Quality

Indoor air quality potentially is a larger issue for CU-Boulder than outdoor air quality. Indoor air quality is affected by many factors in building design, site design, and location of air intakes. Several existing buildings on campus have potential problems with air intakes picking up exhaust from idling vehicles.

Concentrations of potentially toxic materials in the air tend to be much higher indoors than outdoors, in part due to the use of paints, stains, adhesives, and other modern building materials. One way to lower these concentrations is through the use of materials which do not offgas as much formaldehyde, volatile organic compounds (VOCs), or other potentially hazardous chemicals.

Goal
CU-Boulder will continue to implement practices and procedures that help assure indoor air quality.

Guidelines

- Locate vehicular loading areas and air intakes at separate locations in new building design.
- Use low or no VOCs materials more often.
- When possible, instigate a "purging" time to ventilate a new building, when possible, with outside air for a reasonable time before people move in. This will help remove airborne contaminants left over from the construction process, and will better accommodate the initial offgassing of VOCs.
- Increase outdoor make-up air to the extent possible and consistent with building codes, while balancing the consequences of increased energy use.

3. Water Quality

Potable water originates in the mountains and is treated by the city treatment plants before distribution to the campus in Boulder. The City of Boulder is responsible for the quality of this potable water.

Wastewater leaving the campus in sanitary sewers is delivered to the City of Boulder wastewater treatment plant. The City of Boulder regulates CU-Boulder wastewater discharge to comply with Colorado Department of Public Health and Environment, and Federal EPA, regulations. CU-Boulder's wastewater discharge permits limit allowable discharges of organic pollutants, arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, silver, and zinc, and limit allowable levels of biological oxygen demand. Wastewater discharges are periodically sampled from five sampling stations on campus. CU-Boulder historically has had difficulty in maintaining wastewater quality, primarily due to the complexities of controlling the large number of laboratory users on campus. Permit violations have declined in recent years, reflecting improved guidance from the Environmental Health and Safety Office and increasing

education of laboratory users to prevent drain disposal of hazardous materials.

Water collected from storm sewers and ditches runs into local creeks. This can allow chemicals used on irrigated areas, and oils from streets and parking lots, to enter creeks. This is a typical urban condition. In the East Campus Research Park, there was sufficient land to create a series of ditches, ponds, and wetlands that allow chemicals and oils to settle out before the water is discharged into Boulder Creek. This is an exemplary system.

The Mountain Research Station and CU-Boulder South have their own small water and wastewater systems. The plan is to replace the Mountain Research Station wastewater treatment plant, along with lines to the plant, in the first five years of this Campus Master Plan. New systems will be needed at CU-Boulder South when new buildings are built there.

Goal
There will be acceptable levels of water quality in campus discharges to storm sewer systems and to streams.

Guidelines

- Maintain the East Campus wetland ponds that accommodate flood protection, nature study, and cleansing of drainage runoff.
- Regulate all uses on campus through the Office of Environmental Health and Safety in order to avoid instances where hazardous wastes may be dumped into the waste water system.
- Continue the integrated pest management system, which helps reduce the use of pesticides in landscaping and drainage runoff.
- Label and locate storm drains appropriately to help avoid accidental spills into creeks.
- Develop new treatment facilities as needed for properties not served by municipal systems.

4. Flood Mitigation

Reducing the likelihood of flood damage through appropriate land use planning, building siting and building design is an important component of campus master planning. The known campus 100-year flood hazard areas are mapped on Exhibit II-C-6 in Chapter 2. The policy is not to construct new buildings or building additions that would be flooded in a 100-year flood event.

a. Main Campus Flood Mitigation

As noted in Chapter 2, the most damaging major flood on campus likely would affect existing housing units in the floodway and floodplain north of Boulder Creek. Flood-warning sirens have been placed to alert people along the creek of an impending flood so they can move to higher ground.

Goal
Planning will begin to mitigate the flood hazard for those existing campus residential units north of Boulder Creek not elevated above flood levels.

Guidelines

- Cooperate with the City of Boulder and the Urban Drainage and Flood Control District on their purchase and removal of the houses in the floodway east of 17th Street. Additional flood engineering studies will be needed to assess whether re-grading this property to increase flood conveyance might reduce the flood hazard for properties in the area.
- When it is possible, replace the small campus bridges over Boulder Creek between 17th Street and Folsom Avenue with "breakaway bridges" as used elsewhere for pedestrian crossings of Boulder Creek. Utilities on the existing bridges ideally would be buried below the creek.
- Consider redevelopment of Faculty Staff Court and Athens Court (perhaps in cooperation with a private developer) to elevate units and provide improved student housing.
- Implement an evacuation plan.

b. Other Flood Mitigation

On the East Campus, most of the research and services buildings north of Boulder Creek are in a shallow floodplain of Boulder Creek. In the event of a 100-year flood, the flooding of this area would be relatively shallow according to the study prepared in March 1987 by consulting engineers titled "University of Colorado East Campus Flood-proofing Study." Improvements that had been recommended are being implemented when renovations occur in the area.

The Bear Canyon Creek floodplain on Williams Village will require regrading in order to accommodate the proposed residential development on that site. Flow capacity must be maintained (volume of water, velocity, and storage), but needed housing sites can be gained by regrading.

The flooding potential of South Boulder Creek, on and around CU-Boulder South, is currently being studied as part of the planning for the use of the property.

Como Creek at the Mountain Research Station may also periodically flood, but the potential has not been studied. The measures adopted in the micro-master plan for the Mountain Research Station (in Section IV.B.2) include avoiding construction of new structures intended for human occupancy within a defined zone along the creek.

On all properties, the smaller, more frequent floods are also of concern. The design standard for campus storm sewer and surface drainage systems is to accommodate a five-year flood, but storm sewers and surface drainage systems are not complete. Water from storms somewhat greater than a five-year storm may be accommodated within streets in many parts of campus. A few detention/retention areas are also available.

Goal
New building development on all campus properties should be designed to not flood in a 100-year flood.

Guidelines

- Do not develop buildings or parking lots in floodways.
- Elevate the first floor level of new buildings in flood plains above the 100-year flood level.
- Athletics playing fields and recreational facilities, e.g., soccer fields, can be designed and located in floodplains or floodways.
- Complete flood studies for CU-Boulder South to provide

additional information needed for development.
- Address localized flooding situations; continue to upgrade storm drainage systems.

5. Hazardous Materials

Environmental Health and Safety (EH&S), a division of the CU-Boulder's Public Safety Department, initiates many of the policies for hazardous wastes, indoor air quality, water quality, and health risk exposures. Campus safety remains a responsibility shared by every member of the university community. Programs within EH&S focus explicitly upon preventative, remedial, and emergency response measures.

The continued growth of CU-Boulder as a research institution has produced a corresponding growth in hazardous materials. In the five-year period 1992-97 hazardous waste volumes increased 69 percent, from 37,648 kg to 63,485 kg. But since that time the rate of increase has slowed significantly.

EH&S efforts will increasingly focus on waste minimization. Chemical intake and storage is currently located in many department facilities. The chemical redistribution program at CU-Boulder is intended to relieve labs of materials they no longer want but which may be of use to others. The cost and availability of sanctioned waste disposal sites, and related services, is a great concern.

The Environmental Health and Safety Center phase II and III construction is scheduled for completion in 2000. The expanded facility will house all EH&S staff (currently at three locations) and facilitate services and hazardous waste methodologies intended to reduce the amount and costs of waste otherwise removed by contract haulers.

Integrating rapidly changing regulations and environmental standards with actions of the CU-Boulder community is a fundamental aspect of EH&S' mission. For example, lead paint abatement has been added to asbestos abatement efforts, effectively increasing the cost of renovations. Construction and renovation of facilities will need to be planned with a watchful eye to evolving environmental concerns and regulations to help assure CU-Boulder's compliance.

Goal
Environmental Health and Safety (EH&S) will help the campus community nurture an environmental and safety consciousness and maintain compliance with local, state and federal environmental standards and regulations.

Guidelines

- Minimize the production of hazardous waste through education, inventory, tracking, and intra-campus redistribution.
- Conduct on-site inspections, training and program reviews, and investigations of incidents.
- Oversee safe use of radioactive materials and radiation producing machines.
- Handle, transport, and appropriately dispose of hazardous waste materials.
- Test, detect, abate and/or dispose of materials containing asbestos and/or lead.
- Develop contingency plans and procedures.

6. Sustainable Design and Green Buildings

Sustainability is part of long-term campus planning. A generally accepted definition of sustainability is "providing for the needs of the present without detracting from the ability to fulfill needs of the future" (David Johnston, What's Working). The U.S. Department of Energy defines sustainable buildings as "buildings that minimize the impact of the built environment on the ecosystem while providing for human well-being through the design, construction, operation, maintenance, and reuse of buildings."

The concepts of sustainable design and use of "green" building materials apply at all stages of the design process (program plans, architect selection, design, construction, and closeout). Many procedures and materials once considered safe, such as asbestos and lead paint, are now known to be potentially hazardous and "green" building practices and materials are being substituted.

Goal
Adopt improved building industry practices for sustainability and the use of safe materials.

Guidelines

- Select environmentally sensitive architects to design CU-Boulder buildings.
- Keep up-to-date the provisions of adopted building codes and campus construction standards regarding these concerns.
- Weigh first-cost vs. longer-term payback decisions.

7. Resource Conservation

a. Energy Conservation

The construction of the cogeneration facility increased the efficiency of energy production. However, campus energy use and resultant utility bills have been increasing in the years preceding this Campus Master Plan. Among the reasons are a sizable increase in square footage with new buildings coming on line, increased ventilation in laboratory buildings to help assure occupants' safety, lack of heat-recovery equipment, and increases in heat-producing and energy-consumptive equipment such as lasers and computer peripherals.

Planning and design for new buildings can mitigate the demand for energy, although there is often a higher initial cost in order to achieve the subsequent annual savings. In many buildings on campus, building use and equipment produce considerable heat, shifting the emphasis of energy conservation from how to heat a building to how to cool a building.

Goal
Conserve energy to mitigate environmental impacts and to reduce costs.

Guidelines

- Identify opportunities to save energy whenever this is a sound economic decision.
- Assure that new buildings and renovations comply with energy saving provisions of applicable codes and standards.
- Increase metering of use in order to have better information and to provide incentives for efficiency.

b. Water Conservation

The use and payment for treated water was significantly reduced when large parts of the Main Campus irrigation systems were converted from treated water to untreated ditch water. This is a good use of the university's water rights. Also, new campus development no longer pays Plant Investment Fees (PIFs) for the use of City of Boulder water as long as water demand does not exceed the previous peak. Additional opportunities for water conservation include process cooling and conversion of additional areas to non-potable water irrigation.

Goal
Limit environmental impacts and costs through water conservation.

Guidelines

- Identify opportunities to reduce use of treated water to cool equipment (lasers used in research, for example) through process cooling.
- Convert additional irrigated areas to the use of non-potable water.
- Optimize raw water resources on all CU-Boulder properties.

8. Solid Waste Management

CU-Boulder has had a growing commitment to recycling waste materials. This has involved new programs and new facilities. Solid waste management is a growing problem as convenient regional landfill capacity diminishes, environmental pressures to recycle grow, and hauling and disposal costs escalate. Students originally founded the recycling program in 1976. The program became so successful that by 1991 it outgrew student-only efforts. An administration (Facilities Management) and student government (UCSU) partnership was founded, with cooperative efforts by many departments, including Housing.

The Intermediate Processing Facility, in which materials are sorted for recycling, is located in the Grounds Building. This processing facility may need to be relocated as part of a proposed Athletics Fieldhouse project.

Greater attention needs to be paid to the design of site accessories for trash and recycling (see the Outdoor Areas Plan sites accessories section, Secion IV.C.7) and location, especially around building entrances (see IV.C.3.f). Functional design guidelines to integrate recycling facilities on campus grounds and in campus buildings are found in Appendix 7 of the CU-Boulder Construction Standards.

Goal
Reduce the waste for which the campus must pay removal costs.

Guidelines

- Decrease waste generation.
- Increase convenience of diverting recyclables.
- Integrate recycling when new facilities and major renovations occur.
- Recycle and minimize waste in construction projects.
- Continue to replace trash-only containers (indoors and outdoors) with solid waste stations for both trash and

recyclables.

E. Transportation Plan

1. Overview

The goal of this transportation plan is to ensure access to the educational services and other activities on campus, for both consumers and providers.

The University of Colorado at Boulder has found it necessary or desirable to provide a number of supporting services in order to make the campus work optimally. One of these services is transportation. Many departments at CU-Boulder provide transportation services that functionally link campus properties together. CU-Boulder also works with many transportation service providers, including the Colorado Department of Transportation, RTD, Boulder County, the City of Boulder, and other cities, to help ensure reasonable access to the campus. The University of Colorado at Boulder is more involved in transportation services than many other institutions of higher education.

a. Transportation and Growth

From CU's opening in September 1877 to the present day, Boulder and the university grew about 3 to 5 percent annually on average. In recent years, the growth of both the university and the city has slowed substantially. This plan projects moderate growth for CU-Boulder, planning for a 0.7 percent annual increase in students, averaged over 10 years, with a higher rate of growth in research endeavors. Consequently, there will be increasing transportation demand.

In the early part of this century, mass transit in the form of streetcars ran on Broadway next to the campus, and separate electric interurban cars (light rail) stopped on the campus to pick up university people for the hour or so ride to downtown Denver. The interurban station was on the site of the Ramaley Biology Building. Now, the light rail to Denver is gone, and automobiles and buses have replaced the early regional rail system.

Not that many years ago, university faculty and staff could find desirable housing within easy walking distance of the campus. But the pressures of growth have driven up housing prices in Boulder so that many who work on campus now have to travel to distant communities to find suitable housing.

With the increase in commutes and increased reliance on cars since World War II, vehicular circulation and parking have evolved to consume more land. There never seems to be enough parking on most college campuses, traffic congestion can clog streets, and service vehicles park on campus sidewalks. Strategies to consider in managing the campus land resource mirror those used in other limited resource management situations:

- meet transportation needs as efficiently as possible, taking into consideration people's physical, financial, and time constraints;
- facilitate substitutes which consume less land (for example bike parking takes less land than automobile parking); and
- optimize utilization of all transportation modes through incentives, regulation, and pricing mechanisms.

b. Transportation and Land Use,

Densely built environments are efficient from a transportation standpoint. Walking is viable for most trips within the Main Campus, given its density and compactness, but city and regional densities and longer trip distances necessitate motorized modes (private vehicles or transit) for many of the trips to and from the Main Campus.

Mixed land use as well as density helps to reduce transportation needs. For the campus, this suggests having essential services, such as food services, recreation, and health services, located nearby or on the campus, if consistent with the academic facility needs. Convenient student and faculty housing, on campus or nearby, is desirable in order to reduce transportation needs. But mobility will remain important to assure choices for these services.

c. Transportation Vision and Goals

The transportation vision and goals are:

- The campus will be readily accessible to all persons desiring university services and those who provide the services. Transportation systems for the University of Colorado at Boulder will enhance the quality of life by meeting mobility needs, while complementing the beautiful environment of the campus. Transportation services, including parking, will be managed so as to create an inviting campus for both frequent users and infrequent visitors.
- Normally preferred modes of on-campus transportation are, in order: (1) walking, (2) bicycling, (3) transit, and lastly (4) driving. This encourages "environmentally friendly" transportation, meaning best use of land, minimizing air pollutants, and maximizing safety. A pedestrian-oriented environment for the heart of the campus enhances the total learning experience. Vehicular trips may be necessary for longer distances, time-urgent needs, and movement of materials.
- The order of preference for on-campus transportation does not apply for those persons who cannot viably walk the necessary distances due to health problems and/or mobility impairments. For people with disabilities, vehicular access and convenient parking may be especially important.
- The CU-Boulder transportation facilities and operations exist within larger city, county, regional, and state transportation systems. CU-Boulder transportation will integrate with those larger systems, with the goal of creating a seamless transportation system for people. The on-campus modal preferences are not always possible off-campus, depending on distance, physical viability, affordability, and time-efficiency. CU-Boulder will work with the various transportation providers to determine if viable transportation options can be provided.
- The limited supply and increased cost of housing in Boulder has meant that more faculty, staff, and students live longer distances away from campus. Their commutes will become more and more time consuming as traffic congestion increases, reducing the availability of faculty to students. Consequently, CU-Boulder will increase its efforts to help ensure affordable, proximate housing.
- The university will be a leader in telecommunication technology

such as electronic commuting and distance education, which in the future may mitigate somewhat the increasing needs for transportation services.

2. Modal Split

"Modal split" is the division of travel into the various transportation modes. Transportation modes include walking, bicycling, transit, and using a vehicle (either as a driver or passenger). Modal split in this plan addresses the type of trips to campus.

a. Modal Split Information

A study by Felsburg, Holt and Ullevig, a major Denver-area transportation engineering firm, concluded that about 49 percent of trips to campus are by individual vehicles. Of these, 41 percent were people driving and 8 percent were passengers, carpooling. Thirty percent arrived by walking, 11 percent arrived by bicycle, and 10 percent by bus. See Exhibit IV-E-1.

The Boulder campus is relatively compact, high density, has a wide variety of uses, and has, for the most part, a well developed multi-modal transportation system. Trips are less dependent on automobile use than for trips in the nation, region, or for the off-campus city population (documented in the city study cited below). Walking and bicycling are the predominant modes for on-campus transportation. Choice of mode to and from campus depends largely on the distance of travel and the efficiency of the various modes of transportation. Many students live on or near campus, where walking and bicycling can be efficient. Many faculty and staff live at greater distance from campus, where driving, and sometimes transit, can be efficient. See Exhibit IV-E-2 reflecting these different modal choices.

The five sources of modal split data utilized in preparing this Campus Master Plan were:

- University of Colorado Master Plan Transportation Element, Final Report, by Felsburg, Holt & Ullevig, February 1999.
- CU-Boulder Shuttle Service Study, by RRC Associates, April 1999.
- Modal Shift in the Boulder Valley 1990 to 1998, by the Center for Policy and Program Analysis, City of Boulder, February 1999.
- Faculty/Staff EcoPass Surveys, by RTD, March 1998, October 1998, and May 1999.
- University of Colorado at Boulder Long-Range Facilities Master Plan, transportation data by Howard Needles Tammen & Bergendoff, May 1990.

Modal split data can include many different kinds of trips, and (if prepared by survey) can be divided by population characteristics. The reader interested in such additional information is referred to the studies listed above, available at the campus Facilities Planning office.

Conclusions that can be drawn from the plethora of sometimes contradictory data include:

- The choice of transportation mode is very different among students, faculty and staff. For example, walking is the primary means of getting from residence to campus for 40 percent of undergraduates, 16 percent of graduate students, 9 percent of

faculty, and 5 percent of staff. Those driving alone in a car are: 20 percent of undergraduates, 28 percent of graduate students, 45 percent of faculty and 57 percent of staff (source: CU shuttle service study). See Exhibit IV-E-2 reflecting these different modal choices.

- Service vehicles, visitors, and pass-through traffic increase the vehicular total. Multiplying the size of faculty, student, and staff populations by percentages driving alone (in Exhibit IV-E-2) suggests that 29 percent of the students, faculty, and staff arrive by single occupant vehicles. The 41 percent estimated by Felsburg suggests that the vehicular mix includes many other users.
- The bicycle share of trips peaked in the mid-1990s and has declined somewhat since then (source: all studies cited above). This may be attributable to the program providing transit passes to all students.
- The transit share of all trips has increased significantly since 1990, from 6 percent to at least 10 percent of all trips to campus: a 67 percent increase in transit use (source: Felsburg et al. study). The CU shuttle service study and RTD EcoPass surveys show larger and continuing increases in transit share.
- Driving or biking to a bus stop (e.g. to a park-n-ride lot), and then taking a bus to campus, is currently an underutilized option, used by 3 percent or fewer (CU shuttle service study).
- Persons with an EcoPass are four times more likely to use the bus (City of Boulder study).
- The average estimated pedestrian trip length is 0.8 miles, 2.4 miles by bike, longer for transit and vehicle trips (City of Boulder study).

b. Modal Split Policy

Walking should remain the predominant mode of travel on campus. Bicycling should also be encouraged; it can cover greater distances than walking. As uses expand on East Campus, Williams Village and CU-Boulder South, intra-campus transit service will become more important. Driving within campus is minor since there are few campus streets, and parking is rarely available at both ends of an intra-campus trip.

Off-campus modal split will be a function of individual choice and the successful provision of transportation facilities and services by the City of Boulder and regional providers. Use of private vehicles will remain significant. CU should continue programs (transit passes, for example) which are well-used alternatives to automobile use, given limited street and parking capacities. The Board of Regents has endorsed a policy to improve each mode of transportation.

c. Goals and Guidelines

Goal
Modal split on campus should remain predominately non-vehicular. Non-vehicular transportation can be encouraged with some increase in intra-campus transit. Off-campus accessibility can be facilitated by encouraging improvements in all modes, with a preference for those with less impact on the campus.

Guidelines

- Recognize that people have different needs and plan accordingly by improving all modes.

- Continue the policy begun in the 1990 Master Plan for on-campus travel preferences (in order, depending on what is feasible for each trip): (1) walking, (2) bicycling, (3) transit, and (4) driving.
- Consider the impact on the campus and community of proposed transportation improvements. For example: recognize that parking consumes a valuable land resource, recognize the impacts of vehicular fumes and noise, and reduce or mitigate conflicts between modes in order to maintain safety and minimize time delays and additional costs.
- Consider the relative cost per trip to both the individual and to CU-Boulder.
- Encourage better transit service for faculty and staff use with the intent of affecting the modal split to campus.
- Develop better data, combining both counts and surveys, for future modal split analysis.

3. Pedestrian System

People walking make thirty percent of all peak-hour trips to campus. The percentage of people walking throughout the day is even higher. Walking is the lowest-cost mode of transportation, and it is feasible because of compact and functionally related land use both on campus and in surrounding areas. Most student housing is located on campus or within walking distance of campus. Pedestrians are very economical to accommodate in comparison to users of other modes of transportation.

a. Demand for Pedestrian Facilities

Pedestrian facilities are heavily used, which is typical of most university campuses. Many sidewalks and street crossings throng with people, especially during the limited time between classes. Since the campus consists of many buildings, most circulation between classes and activities occurs outdoors. This is different from many institutions of higher education, and it is appropriate in Boulder's climate. Boulder is a health-oriented community, with a disproportionately high number of younger people, walkers, and runners in comparison to other cities. For these people, walking makes sense.

Some specific components of the demand on pedestrian facilities are worth noting:

- Demand has large peaks because of academic scheduling.
- Pedestrian traffic to and from campus is greatest at midday, when people both enter and leave campus (this is detailed in the traffic engineers' report).
- Many students walk to campus from off-campus housing areas surrounding the campus.
- The Broadway underpass at College Avenue is by far the most heavily used pedestrian entrance to campus, with over 2,000 people using it in the peak hours.
- Recreational use is very high on the walkway along Boulder Creek crossing campus.
- Pedestrian demand in areas of narrow or no walkways is difficult to determine.
- Pedestrians often seek the shortest walking distance between destinations, whether or not there is a sidewalk; this results in worn paths across campus lawns.

b. Pedestrian Facilities (Supply)

The Main Campus is a walking environment because of its modest size; efficient land-use arrangement; extensive system of pedestrian walkways; and pleasant, park-like atmosphere. Most undergraduate classes are clustered within 10 minutes walking distance of each other. Most streets, which once bisected the campus, have been eliminated over time. Colorful Tuscan vernacular architecture, diverse plant palette, and water features create a very enjoyable walking environment.

The walkway system is inadequate in some sections because it has been built piece-meal, usually at the time and location of new building development. Some walkways, once adequate, are either too narrow for the growing number of people on campus, or do not serve the destinations now desired. Pedestrian walks connecting the academic core of Main Campus with the student housing (and commercial) areas north of Boulder Creek are the most inadequate sections of the system. Although heavily used, they are in poor condition.

The East Campus also has walkway systems, but it is not as pedestrian-oriented as the Main Campus in large part because travel between classrooms is not involved. The Research Park on the East Campus is typical of office or research parks, with little walking in evidence. Buildings generally set well back from the street, behind parking lots (there is an extensive system of trails along the creeks which attracts recreational walkers). Additional development will be redirected to create a more "campus-like" research park.

North of Boulder Creek on East Campus is a service and research area, which also will be more "campus-like" as the area is developed further. Additional connections between buildings and to the creek paths are part of this plan.Pedestrian links between the Main Campus and East Campus are little used for that purpose. Crossing 28th Street and using the narrow sidewalk along the north side of Colorado Avenue is not pleasant. The Boulder Creek path is more pleasant but more circuitous, attracting more bicyclists than pedestrians because of the added distance.

Williams Village has an adequate walkway system, but there is little need since development consists of two large building complexes. This will change in the future as new development creates a more village-like character. The City of Boulder during the 1990s significantly improved public walkways from the Main Campus to Williams Village, adding underpasses to reduce conflicts with vehicles. But bicycling to and from Williams Village may be more prevalent than walking, because of the distance and because a shuttle service is available for those who might otherwise walk.

c. Pedestrian System Development Plan

Pedestrian travel will continue to be encouraged as the primary mode of travel on all Boulder campuses. This will be accomplished by maintaining and enhancing existing walkways, as well as adding new walkways which reflect the desired lines of travel. Each new building development will include its part of enhancing the overall walkway network, and systematic maintenance and improvements will occur as well.

Staff of CU-Boulder will continue working with City of Boulder staff to

improve pedestrian access to the campus locations in Boulder. This needs to include coordination of the city's sidewalk and trail systems with campus pedestrian entrances. For example, better connections through the Grandview area are planned (IV.B).

Priority locations for walkway improvements are shown on Exhibit IV-E-3.

The "pedestrian areas" section of the outdoor areas plan (Section IV.C.4) details the goals and guidelines for:

- Walkways and nodes
- Overlooks
- Shelter along walkways
- Directional signage
- Grade-separated crossings

Crossings of Boulder Creek and its bluff are a high priority, especially at 17th Street, the "Ho Chi Minh Trail" north of Clare Small Arts and Sciences, and crossings by the Student Recreation Center and Stadium. Creek pedestrian-only bridges are currently inadequate and will be replaced (as resources become available) with standard "break-away" bridges as seen along Boulder Creek (east and west of the campus), in order to provide safer pedestrian movement and to alleviate flood hazards to student housing north of Boulder Creek. Such bridges are to be used on all creek crossings on the various campus properties.

The core area bicycle dismount zone will be retained but made a more effective pedestrian area by better bicycle routes around the edges of it, such as along Pleasant Street.

Improvements are needed in some areas to accommodate demand. Some walkways will be widened, and new ones added. Major trails worn across lawns are usually diagonals to the predominant campus layout. Many of these diagonals should be fully improved as sidewalks to accommodate the expanded campus population. The axial arrangement of buildings and open spaces does not require that all walkways be at right angles. The exception to allowing diagonal walks is at the east and west ends of Norlin Quadrangle, where an experiment is underway installing railings to preserve the large lawn areas which are much-used multi-functional spaces. A decision will be made at the end of the experiment as to whether to keep the railings. At the writing of this plan, the railings appear to be effective in reducing rutted trails across the lawn areas.

There are frequent conflicts between pedestrians and other modes of transportation using walkways, including service vehicles, bicycles, skateboards, and even passenger cars. Pedestrians have the right-of-way on sidewalks. Some sidewalks need to be widened or rebuilt to accommodate the mixed modes. Service vehicle use can be scaled back through better identification of appropriate routes, provision of more service vehicle parking spaces, prohibition of parking on sidewalks, and issuance of fewer permits for service vehicles to use sidewalks.

Until and unless grade separations occur, pedestrian crossings of streets bisecting the campus will receive a high priority in order to help assure safety, particularly across Regent Drive and University Avenue.

Safety and accessibility are overriding considerations for all walks.

For safety reasons, walks will be better lit, highlighting campus entrances and street crossings. Walks will not be fully obscured with landscaping. When building construction temporarily closes a walk, an alternate route will be provided.

Accessibility for those with mobility impairments is a necessary consideration in the development and improvement of all pedestrian facilities. All walks essential to provide access to a building or program will be built to handicapped standards. Non-accessible walks, including those on steep slopes, will be more clearly differentiated with different materials, obvious barriers such as steps, or signage advising that the walkway is not accessible. Signs will continue to be posted at non-accessible building entrances, indicating how to find an accessible entrance. Accessible routes from an accessible parking space to an accessible building entrance are part of the development and improvement of each facility.

Finally, future Williams Village and East Campus buildings will be developed to be increasingly pedestrian-friendly. The Research Park Master Site Development Plan and Design Guidelines provide useful pedestrian-facility guidance.

d. Pedestrian Facilities Funding

Most walkways have been built over time in specific areas, usually as part of adjoining building construction. This funding strategy has meant more than a few odd alignments, widths that don't match, and missing sections. Few systematic improvements have been made, but there has been systematic maintenance through controlled maintenance funds. The City of Boulder has partially funded most of the creek trails and similarly assisted with perimeter walkways and grade-separated crossings. Federal funds have been used on occasion through the City of Boulder. Funds of auxiliary operations, notably the Department of Housing, have been used in areas of campus in which these auxiliaries have operations. The Department of Facilities Management makes improvements and repairs as funds permit.

Campus walkway design is overseen by the Office of Facilities Planning, which has helped piece together the system and facilitated contacts with the City of Boulder and other outside agencies.

e. Goals and Guidelines

Goal

Pedestrian movement will remain a preferred mode for traveling on the campus.

Guidelines

- Improve pedestrian facilities as suggested in this section, including the map exhibit.
- Pursue goals and guidelines in the outdoor areas plan (IV.C.4) for pedestrian facilities.
- Give priority to crossings of Boulder Creek and its bluff.
- Address conflicts between pedestrians and other modes of transportation.
- Add walkway links to facilities for other modes of travel, such as parking lots and transit stops.

4. Bicycle Circulation and Parking

About 11 percent of all peak hour trips to campus are made by bicycle. Within the campus, bicycling is a prevalent mode of transportation, frequently used by students to make the large acreage of campus manageable for multiple trips between residence halls, classes, social activities, and recreational activities. The proportion of CU students commuting to school by bicycle increased nearly 10 percent between 1990 and 1996 (from 24.3 percent in 1990 to 34.1 percent in 1996) according to the biennial travel diary survey conducted by the City of Boulder.

a. Demand for Bicycling Facilities

Bicycling is popular given the generally favorable Colorado weather and the young campus population. But there is some evidence from the traffic engineers' report, and from city surveys, to suggest that bicycling peaked in the mid-1990s and has leveled off since then.

The number of bicycle parking spaces on campus is one way to gauge the extent of bicycling. In response to persistent shortages of bike parking in some campus locations in the 1980s, almost 2,000 bike rack spaces were added in the 1990s to reflect the increase in bicycle usage. By March 1999, there were 7,327 bicycle parking spaces on campus. Except for a few location-specific requests, notably along Broadway and in the residence hall areas, bicycle parking demand seems to be met. There is additional demand, however, for covered spaces and increased security for bike parking.

Bicyclists want a clear west-east bike route on campus. Pleasant Street is commonly used in both directions, despite its being a one-way street. Demand also exists for better bike routes from Main Campus to East Campus along the Colorado Avenue corridor.

Given the popularity of bicycling on campus, the demand on campus walkways and streets can cause conflicts between bicyclists, pedestrians, and motorists. Along with adequate facilities, education and courtesy will continue to remain essential to accommodating bicycling on campus.

b. Bicycle Facilities

Only a few separated bike paths exist on campus; bikes generally share roads and sidewalks with cars. Along Broadway, separate lanes are provided because of the exceptionally high demand. These bike lanes are working well, as long as the signage is maintained. See Exhibit IV-E-4 for a map of existing bicycle routes and proposed improvements.

In 1997-98, the City of Boulder developed an extensive path system for bikes and pedestrians connecting Main Campus with Williams Village, including a grade-separated under-crossing of Baseline just east of 28th Street. This improvement should be adequate to accommodate bicycling to the additional student residences planned at Williams Village.

The Parking and Transit Division, and the Department of Housing, manage most of the 7,327 bicycle parking spaces on the CU-Boulder campus. The 4,392 spaces provided by Parking and Transit are located primarily around the periphery of the Main Campus academic core. The Department of Housing's 2,756 spaces are located near residence halls and family housing units. The availability of bicycle parking encourages bicycling, and reduces the need for automobile

parking. Ten bikes can be accommodated on each campus standard rack, in an area less than that needed for one car.

c. Bicycle Facilities Development Plan

The priority bike project is to develop a west-east route from Broadway, through Main Campus on to the East Campus. This corridor includes Pleasant Street, walkways north of Ramaley and Porter Biology buildings, Fieldhouse Plaza, and Colorado Avenue. The City of Boulder has also identified this as an important corridor for citywide use.

Any street modifications will consider bike usage. For new bike lanes, the preferred standard for bicycle lane width will be used whenever possible. Road construction projects are also opportunities to upgrade existing bicycle lanes to meet the preferred standard. Cyclists should be encouraged, through education and enforcement, to obey traffic regulations with the same vigor as motorists.

More bike racks will be added where they are in short supply. It is appropriate to provide bike racks around, but not in, the Dismount Zone where bike riding is not permitted. Additional racks are needed along the Broadway bike path near the Dismount Zone. New building projects, such as the UMC addition, are to include bike parking in proportion to their building use, as has been done on most recent projects, as well as to replace bike parking displaced by construction.

Many bike racks are dilapidated or have obsolete design. "Hook style" racks, which were popular with racing bikes, should be replaced since they cannot very well accommodate most bikes today that have wider handlebars. The campus-standard rack ("CORAs" with hanging triangles) can accommodate the wide variety of bike styles. For locations with very limited demand, "U-style" racks (an inverted u-shaped pipe widely used in Boulder) should be added to the options available on campus. Old bike rack sites will be systematically updated, prioritizing by level of usage and condition of bike racks at each site.

Alternative bike parking facilities, including covered spaces, will be considered where space and funding permit. Space on the campus landscape is very limited so that bike parking generally needs to maximize the number of bicycles that can be accommodated in a given location.

Finally, service facilities to support bicycling are not convenient. A "bike station" on or near campus would be desirable. It could provide air for tires and basic repairs, much as gas stations provide service for motorists.

d. Bicycle Facilities Funding

Bike registration fees will continue to be a source of funding. But as with most transportation modes, user fees can only be a small part of funding. The Parking and Transit Division has allotted funds annually for bicycle parking improvements, much as funds for vehicular parking are allotted. Many departments, notably Housing, also fund bike facilities as part of the services they provide. New building projects are also a source of funds.

Bike route development can be difficult to fund. Funds from other governmental units, including federal, state, and local governments,

have been the best sources. The university has matched funds with these other governmental agencies to add routes on each of the campus properties, providing service not only to the campus community but also to everyone interested in bicycling.

e. Goals and Guidelines

Goal
A west-east bike route across campus, from Broadway to Foothills Parkway, will be the highest bicycle facility priority.

Guidelines

- Place signs to indicate the route.
- Modify the Pleasant Street corridor to allow two-way bike travel. Pleasant is important for many modes. Parking should be retained for close-in needs, handicapped, and the Macky Auditorium events. Improvements in service access would help. Pedestrian linkages need improvement. So redevelopment of this street should follow the guidelines for multi-modal streets (Section IV.C.5).
- Improve conditions for bicycle safety along Colorado Avenue from the Stadium to 28th Street. Consider bike lanes.
- Improve bicycle crossings of 28th Street, at grade along Colorado Avenue or below grade at College Avenue.
- Add a bike path from College Avenue to the intersection of 30th and Colorado.
- Add directional signage east of 30th Street from the Colorado Avenue bike lanes to Skunk Creek path, Foothills bike path, and the bridge over Foothills Parkway.

Goal
Campus bike racks will be of sufficient quantity and improved quality on campus.

Guidelines

- Add racks to meet enrollment growth; also where racks are insufficient such as along the Broadway bike path, where demand is being increased by new building development, and in housing areas to meet demand.
- Replace dilapidated and obsolete "hook" racks campus-wide.

5. Transit

Buses have garnered a growing share of transportation trips in recent years. Traffic engineering studies for CU-Boulder show that transit use is up from 6.3 percent of trips to and from campus 10 years ago to 10.4 percent now. This is a 67 percent increase, made possible by both growing demand and growing service (supply).

Transit consumes less campus land than any other mode of transportation, since it shares the roadways with other forms of transportation and usually doesn't require parking space. Only about one-half acre is devoted to transit use, at the Transportation Center on East Campus, largely for storing buses when they are not in use. Transit is the most efficient land use mode of transportation. Both transit and automobile driving can also cover regional distances, unlike walking and bicycling, and there is a relatively low cost per passenger if transit is well utilized. But transit trips generally take longer than driving trips, and it is not as convenient for low-density

area service (which is most of the Denver metropolitan region). CU both operates transit and supports other transit providers.

a. Transit Demand

Transit demand has grown significantly, particularly among students, for several reasons: passes that are more convenient than paying in cash for each use, added service, and avoidance of driving in increased traffic congestion.

Since the inception of the bus pass program in the spring of 1991, student ridership on the RTD system has increased by 500 percent, with annual student bus trips increasing from 300,000 in 1991 to 1.7 million in 1998. It is estimated that the student bus pass program has cut 2,000-3,000 metric tons of greenhouse gas emissions and reduced growth in parking demand. The UCSU bus pass program has been expanded to include support for the HOP circulator shuttle, the Night HOP, the SKIP, and the CU Ski Bus. In 1997, the program won the U.S. EPA's "Way to Go! Award" for its success in encouraging the use of alternative transportation, benefiting the environment, and enhancing mobility and economic efficiency.

Starting in January of 1998, CU-Boulder adopted a similar program to provide universal bus passes (Buff OneCards) for its 5,600 continuing faculty and staff members. The number of Buff OneCard holders using the bus at least once a week to commute to work increased from 17 percent before the program to 31 percent at the time of a May 1999 survey. The average number of days per week employees parked a motor vehicle on campus dropped from 2.81 before the program to 2.20 in May 1999. Fewer faculty and staff are opting to have CU-Boulder parking permits. The future of the program looks bright if good utilization results continue.

Beginning with fall semester of 1998, the Buff Bus service to Williams Village, operated by the CU Transportation Center for the Housing Department, was opened to all who hold a CU photo ID (the Buff OneCard). Even before opening up access to the Buff Bus, its ridership had climbed. For comparison, in the 1988-89 school year, 566,000 riders were carried 73,200 route-miles. In the 1997-98 school year, 630,734 riders were carried 85,672 route-miles. Over the nine-year interval, there has been no change in the number of students residing in the Williams Village dormitories. The 11.4 percent increase in Buff Bus ridership is largely due to improved service, particularly longer hours of service.

b. Transit Supply (Service)

Many transit routes serve the campus. Over a thousand buses are routed next to or through the campus on any given weekday. The Williams Village Buff Bus, the HOP, SKIP, and all RTD routes can be boarded by a pre-paid, low-cost student or faculty/staff EcoPass. All students and approximately 5,600 faculty and staff are eligible for these universal transit passes.

The CU Transportation Center operates a one-way loop shuttle bus service between the Main Campus and the Williams Village residence halls. At the time this plan is being written, this Buff Bus service operates from 7 a.m. to midnight with five to ten minute headways. On Thursday and Friday nights, service is extended to 3 a.m. In addition to the Buff Bus shuttle, the CU Transportation Center provides special bus service to individual university departments for

field trips and athletics events.

The Transportation Center also operates a motor pool, consisting of passenger cars, Suburbans, Jeeps, 15-passenger vans, and cargo vans, used by university personnel to travel to on- and off-campus destinations.

The HOP is a City of Boulder bi-directional circulator shuttle loop that connects CU with the commercial districts of University Hill, the Downtown/Pearl Street Mall area, the Crossroads Mall, and the residential areas in between. At the time this plan is being written, the service operates from 7 a.m. to 7 p.m. with buses running every 10 minutes. The HOP route runs through the center of campus. The Night HOP service, funded by the student organization (UCSU), extends the HOP's hours to 3 a.m. on Thursday, Friday, and Saturday nights.

The Regional Transportation District (RTD) operates the SKIP shuttle on Broadway, plus an extensive network of local and regional routes. New services planned include the JUMP along Arapahoe Avenue and the BOUND along 30th Street. A privately-owned bus service to DIA also has stops on campus, and private taxi services are available.

c. Transit Development Plan

Transit strategies include:

- Add a circulator bus, dubbed the "Stampede," which would link the Main Campus with East Campus, and possibly in the future Williams Village and CU-Boulder South. A shuttle might provide links between various Main Campus locations, reduce driving on campus, and improve utilization of remote parking lots. A possible route is shown on Exhibit IV-E-5.
- Select locations for development of transit hubs. Gradually 18th Street and Colorado Avenue are being converted into a transit mall. There are no RTD buses using this central route, and there is only limited additional street capacity given high pedestrian flows crossing these streets, so transit hubs will best be located at each end of the transit mall, linking to the RTD system. An intermodal center serving as a transit hub near Euclid and Broadway is on the 10-year capital projects map (Exhibit IV-E-3) and list (Exhibit IV-E-4).
- Design transit stops and route transfer locations that are convenient and safe. Weatherized shelters and better lighting are needed at frequently used stops to encourage people to use mass transit. Design suggestions are in the outdoor areas plan (IV-C).
- Encourage sponsors of special events to provide or develop plans for the provision of mass transit access to events (i.e., football games, concerts, and conferences).
- Ensure that transit vehicles are: 1) accessible to persons in wheelchairs, 2) of appropriate size to accommodate demand, and 3) equipped with bike racks where needed. Since there is an adequate bike path from Main Campus to Williams Village, it is not necessary to put bike racks on buses for that shuttle route.
- Experiment with van pooling through strong financial incentives, such as free parking.
- Consider new transit technologies and systems. Fixed transit systems to Williams Village and other campus properties should be considered: ski-area technologies and fixed guideways are

possibilities. With rail and alternate technologies, Williams Village might become a system hub given its pivotal location. Clean sources of transit power should be considered in any solution.
- Encourage people to use regional services. The RTD is planning to add over 2,000 parking spaces in park-n-ride facilities along U.S. 36 by 2002 and improve HOV lanes near Denver. Commuters to the Boulder campus can park at these facilities and catch the bus to continue on to campus. The University of Colorado at Boulder encourages the provision of park-n-ride, High Occupancy Vehicle (HOV) lanes and other transit facilities providing service to the campus.
- Plan for extension of the HOV lanes or regional rail to Boulder, although such improvements are years away. Any improvements along 28th Street should anticipate the possibility of HOV lanes. Also, U.S. 36 HOV lanes could accommodate buses and multi-occupant vehicles for stadium and Coors Events/Conference Center events.

d. Transit Funding

Several different departments at CU deal with mass transit. The Transportation Center operates a fleet of buses, vans, and autos for university uses. The Parking and Transit Division administers the CU-Boulder faculty/staff EcoPass program and coordinates campus transit services. The student government (UCSU) contracts with RTD for bus services funded by student fees and accessed by student passes. Facilities Management addresses transit facilities through its Facilities Planning and Physical Plant services.

Direct provision of transit is an expensive proposition. For example, the Williams Village Buff Bus shuttle cost $357,000 to operate during the 1997-98 academic year. A proposed campus shuttle serving the East Campus may be as expensive or even more expensive. Direct fare collection almost never funds transit operating costs. Costs may best be integrated into housing charges, parking charges, and other sources of funds. The student EcoPass program has proven effective. The faculty/staff Buff OneCard transit pass program has also been well received, exceeding the parking reduction and transit increase goals set for the program according to a spring 1999 tracking survey, but on-going funding negotiations have not been concluded as of the writing of this plan.

e. Goals and Guidelines

Goal
Mass transit to and within the campus will be arranged so as help ensure convenient connections.

Guidelines

- Begin to implement the transit strategies listed in this section.
- Ensure frequent transit service to the administrative offices moving to the Administrative and Research CenterÐEast Campus.
- Run bus routes in both directions to ensure adequate frequency of service and ease of connection to other transit services.
- Continue the faculty/staff transit pass program if its success continues and if on-going financing can be negotiated.

Goal

Regional transit that serves the campus will be improved. Transit programs should intercept people commuting to campus destinations as near to their point of origin as possible.

Guidelines

- Encourage transit trips to originate nearest people's residences, working with RTD to begin transit trips at (in order of descending preference):
    1. residential areas
    2. regional park-n-ride lots
    3. university remote parking lots
    4. parking structures or lots on campus

6. Service and Emergency Access

Access to buildings needs to be provided for essential services and in emergency situations.

a. Service Access

Service access and parking need to be better managed to avoid the conflicts between pedestrians and vehicles that are currently too prevalent on campus sidewalks. The maintenance and delivery requirements for nine million square feet of building space, and the equipment contained therein, generate a constant influx of service vehicle traffic to the campus. Consistent with planning tenets, many roadways that previously transected the campus have been eliminated in favor of a more contiguous, pedestrian-oriented environment. Given the absence of proximate roadway access to many campus buildings, service vehicles must drive, and park, on campus sidewalks. Fortunately, pedestrian/vehicle collisions that lead to injury have been extremely rare, although pedestrians often complain of sidewalks obstructed by service vehicles. Vehicles associated with new construction, and those associated with projects maintaining or replacing aging facilities, add to the problem. Service vehicles and emergency vehicles sometimes find their paths blocked by other service vehicles parked along sidewalks.

A variety of regulatory strategies have been tried, but have proven ineffective at significantly reducing sidewalk traffic and parking. In fact, most of the vehicles now driving and parking along campus sidewalks are in compliance with CU-Boulder parking regulations, which include the issuance of permits to park on sidewalks.

The Department of Facilities Management has installed some physical barriers to close off vehicular access to the plazas and other pedestrian areas on which vehicles are inappropriate, but many areas cannot be blocked off due the need to retain emergency access. The campus is also too large for physical barriers to be the principal solution. Permitted sidewalk parking needs to be reduced. Instead, most maintenance and delivery vehicles should be directed to designated service parking areas. Designating more service parking is the key to success. Construction vehicles are to be accommodated within staging areas, a designated access point/path is to be identified for each construction site connecting to the nearest service drive, and construction employee vehicles are to be accommodated at remote locations in most instances.

b. Emergency Access

Based on the Uniform Fire Code, as adopted by the State of Colorado and CU-Boulder, fire apparatus access routes need to be added where any part of buildings are located more than 150 feet from existing fire apparatus access. Access routes are reviewed by the CU-Boulder Fire Marshall, the Boulder Fire Department, and facility planners. Campus emergency access is along a variety of routes: state highways, city streets, university streets, service alleyways, and wide sidewalks serving as fire lanes. Exhibit IV-E-6 is a map of the existing and proposed fire lanes, which need to have at least 12 feet in width of clear access.

Non-fire emergencies such as a flood, chemical release, hazardous material spill, or gas leakage are also important concerns on campus. Especially in light of the many laboratory science facilities on campus, the need for adequate access and evacuation routes is pronounced.

Some portions of the Main Campus need to be made more accessible for emergency apparatus. According to the Boulder Fire Department, an existing area with problematic fire apparatus access is "Engine Alley," the central east-west walkway in the academic core of campus, where many service vehicles are parked each day. This should be addressed by prohibition of service vehicle parking in this or any other fire lane, as specified in the Uniform Fire Code.

Also of concern is access around large building complexes such as the Engineering Center, high-rise structures, building bridges, and below-grade spaces. These concerns should be addressed through upgrade of building fire protection systems, access improvements and regulation, parking restriction, and by careful design of future development.

Trees can limit emergency access. Trimming is often sufficient, but if not, trees may need to be removed. Trees are to be planted considering their mature size so that Fire Department vehicle access is not adversely affected in the future.

Adequate access by Fire Department vehicles is to be included during all phases of new construction and site development. It is the campus practice for the Boulder Fire Department to be invited to provide input for all site and building developments. Boulder Fire Department apparatus requirements with regard to width, height, and turning radius are to be addressed for necessary access in site and building designs.

As the campus continues to grow in density and size, the safety and welfare of all persons and property can be assured by the following: attention to access during design, construction, and operations; provision of an adequate and accessible supply of water; and compliance with adopted building codes.

c. Goals and Guidelines

Goal
Necessary access will be ensured to service buildings and to provide emergency services.

Guidelines

- Provide more adequate service vehicle parking.
- Designate short-term parking spaces for drop-off and pick-up of materials within reasonable proximity of each building.

- Keep emergency access routes, and walkways in general, unobstructed by parked vehicles through better enforcement.
- Review all development proposals to ensure access for building services and for emergencies.
- Coordinate the routes and close-in parking with overlapping requirements to meet needs of handicapped persons. Avoid placing handicapped parking in loading dock areas, which are not appropriate public entries and where conflicts are likely.

7. Vehicular Circulation

Heavily traveled and sometimes congested streets surround the Main Campus. Highways in and out of Boulder, notably U.S. 36 to Denver, the Longmont Diagonal, and Highway 93 to Golden, can be even more congested than streets in town. As is typical in urban areas, these conditions are substantially worse at morning and evening commute times, Monday through Friday, than at other times of day.

These roadways accommodate people driving or taking transit to the campus. The in-town roadway system also accommodates much of the pedestrian and bicycle arrivals. The roadway system is the vital physical link to the higher education services of CU-Boulder.

a. Circulation Demand

On a typical day, 46,500 vehicles use 28th Street adjoining campus. On average, 29,500 vehicles travel on Broadway. An average of 32,000 vehicles travel on Arapahoe just east of Folsom. See Exhibit IV-E-7. Data is from 1997, the most recent available when the research for this Campus Master Plan was done. Vehicle volumes are exceptionally high for streets of these widths. Demand typically grows between 0.5 percent and 2 percent each year on urban streets, but according to the City of Boulder has stopped growing during the last five years for most of these streets. Frustration with traffic congestion in Boulder is a much-voiced complaint.

The following factors magnify traffic problems in Boulder:

- Ownership of vehicles per capita is relatively high in Boulder.
- The city relatively densely developed for a Colorado city.
- The city street layout is far from optimal, channeling demand onto relatively few streets, narrow relative to volume, limited by topography and creeks, and onto the few streets across the campus in the center of the city.

b. Supply Đ The Roadway Network

The roadway system serving CU-Boulder essentially has been unchanged for many years. The number of traffic lanes and intersection design (including signals, turn lanes, and spacing between intersections) determines the capacity of the system. As a general rule, for a principal arterial, threshold volume for capacity is 6,000 vehicles per day per lane, while the threshold volume at which congestion occurs is 8,000 vehicles per day per lane.

The roads surrounding the Main Campus - Arapahoe Avenue, Broadway, 28th Street and Baseline - all approach or exceed the threshold volume for congested conditions. Surrounding the East Campus, the traffic system has additional capacity. For example, only 8,400 vehicles per day use Colorado Avenue's four lanes. The capacity of Baseline adjoining Williams Village is more limited. All of

the figures in this section, and more, are available in the full CU Campus Master Plan Transportation Element report, prepared by transportation engineers Felsburg, Holt and Ullevig, available for review at the Facilities Management offices.

Intersections are evaluated by traffic engineers according to Level of Service (LOS), ranging from A (optimal) to F (when demand exceeds capacity). Exhibit IV-E-7, taken from the report cited above, shows the level of service for intersections surrounding the developed campus property.

The traffic engineers report the following:

Despite the highly congested conditions of major roadways surrounding the Main Campus, the City of Boulder does an excellent job of transportation system management. For example, by coordinating traffic signals, providing actuated control, and limiting turning movements, capacity is maximized and delay minimized.

As traffic volumes increase transportation management strategies become more ineffective and eventually the transportation system begins to break down. During the PM peak hour, 10 of the 17 intersections analyzed in this study operate at near capacity (LOS D) or above capacity (LOS E or F) which indicates that the transportation system in general is operating near capacity. At this point, transportation management strategies will not improve the situation and major capacity improvements, such as additional lanes, are needed. Adding lanes to Arapahoe Avenue, Broadway, 28th Street, and Baseline Road is very unlikely, given the cost and the impact it would have on the university, businesses, and home owners. Additionally, both Broadway and 28th Street are State highways which means any capacity improvements would go through the Colorado Department of Transportation and be included in the six-year TIP.

With roadway capacity improvements unlikely to occur in the near future there are several Transportation Demand Management (TDM) strategies that the university can adopt to decrease transportation demand during the peak periods:

- Continue to encourage the use of transit by faculty, students, and staff who commute to the campus every day. The transit service system serving the Main Campus is very good.
- The university could introduce a staggered work schedule for staff.
- Through the parking system, the university could introduce an aggressive car pooling program that provides reduced parking costs to the people in the car pool.
- The university could shift activities and employees to East Campus or Williams Village where the street network is less congested.

From strictly a standpoint of vehicular access, growth is limited on the Main Campus while the East Campus has a greater opportunity for growth.

c. Circulation Development Plan

Vehicular access to the campus is limited by the capacity of the off-campus roadway system. The university works with other governmental agencies on transportation issues, and occasionally conveys land for rights-of-way. Generally, CU-Boulder's efforts are

best spent affecting the demand (the need) for circulation. The following components of the plan affect demand and could help traffic circulation:

- Allow employees to shift to off-peak hours arriving and departing campus, if consistent with the work performed.
- Add convenient student, faculty, and staff housing to reduce trip needs.
- Continue to support alternative modes and facilitate good transportation choices for each student, faculty, and staff person.
- Develop telecommuting and use of other technologies, such as videoconferencing, to reduce somewhat the driving needs.
- Allow daily permit parking in lieu of monthly permit parking.
- Provide increased financial incentives for carpooling and vanpooling.
- Add transit alternatives for special events.
- Encourage use of transit where feasible through EcoPasses, rather than use of fleet vehicles or reimbursement for private vehicles.
- Place some new facilities at new centers of activity, for example, at CU-Boulder South and at the rapidly growing Interlocken area in Broomfield.
- Explore park-and-ride options to limit traffic close to campus, perhaps in conjunction with RTD, perhaps utilizing shuttles to CU-Boulder South.

There are some supply-side measures as well:

- Complete the parkway in the Research Park, to disperse traffic as outlined in the Research Park transportation plan.
- Develop a looped system at Williams Village to accommodate more housing there.
- Provide transportation between CU-Boulder campuses that will lessen demand on streets between these properties. Investigate alternatives such as gondolas and fixed-guideway technologies that would not rely on the local street system.
- Continue to work with local governments and other public agencies to improve roadways and intersections adjoining campus, with particular focus on improving the efficiency of campus entrances. Directional signage for motorists should be added.
- Approach the Colorado Department of Transportation, as well as local governmental agencies, to begin access improvements for CU-Boulder South. Consider whether there should be a north-south through street (perhaps a parkway) across the property from the U.S. Highway 36/Foothills Parkway intersection to Highway 93.
- Avoid developing buildings close to the streets adjoining campus to allow for some street widening. However, the university has already given substantial land over the years for street widening and lane additions are unlikely for most adjoining streets. But 28th Street is one of the locations where lanes may be added, by other jurisdictions, possibly including an HOV lane.

Specific on-campus improvements are mapped on Exhibit IV-E-8.

d. Financing Circulation Improvements

As noted, the university neither has resources nor jurisdiction to

finance most of the circulation improvements that might benefit the campus. Most of these decisions rest with other authorities. However, project funds will be needed for the supply-side improvements noted above, and ongoing funding is needed for the demand reduction strategies.

e. Goals and Guidelines

Goal
Since CU-Boulder can do little to improve the highway system, efforts by CU-Boulder will concentrate more on adjusting the demands on the circulation system.

Guidelines

- Pursue the 10 demand-side measures listed above in Section IV.E.7.c.

Goal
Specific locations where campus roads connect to the roadway system will be improved, usually in cooperation with other governmental agencies.

Guidelines

- Pursue the six supply-side measures listed above in Section IV.E.7.c.

8. Automobile Parking

Almost half (49 percent) of people arrive to campus by private vehicle, either driving (41 percent) or as passengers (8 percent). Despite higher cost compared to other modes of transportation, people find driving to be flexible, comfortable, and time-efficient, although over-taxed roads are reducing these advantages. The City of Boulder, which surrounds the Boulder campus, de-emphasizes driving and parking by improving other modes of transportation. However, the City (through CAGID, its downtown improvement district) has constructed several parking garages downtown and more are planned. Driving and parking are likely to remain important for many people.

Parking is a major land use on campus. Parking competes with building sites, open space, and athletic and recreational uses for the valuable and limited campus land resource. Approximately 75 acres of campus land are occupied by parking spaces. Of the total 10,585 parking spaces: 6,601 are on the Main Campus; 3,009 are on the East Campus, including the Research Park; and 975 are at Williams Village.

a. Parking Demand

The Parking and Transit Division sells parking permits to approximately 18 percent of the student body (about 4,300 permits per fall and spring semester), and approximately 48 percent of the full time employees (about 2,700 parking permits). Most requests for a parking permit can be met, though often not in a location of first preference.

Parking demand-how many people want to park vehicles on campus and in the surrounding Boulder community-is affected by several

factors. Among these factors are distance from campus, university policies for the use of vehicles, availability of parking spaces both on and off campus, congested roads, available alternatives, available time, and cost.

Most students live on or near campus, which lessens parking demand since easier and less expensive modes of transportation are viable for the shorter distances involved. There is an option to park at Williams Village at reduced cost, an attractive option for students who don't use their cars often. For those commuting greater distances, parking demand is higher. The same is true for staff and faculty, but much fewer live in close proximity to campus, creating a much higher demand for parking from those groups.

Frequently the suggestion is made to restrict student parking demand by prohibiting some or all students from parking on campus. This suggestion is sometimes limited to freshmen since they are expected to live on campus. CU-Boulder does not plan to follow this suggestion for several reasons:

- Most students living on campus already choose not to rely on automobile transportation. Restricting freshmen would do little to change existing parking demand, which is driven by faculty and staff needs.
- Higher education is increasingly consumer-driven, so not allowing students to purchase permits may reduce the attractiveness and availability of a CU-Boulder education for some students.
- Prohibiting student parking would also shift students into parking intended for visitors or parking in the surrounding community.
- Higher education institutions no longer have an encompassing philosophy of in loco parentis (meaning that the university acts as a parent to restrict students).
- Such restrictions would be difficult to enforce.

Congestion associated with university-bound commuter parking in city neighborhoods near campus contributed to the creation of three City of Boulder Neighborhood Parking Permit Program (NPPP) zones along the western boundary of the Main Campus during the 1990s. These NPPP zones (University Hill, Columbine, and Goss-Grove, west, south and north of Main Campus) have contributed to an increased demand for campus parking permits by students. In fall 1991, 3,990 permits were sold to students. In fall 1997, 4,300 permits were sold to students. The increase has occurred notwithstanding phenomenal growth in the use of alternative transportation by students during the same period.

The 7,000 or so currently active faculty/staff and student personal parking permits issued by the Parking and Transit Division are valid for use in 5,793 permit parking spaces. The ratio of all permits to spaces is about 123 percent, and varies by location based on parking utilization data. Not all permit holders are present at the same time, so from experience, "over-assigning" lots allows spaces to be used efficiently. On the Main Campus the permits-to-spaces ratio is about 136 percent: 6,240 permits are valid for use in the 4,568 permit parking spaces available.

The demand for parking permits has been "elastic," an economist's term meaning that when prices change, demand rises or falls in response. Faculty/staff permit sales declined by 71 permits between

FY 1991-92 and FY 1996-97, notwithstanding an increase of approximately 690 employees during the same period. The decline is attributed to the voluntary cancellation of permits by employees due to the 300 percent increase in permit fees that resulted from construction of the Regent and Euclid Autoparks (parking structures). There was a very slight increase in faculty/staff parking permit sales between FY 1995-96 and FY 1996-97.

Visitor parking demand has been more persistent. According to a parking system study performed by Walker Parking Consultants during spring semester 1998, core campus short-term parking facilities (meters and the attendant-operated parking lot near UMC) were essentially fully utilized between the weekday hours of 9:00 a.m. and 4:00 p.m. This suggests that the demand for short-term parking, which notably is the parking accommodating visitor demand, exceeds the supply of such parking. Revenue from parking meters and the short-term parking at Euclid Autopark increased by 30 percent and 38 percent respectively since FY 1992-93.

In summary, parking demand has changed remarkably little in recent years, despite an increase in the number of faculty, students, and staff. Student parking permit demand increased by an average of 1.5 percent between FY 1991-92 and FY 1996-97. Faculty/staff parking permit demand decreased by an average of 0.7 percent between FY 1991-92 and FY 1996-97. The transit share of all transportation trips to campus has significantly increased in recent years, reducing the demand there might otherwise be for parking. Based on analysis of current demand, the most pressing need for additional parking supply is probably for core campus short-term parking.

b. Parking Supply

There are several parking systems managing the 10,585 spaces provided on the three developed Boulder campuses. The Parking and Transit Division of the Department of Public Safety is the largest, managing 121 of the campus total of 159 parking lots (or "zones"), and 7,019 of its parking spaces. The remaining campus parking spaces are managed by the Department of Housing, the Research Property System, the Athletics Department, the CU Foundation, the Alumni Center, and private ground-lease tenants.

Exhibit IV-E-9 shows parking inventory and inventory changes. In 1991, over 1,000 parking spaces were added to the Main Campus parking inventory through construction of the Euclid and Regent Autoparks, and the reconfiguration of several other parking lots. Since then, Parking and Transit's Main Campus parking inventory has declined by 207 spaces as a result of campus construction. Many campus parking lots are temporary uses of campus land space until they become building sites. Notwithstanding the loss of parking inventory due to building construction, there was a substantial growth in the total number of parking spaces over the last decade, largely due to construction of parking structures and development of the Research Park on East Campus.

Though some pockets of parking availability exist, the Main Campus parking inventory has essentially reached its permit capacity. New and/or added permit demand is being accommodated in space created through displacement of Main Campus residence halls permit holders to Williams Village parking lots, and through the attrition of existing permits. The parking system currently can accommodate permit requests for several years if:

- People are willing to use lots on campus remote from their destination,
- No significant permanent loss of parking spaces occurs due to construction, and
- Continuing successes in "alternative modes" programs (encouraging use of modes other than single-occupant vehicles) help offset the planned increases in numbers of student, faculty, and staff.

Parking supply is constrained by the limited amount of land available for convenient parking, high costs of parking structure construction, and impacts of vehicular traffic. However, development of at least replacement parking for existing inventory lost to construction is probably unavoidable.

c. Disability Parking Demand and Supply

The Parking and Transit Division uses a subset of Americans with Disabilities Act (ADA) guidelines issued by the Architectural and Transportation Barriers Compliance Board (ATBCB) to help determine the number of accessible parking spaces to be provided in its parking lots. These ATBCB standards provide guidelines regarding the number of disability spaces that should be provided in relation to the number of spaces within parking lots. In concert with the concept of "reasonable accommodation," ATBCB guidelines do not require that the recommended number of disability spaces be placed in each parking lot within larger parking systems. Parking spaces for handicapped persons may be apportioned differently per lot if equivalent or greater accessibility in terms of distance from accessible entrances and convenience is assured thereby.

In accord with the spirit of ATBCB guidelines, the Parking and Transit Division has prioritized the installation of disability parking spaces in lots nearer to common destination points on campus. These more proximate parking lots meet or exceed ATBCB guidelines regarding the number of disability parking spaces provided. Peripheral campus parking lots, where demand for disabled parking is virtually nonexistent due to their greater distance from campus buildings, may not meet ATBCB guidelines, but disability parking spaces will be installed in peripheral parking lots as needed. As most spaces are regulated by permit, disability demand is easier to predict and accommodate than is the case for open public parking. Accessibility guidelines do not require that disabled persons be provided free parking. Accordingly, disabled parking patrons are charged applicable permit and meter fees for parking at CU-Boulder.

d. Parking Development Plan

Given the limited campus land availability, future development of parking supply on the Main Campus would most likely occur through construction of parking structures. Sites are available. By the end of the 10-year planning period, if demand warrants and financing is reasonable, this plan envisions that the Main Campus may have four parking structures as shown on Exhibit IV-E-10:

- (South) Euclid Avenue Autopark
- (East) Regent Drive Autopark
- (North) New structure off of Folsom Avenue
- (West) New structure(s) in the Grandview vicinity

This scenario would provide walking access from the parking structures to campus destinations, without requiring potentially expensive and time consuming shuttle services. This dispersal of structured parking can be accommodated by the existing road system far better than concentrating structured parking at one location, and accommodates people arriving from all directions. The potential of any sites to function well can be constrained by the limited capacity of streets accessing the campus (see the vehicular circulation section, IV.E.7).

Given projected growth in campus populations, this plan will not increase the private vehicle share of the modal split (the percentage of campus arrivals by automobile and other private vehicles versus those using alternate modes).

Additional parking development is part of this plan for several reasons. First, it is estimated that approximately 500 parking spaces will be lost due to the following capital construction projects: Humanities, Business, Law, Discovery Learning Center, Duane Physical Laboratories addition, Science Library, and Athletics Fieldhouse. Additional projects likely will result in additional parking losses. This new construction creates both replacement demand and new demand related to the net increase in campus facilities. Given the limited and valuable land resource, the density of development suggests that structured parking, rather than surface parking, be planned.

Most of the displaced and added parking demand is projected to be accommodated in a new parking structure on Folsom Avenue near Boulder Creek, underneath a new Athletics Fieldhouse, accommodating perhaps 400 to 600 cars. This project is intended to help accommodate stadium event parking, and the location will serve daily needs since it is in reasonable proximity to parking spaces both displaced and needed along the Colorado Avenue corridor. The traffic engineers' study indicated that Folsom Avenue could accommodate the proposed garage traffic.

A second location for structured parking is in the Grandview area. This is to accommodate parking displaced by development of that area, and to accommodate a portion of the new demand created by development there. Temporary surface lots may serve Grandview until a structure is built. Grandview parking could help relieve the tight parking supply in the northwest part of campus, as well as the parking shortage in the evening for Macky Auditorium events. Total parking in this area should not exceed 470 spaces, as specified in a Memorandum of Agreement with the City of Boulder. Intersection capacities limit the parking potential. Parking will be phased depending on timing of development and the use and further refinement of alternative modes in this location which is presently served by transit, pedestrian, and bike facilities. Future structured parking north of the Humanities Building, west of the Recreation Center, is an alternative, but the traffic impacts would likely be the same or worse.

Expanding at or near the two existing parking structures is not as preferable. Neither structure was built to accommodate more spaces. Additional sites are available adjacent to the Regent Drive Autopark. Both structure locations would require significant roadway and intersection improvements in their vicinities to support added parking, according to traffic engineering studies.

More than the two additional structured parking sites are likely not needed during the 10-year planning period, given the modest growth proposed on Main Campus, the relocation of some administrative and service offices to East Campus, and considering the price sensitivity noted earlier. Additional parking structure sites are available along Regent Drive if they are needed in the future. Additional surface parking lots at both Williams Village and East Campus are expected during the 10-year period, in order to accommodate development on those properties.

Development costs of providing the supply to address short-term (visitor) parking demand could be minimized by conversion of more core campus parking to short-term parking. This might be accomplished by shifting some long-term parking to more peripheral locations, perhaps served by a campus shuttle.

Peripheral parking with a shuttle has worked well at other universities, notably those that have surplus peripheral land, people arriving primarily from one direction, and funding for frequent shuttle service. The issues for CU-Boulder regarding developing peripheral parking are four-fold: will customers use peripheral parking, what sites are available, how will people get from these spaces to core campus destinations, and at what cost (in terms of money and time)? Peripheral parking now sited at Williams Village is likely to be phased out in order to support additional student housing there. Vacant land on the East Campus is also being developed. Peripheral parking at the CU-Boulder South site might work for some persons arriving from Denver, but peripheral parking may not be the best long-term sustainable solution given the value of land for other purposes. A shuttle system is needed but its cost and inconvenience make peripheral parking less attractive.

Off-campus peripheral parking, i.e. park-n-rides with existing transit service to campus, may be most viable. RTD is planning to add over 2,000 spaces in park-n-Ride facilities along U.S. 36 by 2002. These are all in areas where CU commuters can use them.

e. Parking Funding

Structured parking development costs are high, and given the demonstrated elasticity of demand (price sensitivity) and the intent not to use general funds of CU-Boulder to support parking, cost is an issue. In 1991, development cost for the Regent Autopark was $6,200 per space, and $11,959 per space for the Euclid Autopark (below grade). The costs per each added space for these facilities were $10,034 and $23,632 respectively, since each was built upon an existing parking lot. Construction costs were unusually low at the time these structures were built, and costs have approximately doubled since then. The City of Boulder estimates that its new parking garage at 15th and Pearl Streets cost about $18,000 per space. Surface lots are less expensive to develop (approximately $3,000/space), however, surface lot sites are very limited.

Revenues from the Euclid Autopark do not cover capital and operating costs of the structure, but come close due to the moderate initial capital cost and the relatively high revenues achieved by charging visitors per hour (currently $1.25/hour). In contrast, Regent Autopark revenue falls far short of covering costs since parking revenue is approximately $1 per day, paid monthly or by semester. The costs of these parking structures is "subsidized" by the many surface lots. If the percentage of structured spaces relative to total

spaces increases, the cost of parking will need to increase very substantially. This ability to pay for structures through surface spaces revenue is a major determinate of future parking supply.

This plan will be fiscally challenging, given the very difficult economics of parking structures. Costs of structured parking are almost always subsidized, often (as in downtown Boulder) by a tax. Auxiliary (self-funded) department revenues fund campus parking development. The 1991 construction of the campus's two parking structures, the Euclid and Regent Autoparks, led to a 300 percent increase in parking permit rates. CU-Boulder's experience does not exceed costs for similar parking in other cities and urban universities.

The Parking and Transit auxiliary operation, and the other campus parking lot operators, do not pay for the land occupied by parking facilities. They have not been charged for related facilities, such as roadways, sidewalks to the parking, and needed landscaping. Therefore, the true costs of providing campus parking are much greater than current parking charges. Parking system revenues also pay 30 percent of the faculty/staff EcoPass program's cost. Some of the parking revenues will likely go to these purposes in the future.

As more of the campus's parking inventory is converted to structured space, parking fees will more closely match the higher costs of these facilities. Consideration must be given to price elasticity issues associated with parking fee increases. Reduced permit demand due to higher charges could jeopardize the revenue streams that support transportation programs and existing bonded indebtedness. A 300 percent increase in fees led to the net decline of faculty/staff parking permits sold between fiscal years 1991-92 and 1996-97. The increased costs that would have to be passed on to pay for new parking garages may reduce the demand and could create significant problems in financing parking garage construction.

f. Goals and Guidelines

Goal
Additional Main Campus parking will be developed at one or both of the two identified parking structures sites 1) if parking demand warrants an additional structure or structures or there is a loss of existing parking, 2) if alternative mode programs do not provide adequate mobility, and 3) if parking can be developed at an affordable price.

Guidelines

- Recognize that permit demand and supply will change, although currently in balance given the charges for permit parking on the Main Campus.
- Add visitor parking, for which demand currently exceeds the supply. Consider doing this by reallocating existing spaces.

Goal
Parking demand on East Campus, Williams Village, and CU-Boulder South will be met with surface lots during the planning period (to 2008).

Guidelines

- Augment transit systems to all campus properties to both optimize the parking system and provide an alternative to parking.

- Anticipate that land costs and increased development on these properties will in the longer run warrant parking structures.

9. Alternatives to Physical Access

This transportation plan has considered the demand and supply for each mode of transportation. The traditional planning approach has been to address the supply of transportation services to accommodate existing and growing needs. But CU-Boulder can somewhat better affect the demand for, rather than the supply of, transportation services, while recognizing that both are needed.

Student and faculty schedules have always varied from the corporate 8 a.m. to 5 p.m. model. Technology now allows even greater flexibility in scheduling and transportation. CU-Boulder is located in a low-growth city that intends to reduce the share of single-occupant vehicle trips. Growing regional mobility problems will not be solved before they get worse. Given this environment, the best strategy is to reduce CU-Boulder's reliance on peak-hour transportation systems, perhaps increasing demand during non-peak hours.

Proposed campus traffic demand management strategies were listed in the Vehicular Circulation Development Plan (IV.E.7). This section and others suggested ways to manage demand, for example EcoPasses. Strategies listed below are intended to reduce the need for any mode of transportation as part of a Transportation Demand Management (TDM).

a. Computer Access to Educational and Other Services

Some campus services have been available by telephone for a long time. Now, computer access through the Internet, and similar world networks, substantially increases the range of CU-Boulder services that can be accessed without requiring transportation.

The educational services of CU-Boulder are increasingly available on the World Wide Web, important not only as a substitute, but as a supplement, to the classroom. Yet CU-Boulder intends to remain a residential university, valuing in-person contact and hands-on laboratory experience.

Many student and administrative services are becoming web-based through the student services Odyssey project and through the Administrative Streamlining Project (ASP). Once again, the university is retaining an option of in-person contact.

b. Teleworking

Teleworking is defined as a way for employees to work at home, or some other location away from their normal place of work, for a designated period of time. Such workers communicate with their normal office location by telephone, computer, fax machine, and other communication devices in a manner that approximates virtual presence in the workplace. According to the U.S. Department of Transportation, more than 11 million people already are in this category nationwide, with the number rising annually. Their studies show that teleworking programs can significantly reduce costly job-related travel, reduce employee absenteeism, and actually help workers be more productive.

There are certain characteristics, qualifications, conditions, and

procedures that help identify which workers and their work tasks are best suited for teleworking. Employer concerns related to timekeeping, reporting, and liability must be met. The objective is to provide a "win-win" situation for both employer and employee that maintains the quality and reduces the cost of services. The university, with its traditional flexibility in scheduling for students and faculty, is an ideal place for teleworking. However, maintaining a campus community will continue to mean in-person contact, limiting the extent of teleworking.

c. Future Technologies and Opportunities

To some extent there has been modification of workplace methodologies, by teleconferencing, job-sharing, flexible working hours, internal/external task consulting, outsourcing work, and other innovative means to deliver administrative and educational services in a productive and efficient manner. These will increase efficiency and reduce transportation needs.

The opportunities for change in the educational marketplace are increasing exponentially. This plan anticipates that the university will support new technologies and new opportunities, reducing but not eliminating the additional need for "bricks and mortar" and physical transportation.

d. Goals and Guidelines

Goal

Technology and innovations in education and employment will reduce the need for transport.

Guidelines

- Utilize innovations to become more efficient in time management, reducing unnecessary travel.
- Make the best of a regional transportation system that is beginning to make access to campus services more time consuming.
- Retain a university community with productive in-person exchanges.

F. Utilities Infrastructure Plan

The University of Colorado at Boulder is served by a variety of utilities that are essential to campus operations. This infrastructure plan identifies the various utility systems, their current status, and the issues that should be addressed. During calendar year 2000, following the scheduled adoption of this Campus Master Plan, the Utilities Master Plan will be further developed to better serve the building needs identified by this Campus Master Plan.

References to "City" (upper or lower case) in this section mean the City of Boulder, particularly its Public Works Department. Campus properties outside of the City of Boulder are also discussed in this section. Utilities at the Mountain Research Station are addressed separately in the Mountain Research Station Plan (in IV.B).

1. Utility Systems Overview

Fuel: Central campus heating, power, cooling and compressed air are

produced by a co-generation facility fueled by natural gas, with fuel oil backup. Williams Village also uses natural gas with fuel oil backup. Natural gas is the only fuel source for heating buildings on the East Campus and CU-Boulder South.

Heating: Most Main Campus and Williams Village buildings are heated through district steam heating systems radiating from central plants on the two campus properties. Buildings on the north periphery of the Main Campus, and buildings on the East Campus, have individual building heating systems.

Power (Electricity): Most electricity used by the CU-Boulder campus is produced at the campus Power House, which also produces steam for heating. Public Service Company of Colorado (PSCo) provides backup electricity for the Power House. University supplied power is not now available to Grandview, Williams Village, leased buildings in the Research Park, and CU-Boulder South, all of which are supplied by PSCo.

Natural gas: A high-pressure natural gas line provides service to the Power House for turbine operation. Intermediate pressure gas lines serve other campus buildings. With few exceptions, PSCo owns and maintains the natural-gas distribution systems on campus.

Cooling: Sixteen buildings comprising approximately 40 percent of the Main Campus building space are cooled by chilled water from the Power House. Other buildings are cooled with individual systems such as building chillers, evaporative cooling systems, or window air conditioners. A number of buildings, including most dormitories, have no space cooling systems.

Compressed Air: The Main Campus is served by a central compressed air system. This system is used for both building temperature control systems and laboratory use. However, some buildings utilize this system only as a backup supply and new laboratory usage is currently not permitted due to limited capacity.

Water Supply: Domestic (potable) water is distributed from two City of Boulder water treatment plants to the campus edge. On-campus water distribution is primarily through university-owned and maintained water lines with some city lines.

Irrigation: Most of the grounds are irrigated by sprinkler systems using water from irrigation ditches, although many housing areas, including Williams Village, still use city domestic water for grounds.

Sanitary Sewers: On campus, sewage is collected primarily by university sanitary sewer lines and by some city lines. All sewage is conveyed through city sewer lines from the campus edge to the city treatment plants at 75th Street.

Storm Sewers: Storm water is collected by a complex system of on-grade facilities and university storm sewer lines. Most storm-water runoff is routed to Boulder Creek or other creeks.

Metering: All campus buildings are metered for electricity use. Most buildings on the Main Campus and Williams Village are metered for condensate (steam) and water usage. Several buildings on the central chilled water system are metered for cooling. Buildings served with natural gas are also metered.

Communications and networking: The campus has its own telephone

system and data communications network, connected to worldwide networks. The campus currently has audio-visual cabling in selected buildings. A few peripheral buildings, including some in the Grandview area and some housing, have direct phone service provided by U S West.

2. Infrastructure Principles

The following principles should be used as utility systems are improved and expanded:

- Safety: Of primary concern is safety of the students, faculty, and staff. Utility systems must ensure the safety of the entire campus community.
- Reliability: Utility systems must be reliable. For many systems, this suggests backup and redundant systems allowing for downtime for equipment failures, maintenance and replacement, and peak-load accommodation.
- Minimization: Utilities operating costs should be minimized, with life-cycle costing that includes capital improvements. System demands should be controlled, where possible, through energy management tools. New buildings and major renovations should be properly commissioned. Integral to this is the accurate metering of utilities for each building.
- Reliance on Utilities Providers: The university will need to rely on the city for the provision of most potable water service and sewer treatment and conveyance. Natural gas will be provided either by PSCo or third-party suppliers. Some campus buildings will continue to receive electricity from PSCo.
- Longer Demand Periods: Summer occupancy of campus is increasing, creating higher peak power demand and increased cooling demand. Nighttime and weekend use is also increasing.
- Information Technology: Communications, networkings, computer, and building controls technologies are increasingly integral to higher education endeavors. Utility and building systems planning must account for these emerging technologies.
- Utility Development Costs: These costs should be recovered through assessments to the various users based on their proportional demands upon the system.
- Environmental Concerns: Environmental impacts associated with the acquisition, production, and distribution of campus utilities should be minimized.

3. Fuel Use

a. Power House

The central plant on the Main Campus, the "Power House," provides electricity, steam, chilled water, and compressed air. Electricity and steam are both produced (co-generated) through the combustion of natural gas in two industrial gas turbines. Production of electricity began in 1992, upon completion of an approximately $42 million construction project to convert the Power House to the production of electricity. Debt is owed through 2006 on the bonds used to finance the plant construction. Repayment is partially through the sale of excess power to the Public Service Company of Colorado (PSCo) through a multi-year Power Sales Agreement, with payment made to the university on a monthly basis. Revenue is also received through the sale of electricity to campus users.

b. Natural Gas

Natural gas is the primary fuel for the Power House and is currently furnished by a private company through a contract that expires in 2002. In fiscal year 1997-98, the Main Campus Power House used approximately 1.9 billion cubic feet of natural gas. Natural gas is the fuel of choice for several reasons, including its relatively clean-burning characteristics, lack of storage requirements, and cost. The gas supply contract(s) are for firm supply which means CU-Boulder is given preference should a supply problem develop, but there is no guarantee that the supply will never be interrupted.

The natural gas is transported to the campus through a high pressure pipeline owned by Public Service Company of Colorado (PSCo). A transportation fee is paid monthly to PSCo for this service. When the gas supply contract expires in the year 2002, the university will likely evaluate its options to purchase natural gas in a competitive marketplace while still maintaining the necessary assurances regarding its supply.

The university also secures natural gas through several other means. The Williams Village complex is served by a central steam and chilled water plant. Natural gas is the primary fuel and is purchased monthly at market prices from third party suppliers and delivered to Williams Village through PSCo's distribution system. Williams Village has #2 fuel oil in reserve on-site if natural gas is curtailed.

Buildings on the East Campus, on the Main Campus north of University Avenue, and some of those north of Boulder Creek have individual building heating systems fueled by natural gas, supplied either commercially by PSCo or through competitively-sourced contracts, and again delivered through PSCo's transportation system. These buildings do not have reserve fuel oil on-site and rely solely upon natural gas for space heating.

c. Backup Fuel Sources

It is possible that the natural gas supply to the Power House could be interrupted for a period of time. Public Service Company of Colorado has called several restricted delivery days since 1992 where it was unable to deliver sufficient quantities of natural gas to its customers on the Front Range, including CU-Boulder. In those instances, backup fuel oil was used to maintain continuous operations at the Power House. CU-Boulder has fuel oil stored in below-grade tanks adjacent to the facility for immediate use should natural gas become unavailable. This on-site supply will operate the Power House fully for 96 hours before oil deliveries would need to occur to replace the fuel oil. Fuel oil will remain a reserve fuel at the Power House for both electricity and/or steam production. A current project at the Power House will refurbish the oil storage tanks and bring them into regulatory compliance. Williams Village also has sufficient fuel oil in reserve on-site for approximately two weeks of continuous operation should natural gas be curtailed.

The campus also has twenty-two diesel emergency generators to back up limited, but key, electrical systems in some buildings.

d. Resource Conservation

Natural-gas-fired cogeneration represents a very efficient use of natural resources and also significantly reduces air pollution

compared to coal-based technologies. Since 1977, over $18 million in avoided utility costs through resource conservation programs has been realized on the Boulder campus. However, faced with both new buildings and major building renovations, especially those for more energy-intensive research programs, the subsequent demands upon campus utility systems are increasing. For example, the electrical service to many buildings has been upgraded due to increased electrical demand from fixed equipment, lasers, computers, and support equipment. Rather than turn HVAC systems off during unoccupied periods, it is becoming more prevalent to continuously operate them so as not to compromise research. Also, in part, energy use is affected due to the need to continuously provide 100 percent outside air into some research facilities (i.e., no recirculated air), for health and safety reasons. In such HVAC systems, the installation of heat recovery is often used so as to minimize energy use.

With the anticipated deregulation of electricity expected in Colorado in the next several years, new opportunities and challenges are emerging to keep pace with this dynamic environment. Building owners must position themselves to take advantage of this evolving marketplace. Fundamental to this effort is understanding the specifics of how the campus uses energy, which is possible through the metering of utilities.

With these anticipated campus demands and opportunities in mind and the expectation that the sourcing of energy will become increasingly competitive, CU-Boulder should seek to decrease utility expenditures. This can be accomplished through making strategic investments in resource conservation, strengthening public awareness of the importance of resource conservation, and implementing projects which reduce resource consumption, while retaining or improving user comfort and convenience and preserving and enhancing the environment. For example, new lighting fixtures and controls improve lighting while simultaneously reducing electrical usage and demand.

4. Heating

a. Steam Production

Steam is the heating source for almost all buildings on the Main Campus. As noted in the previous section, however, some buildings have independent heating systems served with natural gas. The Power House on the Main Campus produces steam in four boilers capable of 425,000 pounds-per-hour peak total output. Current maximum peak demand during severe winter weather is approximately 185,000 pounds per hour and is increasing annually. Production capacity to meet peak demands is currently such that the Main Campus could still be supplied with adequate steam in the event that the largest boiler is out of service.

The exhaust gases from the two gas turbine-generators are routed to two heat-recovery steam generators (HRSGs) to produce up to 80,000 pounds of steam per hour each. The HRSGs may also be fresh-air fired with fossil fuel, providing the Main Campus with the capability of producing steam from all four boilers independent from gas turbine operations, if necessary. When they went into service in 1992, the HRSGs replaced the two old boilers, #1 and #2, that were at or beyond their expected service life. Combined with boilers #3 and #4 that remain in service, the resultant total peak steam capacity of the Power House is 425,000 pounds per hour using

natural gas (315,000 pounds per hour with backup fuel oil). If the largest boiler were out of service, this peak capacity would be reduced to 275,000 pounds per hour (200,000 pounds per hour with fuel oil). As previously mentioned, this production capacity compares with a current estimated Main Campus peak load of 185,000 pounds of steam per hour peak demand in severe winter weather. However, boilers #3 and #4 at the Power House are now fully depreciated and may require replacement within the next five to 10 years.

The anticipated growth of Main Campus steam demand is such that options for increasing production on campus are currently being analyzed. The ability to raise up to $75 million with debt financing has been reserved to develop enhanced production within the next five to 10 years. Among the options being analyzed are to increase production at the Power House and/or a second production facility. One potential location for a new plant is near the eastern edge of the Main Campus; this new plant could also produce additional chilled water, if appropriate. Another option may be to expand the production capacity of the Williams Village Heating Plant also. Again, improved system maintenance and resource conservation are anticipated to factor into the decision process.

The Williams Village Heating Plant currently produces steam in two boilers for the Williams Village complex exclusively. The plant has a total capacity of 60,000 pounds per hour with a current peak demand of 18,000 pounds per hour during severe winter weather. One boiler is always in stand-by mode. The steam is distributed to the various buildings through a utility tunnel system. There is currently underutilized steam production capacity to support some additional buildings. Additional housing and a Conference Center are planned for the Williams Village campus. As mentioned, the Williams Village Heating Plant should be considered within the overall campus utility planning effort. The boilers are thought to be generally in good condition. The tunnel system is similar to that of the Main Campus. As such, it should be considered for upgrades regarding life safety issues such as asbestos, ventilation, and access/egress, and separations from adjacent buildings.

East Campus buildings are heated by individual systems fueled by natural gas. An earlier study in 1964 recommended the consideration of a central steam facility as an option for this area. The relatively high ground water table in the area may make the installation distribution piping systems both difficult and expensive, both on an initial cost and long-term maintenance basis.

b. Steam Distribution

Steam is distributed on the Main Campus through a utility tunnel system nearly three miles in length, plus shorter sections of both elevated and buried pipe. It leaves the Power House through one of several lines arranged in a radial pattern. It is estimated that about 50 percent of the distributed steam is returned as condensate to the boilers for reuse. This steam distribution system dates back nearly to the turn of the century. These same tunnels are also used to convey other campus utilities, including environmentally-sensitive telecommunications cabling. In the last several years, the condition of the steam tunnel system on the Main Campus has been scrutinized in a variety of areas. The system is generally in fair condition, although some piping has required replacement in the last several years due to corrosion. A 1975-76 program plan for utility system improvements specifically addressed two direct-buried steam

lines for replacement. One, a service line for the Fleming Law Building, was installed in a new utility tunnel. The other, a direct-buried line serving the Stadium, Grounds Building, and Dal Ward has yet to be replaced. This should be considered when the new Fieldhouse is constructed north of Franklin Field.

Steam velocities in the pipes are increasing as more loads are added, placing increasing demands on the maintenance staff. The radial pattern of the steam distribution piping also adds complexity to maintenance activities, as taking any one piping system out of service affects all buildings downstream from the shutoff point. These velocities and subsequent pressure drops are currently being analyzed with regard to the ultimate buildout capacity of the existing distribution system.

The 1972 Steam Utility Master Plan discussed the need to rehabilitate the utility tunnels including ventilation and improved lighting. These conditions were assessed in more detail as substandard in a 1990 engineering study and also included other life safety considerations. Out of that work, a multi-year program for improving tunnel conditions was instituted through the State of Colorado Controlled Maintenance Program. It includes structural upgrades, improvements in ventilation, lighting, and drainage; access/egress for maintenance staff, and replacement of failed and failing pipe support systems; and mitigation of asbestos insulation on the pipes. This work is estimated to be from 35 to 40 percent completed. Additional funding from the State should continue to be requested.

While providing access for maintenance workers and, thus, extending the life of equipment for many years, new utility tunnels are relatively capital-intensive at $1,600 a foot or more. Only relatively short sections have been constructed on campus in recent years. In order to provide service to new buildings, the construction of less expensive shallow trench tunnels or the burying of steam lines directly in the ground are being considered as options to full-size service tunnels. The cost to extend steam utility service from a main in the tunnel to a new building is borne by the project. The extension of steam mains is also under consideration with that of increasing production capacity.

c. Heating Systems within Buildings

Older buildings such as Old Main are still heated directly with steam in cast-iron radiators. However, the majority of buildings utilize heat exchangers to heat water from steam, which is then used to condition the building space. Generally, buildings not supplied with district steam are heated with natural-gas-fueled boilers. The newer designs usually feature two boilers per building, each designed to meet from 65 to 70 percent of the peak heating load. In this manner, other than during very severe conditions, the loss of a single boiler will not significantly affect use of the building. Some areas, such as Newton Court, have more than one building served by a single boiler. Other smaller buildings such as those in the Grandview area have natural gas fueled, residential-type furnaces.

5. Power

a. Electrical Supply and Generation

Electricity for both the Main Campus and East Campus buildings is supplied by the Power House. Exceptions include all buildings in

Grandview, some buildings north of Boulder Creek, and privately-leased buildings in the Research Park which are served by directly by PSCo. PSCo maintains two feeders to the Main Campus that normally convey power from the Power House to PSCo through a power sales agreement. Power can also be imported from PSCo to the campus. However, it should be noted that each feeder by itself is not able to convey sufficient power to meet the campus peak electrical demand. The potential necessity and cost to increase the capacity of these feeders and the Engineering Sciences Center high voltage switchgear are emerging as an issue in the utility planning process.

The cogeneration facility has the capacity to produce 33 megaWatts of electrical power; the output of each gas-turbine generator produces up to 16 megaWatts and a smaller steam generator is capable of nearly 1 megaWatt. The current peak demand on the facility, including the East Campus, is about 18 megaWatts. Peak demand is projected at up to 29 megaWatts within 10 years. The current Power Sales Agreement with PSCo runs through the year 2006, whereby the university exports up to 10 megaWatts of continuous power back into the PSCo grid and receives a monthly payment. At about the time this contract expires, the previously discussed deregulation of electrical generation in Colorado may be implemented. Although the details are uncertain, this will likely foster increased competition and also offer opportunities for producers and consumers alike. Deregulation is thought by many in the power industry to be a disincentive for the formerly regulated utility companies to maintain existing power plants and distribution systems. In the summer of 1998, PSCo was forced to schedule rolling blackouts on the Front Range as it was unable to meet the demands on its grid due to higher than anticipated peak loads and supply disruptions.

The reliability and quality of campus electrical power are concerns. At over 18 megaWatts peak demand, the campus no longer has full redundancy within its own supply or through PSCo. The campus does have limited load-shedding capabilities, which have been implemented on few occasions. The campus will need to examine how the mix of self-generated, purchased, and exported electricity meets its long-term objectives as campus demand increases and deregulation develops over the next several years. Deregulation of electricity generation will likely require that CU-Boulder compete further in the marketplace for the purchase and/or sale of electricity. Knowing the patterns of electricity usage and associated power quality requirements for campus buildings is considered critical to this process. The existing building electrical meters do not provide this information. Replacing these meters with improved meters is considered necessary and is under consideration.

b. Electrical Distribution

The university owns and maintains the electrical distribution system running through most of campus, although PSCo does own some electric lines. The system is distributed at 13.8 kilovolts (kV) and looped to allow power to be backfed to any particular building in the event of failure in any one distribution cable. These improvements and others were implemented in the subsequent years after a 1972 Electrical Utility Master Plan was developed.

Studies will need to determine the feasibility of extending the central electrical utility to Grandview and areas of the Main Campus north of Boulder Creek. The Research Park east of Innovation Way and the

Williams Village campus will likely continue to be served by PSCo, except that CU-Boulder maintains the option of extending electrical service from the cogeneration facility to additional campus-owned buildings in the Research Park.

The high-voltage distribution system has received significant State Controlled Maintenance Program funding over the last several years. Nearly all the high voltage cabling has been upgraded and is rated for over 25 years of service life. The capacity of the distribution system should serve planned campus expansion for the next 10 to 20 years.

Improvements to the Main Campus and East Campus 13.8 kilovolt (kV) system included extensions to loop the main feeders. Some high voltage switches are also scheduled for replacement. A control system to better manage the routing of power on campus is being considered. Due to the age of various transformers and changing building usage patterns (computers, lasers, etc.) the possible replacement and/or upgrades to a number of building transformers will be required over the next several years.

The university also owns and maintains the primary distribution systems at the East Campus which are served by the Power House. The Williams Village complex is served by radial (unlooped) 13.2 kV feeders from PSCo. PSCo also serves CU-Boulder South.

6. Cooling

a. Chilled Water Production

The Power House produces chilled water to air-condition approximately 3 million square feet of Main Campus buildings. These buildings are generally located near the core of campus. All other air-conditioned buildings, including the Engineering Center complex, the Business Building and Norlin Library are cooled by individual systems. These systems also employ chilled water and provide nearly 4,000 tons of distributed peak cooling capacity.

The plant has three absorption chillers that are capable of producing a peak capacity of 2,500 tons of cooling. The maximum cooling demand is approximately 1,500 tons during the hottest summer weather. If the largest chiller were out of service for an extended period of time, the two remaining chillers could currently carry the load. However, as with steam, that additional margin of redundancy is expected to largely diminish within several years given the anticipated campus growth. A 1995 Chilled Water Master Plan indicated that adding cooling capacity at the Power House would be difficult, and should be considered for the purpose of providing redundancy. The Chilled Water Master Plan also recommends verifying the actual connected loads over time through testing to confirm the ultimate buildout capacity of the existing system. This will also factor into the decision to increase the size of certain sections of the distribution pipe in the utility tunnels. Improvements to the chilled water piping and control systems in each building were also recommended in the Chilled Water Master Plan. A State of Colorado Controlled Maintenance Program project has funded a part of the controls portion of these improvements which is expected to increase occupant comfort while improving the efficiency of both production and distribution.

Of note, the co-generation facility has provided opportunities to

expand chilled water production efficiently at locations other than the Power House. In the summer, the production of electricity results in some quantities of unutilized (excess) steam being available. This excess steam is now used, for example, in the production of chilled water for cooling purposes in Norlin Library through the use of absorption chillers.

Given the anticipated growth of cooling requirements projected for the Main Campus, the options for expanding campus cooling production are also under development. For example, if in five to 10 years, the peak loads exceed the existing plant capacity, some new or renovated buildings planned may not be permitted to tie into the central chilled water system. The possibility of creating other multiple building cooling plants is one option. As previously mentioned, one area being explored is on the east side of the Main Campus, possibly integrated into a new steam production facility. In some instances, upgrades and/or retirement of equipment due to the mandated change away from the use of chlorofluorocarbons (CFCs) may factor into the analysis.

b. Other Cooling Production

The Williams Village plant has a capacity of 600 tons of cooling, as a result of the installation of two centrifugal chillers. Currently, the peak demand is estimated to be approximately 500 tons. The original 800-ton absorption chiller is also in place and operational.

Some Main Campus buildings have independent air conditioning systems and others are not air conditioned at all. Others utilize evaporative cooling systems and do not require an additional means of cooling. The use of electric-driven, window air conditioners is discouraged due to their inherent inefficiency, maintenance requirements, and unpleasant aesthetics.

c. Chilled Water Distribution Systems

Chilled water is distributed from both the Power House and the Williams Village plant through utility tunnels to various campus buildings. Eighteen buildings on the Main Campus are served by this system. The insulated chilled water piping runs parallel to the steam piping in the utility tunnels. The piping systems are generally in fair condition. A portion of the chilled water piping near the Power House was increased in size several years ago to handle larger flows due to the addition of buildings. Other sections may require similar upsizing as new building loads are planned to the system. As mentioned, a State Controlled Maintenance Program project is currently in progress to upgrade the chilled water control systems in each building to better utilize the installed chiller plant capacity and increase occupant comfort.

Air conditioning of buildings on the East Campus is through individual building systems, a pattern which is expected to continue.

7. Compressed Air

Compressed air is produced at the Power House for both plant purposes and for use in nearly every building on the Main Campus. Temperature control systems in buildings continuously utilize compressed air for equipment such as thermostats, valves, and air dampers. Compressed air is also used in many laboratories. The use of compressed air has increased such that if one of the two primary

compressors in the Power House were to fail, sufficient capacity would not be available in all areas of the system. This was discussed in 1998 Compressed Air Supply and Distribution System Master Plan. At the writing of this plan, a State Controlled Maintenance Program project is underway to implement this plan by increasing the plant capacity with the addition of up to three additional compressors to the system and upgrading the compressed air distribution piping in the utility tunnels. Some buildings on the Main Campus also have air compressors in them as backup to the Power House supplied compressed air. Buildings at Williams Village and the East Campus have individual air compressors.

8. Domestic Water

a. Main Campus (excluding Grandview)

The supply of domestic water to all campus areas, including the Main Campus, is from the City of Boulder. The Main Campus is served through four main service meters. The distribution systems on the Main Campus are generally satisfactory, except that some of the older mains on the west side of the Main Campus may require upgrades and/or replacement within the next five to 10 years. Some pressure loss is being experienced in these areas due to aging effects such as corrosion and tuberculation. There are some dead-end water mains (water supplied from only one direction) to a few buildings such as Fine Arts, JILA, and Wardenburg. New construction and renovations may offer opportunities for upgrades in these areas. State funding may also be required on a multi-year basis to perform the necessary upgrades. Also, due to the current system pressure/flow criteria, it is likely that fire pumps will be required to provide sufficient flow and pressure at both Gamov and JILA Towers when fire sprinkling systems are retrofitted to them. In order to maintain properly the water distribution system, the ongoing testing of primary gate valves and fire hydrants should continue. The effort to upgrade the documentation of the distribution system on a computerized database should continue. This allows the staff to assess better and repair the equipment and plan for future development.

b. Grandview

Grandview is served by old 6-inch looped water mains which are maintained by the City of Boulder. Although they are adequate for the existing properties, consideration will need to be given whether to keep the city system or develop a new CU water system for a reliable/adequate water service and minimal maintenance.

c. East Campus/Smiley Court

The domestic water system in the Research Park is owned and maintained by the City of Boulder. The East Campus north of Boulder Creek is served through two main service meters. Based upon available pressures and flows, the system is generally adequate, but will need reconfiguration and/or extensions of the system as additional service uses are developed north of the creek. The system serving the Smiley Court area is likely deteriorated in places, and needs to be upgraded as well as possibly reconfigured.

d. Williams Village

The domestic water system in Williams Village is owned and maintained by the City of Boulder. Based upon available pressure and flows, the Williams Village water system is considered adequate, but major reconfiguration and/or extensions will be needed as additional housing is developed there.

e. CU-Boulder South

CU-Boulder South currently is not served by a municipal water/sewer utility. The university, however, does own water rights in a mutual ditch company that serves shareholders along South Boulder Creek. Either service by a municipal system or a package treatment plant for providing potable water service to CU-Boulder South should be pursued in order to accommodate further development. Some initial funding for this and other utility work on this site is included in the 10-year capital projects list of this Campus Master Plan.

9. Irrigation

The automated sprinkler system that uses untreated (raw) Boulder Creek water, which was installed several years ago, has proven to be a cost-effective system to irrigate the campus. This system was the topic of a 1983 Campus Irrigation Master Plan. The purchase of approximately 90 million gallons annually of more costly, treated city water is currently avoided by using this system. This system utilizes a portion of the university's decreed water rights. Water is diverted from Boulder Creek and routed through irrigation ditches to the campus where it is stored in two ponds. From there, it is pumped through distribution piping to its point of use. Computer-based technology is employed to apply the proper amount of water to each area served by an individual sprinkler head. The expansion of this system is clearly in the university's interest and should continue. Approximately 85 acres of campus are irrigated in this manner out of a total of 141 possible according to the campus-decreed water rights. The university is a shareholder in three irrigation companies that collectively manage shareholder water rights and maintain the ditches to adequately deliver shareholders' water.

The current use of treated water in some sprinkler systems on the Main Campus, East Campus, and Williams Village should be phased out. As funds permit, Facilities Management staff should work with others on campus, notably Housing Services and the Department of Athletics, to foster the continued conversion to raw water irrigation. The automated sprinkler system is capable of managing the entire campus in this manner.

As Grandview and other campus areas are developed, they should be considered for integration into the central campus irrigation system. The decreed water rights At CU-Boulder South should be used in a timely manner.

10. Sanitary Sewers

The current campus system of sanitary sewers routed into the City of Boulder sanitary sewer system is generally considered adequate for the current level of development, although some systems are maintenance intensive. Previous studies have illustrated the potential for excessive loading as the campus develops further. Contributing to the effluent into the system from some buildings is the cooling of building spaces using once-through (not recycled) potable water. In one laboratory, for example, this has taxed the sanitary system

beyond its capabilities. The use of this type of cooling should be discouraged and alternatives used. The City of Boulder is responsible for the maintenance and upgrades of many of the mains through campus. Staff should continue to work with their counterparts in the city in their management. Environmental Health and Safety should continue to work with the City of Boulder in monitoring the effluent within sanitary sewers.

The discharge from food service areas on campus is a concern, particularly with regard to grease and its buildup within sanitary lines. Efforts should continue to bring these areas into compliance through the use of appropriately sized and maintained grease traps and waste minimization practices.

The sanitary sewers in a few campus areas, including the area east of the Engineering Center, may require upgrading as the area is developed. The university should continue to work with the city on utility planning.

Grandview is served by city sewers, with some building service lines in poor condition. Consideration will need to be given whether to maintain city service or build new sanitary sewer systems as part of the Grandview redevelopment.

Williams Village systems will need to be expanded as part of future development. The sanitary sewer system in the Research Park is owned and maintained by the City of Boulder and is generally in excellent condition.

11. Storm Sewers

The current approach of using the State of Colorado's Controlled Maintenance program to upgrade campus drainage systems should continue. Several areas of the Main Campus and East Campus, outside of the Research Park, are inadequately drained and present both localized problems and the threat of overflow flooding during major events. A major improvement was a new storm sewer main installed along 18th Street and Colorado Avenue during 1997. Planned for the year 2000 is a new storm sewer system serving the area from Wardenburg through the student residence halls to the corner of Folsom Street and Colorado Avenue. An additional storm sewer system is under consideration for the area west of 18th Street. The area through the Mary Rippon Theatre, the UMC and Fine Arts is included. Also, drainage east of the Engineering Center may require upgrades to handle the proposed development. CU-Boulder staff should continue to work with the city regarding the routing of drainage off-campus.

The storm sewer system in the Research Park is owned and maintained by the City of Boulder and is adequate. As Grandview and other campus areas are developed, new storm sewer systems will also be integrated into those projects.

It also appears that the federal government will increasingly regulate the quality of stormwater discharged into lakes and streams. The use of catch basins for sediment and the routing of storm water through landscaped areas should be considered as local conditions warrant. The Research Park was built with such a system, assuring cleaner water returning to Boulder Creek without the oils and other water-borne additions typical of urban development.

Storm water systems are generally designed to accommodate five-

year storm events in campus streets and associated piped systems, with additional surface improvements possibly accommodating 10-year storms. Larger events are considered flooding and are addressed in the flooding section of this plan.

12. Information Technology

Information technology Services will evolve as campus needs and technology change in the future. This will require a continuing expansion of the wire and cable plant to support additional voice, data, and video applications as well as continuing investment in the central office switching systems.

Information Technology Services (ITS) participates closely with computing resource providers of the Boulder campus in planning voice, data, and video communications systems. Video transmission to other campuses, businesses, government offices, and high schools for remote classroom instruction will continue to grow. ITS is responsible for planning video applications, cablings, and interface with public networks.

Plans are being developed for comprehensive educational telecommunications for the four-campus CU system. Three priorities have been established by the president's office:

- Expansion of intercampus exchange of telecourses on the fiber optics network.
- Development of select, off-campus degree program proposals for submission to CCHE for state General Fund support.
- Completion of technical network linkages to provide for data and voice transmission on the fiber optics network.

a. Summary of the Information Technology Strategic Plan

Information technology (IT) is important in the total learning environment envisioned. Multimedia and computer-based technologies expand the possibilities for creative teaching, collaborative research, and meaningful public service. But in order to explore and use these emerging technologies, CU-Boulder must create a sound framework that enables and encourages a wide variety of uses of IT.

The Information Technology Strategic Plan recommends an IT framework to help enhance learning and expand access while meeting cost and quality concerns expressed by the CU-Boulder community. The plan identifies the physical systems and user support systems necessary to provide convenient and reliable IT tools to all CU-Boulder users. It also recommends ways to provide the leadership, funding, and management necessary to properly support a versatile and flexible IT environment.

Information technology is changing the face of higher education, and the campus must not only respond to that change, but responsibly guide and lead it. The vision is not driven by technology, but rather by the thoughtful exploration of IT and its potential impact on higher education and specifically on CU-Boulder.

Campus community members envision an environment where everyone has equal access to high-performance, high speed networks through the development of a core set of services, known as the "IT Commons." They also see world-class networking and computing,

streamlined administrative systems, cutting-edge technology in classrooms, and expanded access to campus expertise and resources for Colorado citizens.

The strategic recommendations are intended to help campus leaders effectively implement rapidly emerging information technologies to effectively support CU-Boulder's mission. The key recommendations in this plan follow.

CU-Boulder should:

- Assure access for every full-time, tenured track faculty member and full-time instructor to a networked computer.
- Recommend that every student have a personal computer if this is financially viable.
- Require every campus department to plan and budget for the renewal and replacement of administrative computing hardware and software.
- Increase support to student computer labs and create multimedia laboratories.
- Provide data communications connectivity to all residence hall and family housing units.
- Increase remote access to campus networking and computing resources.
- Provide full function, high capacity, universal data network access to all campus locations.
- Replace over time the existing voice telecommunication systems.
- Begin to provide wireless networking services in work areas where flexibility and mobility for data access are required and when this is the most cost effective alternative.
- Improve user support at all points of IT access.
- Increase the number and improve the support of technology-equipped classrooms.
- Provide facilities and support for individuals with disabilities to access computer and IT resources throughout the campus.
- Manage desktop and notebook computing assets by establishing hardware/software standards, implementing inventory requirements, and improving purchasing procedures for large quantities.
- Leverage IT networks and applications that strengthen libraries' electronic resources.
- Adopt and support an information technology architecture (ITA) to promote managed change and lower the total cost of ownership (TCO).
- Continue its involvement in the replacement of the university's human resource and financial information systems; enhance and extend the Student Information System (SIS); systematically replace systems unique to departments; and support and upgrade support systems for general use.

This significant resource commitment will require improved planning, management, and coordination. It is estimated CU-Boulder spends more than $50 million annually on information technology. Because much of the current funding and costs for IT services and resources are embedded in academic and administrative departmental budgets, it is difficult to accurately measure the current total campus expenditure on IT.

13. Capital Expenditures for Infrastructure

Much of the infrastructure costs will be borne by individual building projects, controlled and deferred maintenance, CU-Boulder operating funds, and expenditures by non-university utility providers. These costs are not included in capital estimates in this plan. As detailed utility planning is done in the year following this plan, a clearer picture will emerge as to both costs and revenue sources. The capital needs in the next 10 years for improvements discussed in this chapter are approximately:

- Utility Generation: $75,000,000
- Civil/Utilities Infrastructure: $10,000,000
- Communication Infrastructure: $10,000,000
- CU-Boulder South Infrastructure: $10,000,000

These figures are included in the capital projects list (Exhibit IV-A-4).

V. Enactment and Implementation Provisions

This chapter addresses the implementation of the Campus Master Plan. The first three sections are the basics: adoption, amendment, and interpretation provisions. The next section considers the necessary relationships with local communities. The following section addresses land acquisition. The final section contains the current Five-year Capital Improvements Plan (CIP).

A. Adoption

The University of Colorado Board of Regents, the governing board for the university, is the appropriate entity to adopt this plan. Prior to adoption, there was a process of widespread input and review. This included recommendations and approval by the Boulder Campus Planning Commission (BCPC), which is the committee of faculty, students, and staff charged with advising on campus planning matters; and the university Design Review Board (DRB), comprised of four design professionals who advise on campus layout and design.

Following its adoption by the Board of Regents, the Campus Master Plan will be forwarded for action by the Colorado Commission on Higher Education (CCHE), which requires that each higher education institution in the State of Colorado have a master plan.

B. Amendment

The procedure for amendment is essentially the same as the procedure for adoption, although amending should take less time than the original adoption since the scope of an amendment is narrow rather than wide. Amendments are necessary to accommodate unanticipated changes; for example, when there is a significant change in policy, a new program requiring a new building, or a need for an unanticipated building site.

Amendments follow the applicable review and approval processes in effect at the date of amendment. At this writing, the process includes the following steps:

- Campus staff prepares the amendment and an analysis of it;
- BCPC reviews the amendment proposal;
- The Chancellor's Campus Executive Committee (CEC) decides a course of action;
- The Chancellor recommends the amendment to the Board of Regents; and
- The Board of Regents decides whether to approve the amendment or not. This last step is usually preceded by analysis by one of the standing committees of the board.

Amendments will be forwarded to the Colorado Commission on Higher Education (CCHE), which may or may not find the amendment significant enough for their review. The master plan or any amendment is in effect unless CCHE decides otherwise.

C. Interpretation and Enforcement

It is the responsibility of the Chancellor and the administrative staff to interpret the plan and see that it is implemented through the campus planning process. The staff advises the BCPC, DRB, and the Board of Regents as to whether or not campus planning proposals coming before them, such as program plans, are consistent with the Campus Master Plan. These boards decide whether or not there is that consistency through their actions. A finding of inconsistency suggests that either a change in the specific proposal before them is appropriate, or an amendment to the Campus Master Plan is appropriate.

D. Community Relations

1. Guiding Principles for Community Interface

There is a commitment by CU-Boulder to be a good neighbor in the Boulder community. This commitment reflects an awareness of mutual interests in addressing the community's attractiveness, affordability, and accessibility. Both CU-Boulder and the community are concerned that boundaries between them should be continually improved, reflecting interdependence. With respect, cooperation, and sensitivity on both sides, mutual growth and development will be harmonious and beneficial.

The following principles for community interface were initially drafted in 1998 by an 18-member task force comprising both CU-Boulder and community representatives. Task force community membership included persons from the Chamber of Commerce, historic preservation interests, City of Boulder planners, surrounding neighborhoods, the business community, and many other entities. As part of its work, the task force identified reasonable transitions and connecting links from the campus to the rest of the community, highlighting the policies and sensitivities required. As the campus and local communities continue to evolve and grow, communication, mutual respect, and cooperation are needed.

a. University/Local Government Cooperation

As sovereign governmental entities, each with distinct missions, goals, and authority, it is inevitable that at times there will be disagreement between local governments and the university. Major employers, other local groups, and individuals are also interested in campus development.

Issues of mutual concern should be discussed. For most issues and decisions, this means discussions between CU-Boulder and the City of Boulder. Some issues, e.g., transporation, air pollution, housing, etc., will require increasing discussion and cooperation among all of the local communities nearby. A number of groups have been formed to further dialogue, such as the CU/City Steering Committee and the Community Advisory Committee, a Chancellor's committee of local mayors and business leaders.

b. Convenient and Affordable Housing

The Boulder community has changed significantly in the last decade. The community has experienced substantial employment growth, including jobs related to university research, while residential growth has been limited. The increased cost of housing in Boulder, and the associated trend toward more commuting students, faculty, and staff, are regional issues that have negative impacts on both the campus and the community. Affordable housing is a regional issue involving the many communities in the region.

Addressing housing issues is a high priority in this plan, as detailed in Chapter III. The plan is to expand the supply of student housing on university-owned property and possibly explore new, innovative opportunities for public-private partnerships in nearby areas. Some faculty and staff housing may be added on campus, and new programs created to help ensure the availability of faculty and staff housing within a reasonable commute from campus.

c. Transportation Linkages

The City of Boulder, Colorado Department of Transportation (CDOT), Regional Transportation District (RTD), and CU have a long history of cooperation on transportation improvements. Of importance to CU-Boulder is a logistical cohesiveness between the four campus properties in Boulder, including transportation linkages. Staff of CU-Boulder will continue to work with the staffs of City of Boulder, CDOT, RTD, and other transportation providers to improve all modes of transportation. The campus transportation plan is detailed in Section IV.E.

d. Wise Use of Environmental Resources

Significant environmental research is conducted in Boulder, often through cooperative activities of the university, federal government agencies, and other organizations. The Boulder Research Area Network (BRAN) is a fiber-optic system being installed in 1999 that links these activities. Development and redevelopment activities should build on the research knowledge to promote practices that help ensure a sustainable environment. The environmental management plan (IV.D) covers many of the environmental concerns.

e. Strategic Land Acquisition and Development

Given utilities, transportation, and land use compatibility concerns, university properties with urban services should be developed first, if possible. The university acquires land in anticipation of needs that cannot be met on existing properties. Among the many factors that need to be weighed in order to accommodate change are state educational needs, local concerns about impacts, livable densities, and available infrastructure.

f. Sensitivity to Neighborhood Context and Historic Resources

The campus is a major activity center in the city. The community is particularly concerned about CU-Boulder development of those properties that directly interface with the community's existing fabric. When the campus grows, in particular with acquisition and/or

development at the campus edge, this can impact adjacent neighborhoods. The reverse is also true: new development near the campus can affect CU-Boulder.

Campus development plans are sensitive to the existing community context at campus edges. Buildings to accommodate the statewide higher educational services provided by CU-Boulder tend to be of a larger scale than is typical of most surrounding development. In order to avoid or minimize conflicts between adjacent land uses, development at campus edges should provide for logical and aesthetic transitions in use, density, scale, and massing of buildings, preservation of historic buildings, and transportation.

The University of Colorado at Boulder has a tradition of both architectural excellence and historic preservation. When buildings are acquired that are suitable for university needs, they are generally preserved. However, when the type and scale of buildings acquired do not meet institutional needs, new buildings will be constructed.

More specific consideration follows of how these principles should be put into effect around the perimeter of campus. Exhibit V.D.1 shows the location of the areas around the campus that are referenced in the following sections.

2. Interface with Surrounding Residential Areas

a. University Hill (West and South of Campus)

Extending toward the mountains, the University Hill area south and west of the Main Campus has traditionally been an area of student and faculty housing. The University Hill area is comprised of well-established uses including commercial development, higher-density residential housing, and single-family housing. Areas east of Ninth Street have large student populations. The commercial area is known as the Hill.

The University Hill neighborhood has been a local source of tension between university students and the rest of the community for several decades. The diversity and density of land uses and the intrusion of privately owned student rental housing into existing single-family neighborhoods contribute to the tension. University Hill, including the commercial area, has had problems with crime, transients, overcrowding, and persons abusing drugs and alcohol. At times these problems have led to violent conflicts. The condition of the rental housing stock serving the student market continues to deteriorate and suffers from inadequate landlord maintenance and investment. Many of these properties and their occupancy do not conform to local codes. Additional investment may result in lower permitted occupancy, in effect discouraging investment.

In order to ensure convenient and affordable housing, it would help if the City of Boulder would do what it can through regulations that affect the availability and quality of rental housing for students. It is in CU-Boulder's interest to work with the City of Boulder to help ensure that this largest concentration of housing for college students is safe and attractive.

The university owns a long edge of property along Broadway abutting University Hill. The Outdoor Areas Plan (IV.C) describes goals and guidelines for this edge, including campus corners and entrances along Broadway. While Broadway has seen significant improvements

during the 1990s, vehicular entrances need to be enhanced to direct motorists to parking, improved amenities and directional signage should be located at pedestrian entries, and conscious attention should be given to views into campus (and views out from campus). The Transportation Plan (IV.E) addresses the interface along Broadway in order to correlate growth and the capacities of transportation systems.

The University Hill interface is also an area of historic resources, including the Norlin Quadrangle Historic District. This Master Plan envisions retention of the older buildings along the Broadway and University Avenue corridors, including within the Grandview neighborhood where the university has been strategically acquiring land, helping to retain the scale and character of the community. In recent years the university has devoted substantial resources to rehabilitating many ³historic² buildings, including the Hazel Gates Woodruff Women's Studies Cottage, Hale Science, the Armory, and the Continuing Education Center.

b. Residential Areas North of Campus

Clinging to the steep slopes above Boulder Creek along 17th Street is a small neighborhood of single-family houses along Hillside Drive. Given the close proximity of the homes on Hillside Drive below Grandview, there needs to be sensitivity to this neighborhood context. A landscaped transition should be retained between the institutional use and the existing neighborhood.

North of the Main Campus, across Boulder Creek, is Boulder High School. Synergy between the high school and CU has occurred over the years as a result of using each other's facilities and providing college-level courses for high-achieving high school students. Potentially negative impacts, such as traffic and social issues, merit both entities considering the off-site impacts of their individual activities.

East of the high school, both university and privately owned higher-density housing is relatively convenient and affordable for students. Parts of the area have potential for additional development where flood dangers posed by Boulder Creek are not severe. The university plans to continue acquiring some properties in this area, as they become available, to support student housing. Improved pedestrian and bicycle links to the Main Campus across Boulder Creek are planned. These transportation linkages would benefit the entire community, for example, facilitating access between the campus and the Naropa Institute, an adjoining higher education institution.

c. Residential Areas East of Campus

Residential areas east of the Main Campus vary from low to high density and accommodate many students. Most of the land is fully developed. The main interest of CU-Boulder in this area is improved linkages between the Main Campus and East Campus. A tree-lined corridor with better transit, pedestrian, and bicycle access is planned (Outdoor Areas Plan, IV.C) along Colorado Avenue from Foothills Parkway to 18th Street. This will help also ensure a transition between the Research Park and the residential areas south of Colorado Avenue. Fully improving this corridor will require university and City of Boulder cooperative efforts and may involve some strategic land acquisitions in the future.

East of Williams Village is the Frasier Meadows single-family area. The University Residence, originally built to house then CU-President Gordon Gee and currently used for hosting small meetings and social functions, is accessed through this neighborhood. Campus land east of Bear Canyon Creek is a transitional area. When it is developed, probably for faculty housing and recreational housing, there will be sensitivity to the neighborhood context in terms of land use, height and scale of future buildings, and access. Landscaping will also be supplemented along the Baseline corridor to soften the view of parking and future Williams Village development, providing some transition to the residential areas north of Baseline.

3. Interface with Surrounding Commercial Areas

a. The Hill (West of Campus)

The Hill historically has been a student commercial area. The Hill provides book and media services, restaurants, and other services.

The one university-owned site in the commercial area, a parking lot, was identified in the University Hill Plan, adopted by the City of Boulder in March 1996, as having potential for development. However, reduction or elimination of this heavily used parking would exacerbate the shortage of parking in this area. This university-owned parking lot at Broadway and Pennsylvania, or other suitable Hill sites, could be redeveloped for student services, retail, office space, or cultural facilities to help reinforce ties between CU-Boulder and the Hill. The Hill may be one of the suitable locations for a CU-Boulder fine arts museum, should there be resources to develop a facility. The underpass at College Avenue serves as a strong pedestrian linkage between the Main Campus and the Hill.

b. Downtown Boulder (Northwest of Campus)

Downtown, including the Pearl Street Mall, is a thriving area of historic buildings, retail stores, street performers, restaurants, and offices. Beginning only a couple of blocks from the Grandview portion of campus, downtown is often perceived as farther away than it actually is, due to steep slopes. Campus and downtown are effectively linked by the HOP and SKIP transit services. As Grandview redevelops, improved campus-to-downtown pedestrian access will be developed with the connections to the adjoining arboretum trail.

c. Boulder Valley Regional Center and Crossroads (Northeast of Campus)

There are two major commercial areas in Boulder: downtown, centered around the Pearl Street Mall, and the Boulder Valley Regional Center (BVRC), centered around the Crossroads Shopping Center. The BVRC is a thriving area of strip shopping centers, offices, and restaurants but with a declining regional enclosed mall (Crossroads) at its core. As this plan is written, the shopping center owner is beginning a major renewal effort. The City of Boulder has encouraged development of mixed land uses in the BVRC, particularly to add more residential use. The BVRC and the campus adjoin near Folsom Street and Arapahoe Avenue, and again near 30th Street and Arapahoe Avenue.

The Crossroads owner and the City of Boulder, through the Boulder Urban Renewal Authority (BURA), have indicated an interest in

university involvement in the BVRC in several ways, from attracting more students, faculty, and staff as patrons to joint venturing for public outreach spaces and meeting spaces. CU-Boulder relies on the private sector to supply overnight lodging for its many conferees and visitors. Also, demand for campus facilities to host university and community meetings far exceeds the availability. Large meeting spaces in Boulder are lacking. The university will need additional meeting space and overnight lodging in the BVRC, downtown Boulder, other local communities, and/or on the CU-Boulder campus.

Conveniently located and affordable student, faculty, and staff housing in the BVRC area, privately provided or with university involvement, could help address housing needs while introducing desired mixed land uses into the commercial area. Improved linkages for all transportation modes are being considered.

d. Commercial Areas East and South of Campus

There are a few retail shops and motels along 28th Street east of campus, which help address community needs and university conference needs. The 28th Street campus edge is in need of functional and aesthetic improvement, particularly since it is the principal vehicular entrance to Boulder from Denver. The City of Boulder and CU-Boulder are beginning improvement projects in this area. Regional transportation linkages and other modal improvements are being considered as well.

Two neighborhood shopping centers, Williams Village Shopping Center and Basemar Shopping Center, service students east and south of the Main Campus. These centers are auto-oriented and redevelopment with improvements in pedestrian, bicycle, and transit access from the campus to these centers would be useful.

In summary, because university students, faculty, and staff wield major purchasing power in the community, it is in both the city and university interests to have cooperative efforts to assure convenient housing and commercial services to the campus community.

E. Land Acquisition

Land must be viewed as one of the most basic resources necessary for CU-Boulder to meet its goals. As student enrollments, research, and support programs expand, the university is confronted with the problem that available land on the Main Campus is scarce. In order to implement this Campus Master Plan, and to provide a long-term source of land to support campus programs, the university should aggressively pursue strategic land acquisitions.

1. The Need for Land

Not only does the upgrading and expansion of programs require more space, but CU-Boulder must also acquire land to assure a quality of life for the CU-Boulder community. For example, recreation fields are in short supply - more fields would be desirable for the current student population - a shortage that is compounded when existing fields are used for new building sites. A variety of outdoor areas are necessary to preserve the campus's traditional beauty, a principal factor cited in students' choice to attend CU-Boulder.

Because development and expansion are likely to continue far into the future, some land must be acquired for its long-term value rather

than for an immediate use. A good example is the East Campus, which was purchased almost 50 years ago and has more recently been developed for housing, research facilities, and ancillary activities. Another example is the CU-Boulder South property, which will be used to help meet the long-term needs of CU-Boulder.

2. Acquisition Priorities

General areas, not specific properties, have been identified for future acquisition, sale, or trade. Priorities in land transactions must remain flexible because the university cannot control the timing or price of specific property offerings. Identification of specific properties, in advance of obtaining property options, can also increase purchase costs and make acquisition difficult or even impossible. General areas for acquisition include:

- North periphery of the Main Campus
  Land acquisitions continue to be ongoing in Grandview, and for the Athens and Marine Street area north of Boulder Creek, as recommended in previous master plans and approved in a 1980 Program Plan. These areas are needed to meet long-term needs of instruction, research, services, parking, housing, conferences, cultural uses, and student recreation.
- Properties between the Main Campus and the East Campus
  Strategically located properties between the Main Campus and the East Campus should be acquired in order to help achieve a physical connection and logistical cohesiveness. These properties could be used for transportation improvements, housing, research, or services. At the time this plan is written, CU-Boulder leases spaces in three of the buildings in this area for research and services. Public-private cooperation may be another option to acquire or control the land uses and building development within this corridor.
- Large institutional properties close to campus
  Relatively large properties, such as public schools and housing complexes, are near the campus and would be useful to the university if their owners decide that these properties are surplus to their needs. Uses might include instruction, research, services, recreation, housing, or parking. Institutional scale of buildings and grounds would be more useful, and relatively less expensive, than smaller parcels.
- Properties adjoining the Main Campus
  The university should consider acquisition of any property adjoining or in the immediate vicinity of the current Main Campus. A few acquisitions would make for a more cohesive campus and preclude incompatible land. Uses might include instruction, research, services, recreation, housing, or parking. Use of these properties would depend on the proximity to related Main Campus uses.
- Properties around the East Campus and the Research Park
  These properties could be needed for expanding research, services, intercollegiate athletics and student recreational fields, and parking.
- Remote Properties
  Properties not in the immediate vicinity of the current campus may be used as investments, to accommodate larger or specialized functions unavailable near the existing campus, or to help ensure the long-term viability of the campus by serving as ³expansion² properties of the future.
- Properties near the Mountain Research Station
  The Mountain Research Station maintains many cooperative

agreements with adjacent landholders. The station has several research sites located on National Forest Service land. Conversely, the station allows trail access across portions of the university's property. The station has been approached about exchanging parcels of land so that major equipment sites are on university property. This may be desirable in the future as research grows and the need to consolidate operations increases.

3. Timing

The university should remain active in its land acquisition program in order to continue to provide sufficient land for current and future needs. Opportunities for land acquisition occur at irregular and sometimes unpredictable intervals. Timeliness with regard to individual transactions is often critical. Desirable properties are usually acquired as they become available at market prices. Timeliness is essential to allow for the at least partial amortization of debt on existing structures before they are demolished or significantly renovated. Timeliness can also be crucial to take advantage of a seller's particular tax needs.

4. Alternatives to Acquisition

Alternatives to acquisition include cooperative agreements for mutually beneficial use. Agreements with the City of Boulder and Boulder Valley School District, for example, have produced good results. Leasing, rather than acquiring a particular property, is also an option. Alternatively, potential property acquisitions may be referred to the University of Colorado Foundation for possible purchase.

5. Funding

Each real estate transaction undergoes a feasibility analysis to assess its potential use to CU Boulder. A detailed financial analysis also is conducted for each transaction. In the absence of state appropriations for acquisition, other potential sources of funding are used, as appropriate:

- Gifts of real property or donations of cash
- Self-funded or bonded projects, repaid with user rents or indirect cost reimbursements from contracts and grants
- Earnings from campus-owned enterprises, such as the housing system, Research Park and the Research Building System
- Future earnings from buildings and/or land once acquired
- Lease or sale of existing properties
- The Boulder Campus Permanent Land Fund
- Internal advances from CU-Boulder funds or the university treasury
- Trade of properties
- Joint or cooperative ventures with the private sector
- Funding or purchase through the University of Colorado Foundation or The University Improvement Corporation (TUIC)

F. Capital Improvements Program

1. Five Year Capital Improvements Plan

Each year the university adopts an updated five-year Capital

Improvements Plan (CIP), an important step in capital improvements programming, and forwards it to the state as part of the process of requesting annual capital funding. It is updated periodically, so the reader of this plan should realize this is a snapshot in time, and should obtain the most recent CIP if interested.

The relationship of this five-year CIP to capital planning in this Campus Master Plan was discussed in the Building Plan (Section IV.A). From the catalogue of capital projects in this Campus Master Plan, a shorter list of projects is selected each year for inclusion on the CIP, based on prioritization of programs and prospects for funding. The CIP goes beyond this master plan, to address where the resources will come from to achieve each capital project.

2. Financial Analysis

The CU-Boulder Financial and Business Services Office has conducted a funding and debt analysis of the capital programming in this Master Plan and in the five-year CIP. Its conclusion reads in part:

> The catalog of projects presented in the Master Plan provides the campus with the ability to respond quickly to changing financial environments and innovative programs that achieve excellence in future years. Prioritization of projects and financing decisions will continue to be refined each year during the life of the Master Plan through a comprehensive annual review process based on financial feasibility, campus priorities, projected state appropriations, available debt capacity, and capital campaign successes. Assuming the use of private financing mechanisms, the integration of future capital campaigns with the Master Plan, and continued state support, this Master Plan is financially achievable.

The university seeks a variety of sources of funding, including state capital appropriations, gifts and grants, and other resources appropriate and available for capital projects, in order to achieve the vision outlined throughout this plan. How successful the university is in attracting funding will determine how much of the vision is implemented.

This Campus Master Plan helps meet the needs of the state's citizens and employers for higher education in Colorado. The planning has furthered the dialogue necessary to turn goals into reality.

MAPS AND CHARTS

UNIVERSITY OF COLORADO AT BOULDER CAMPUS MASTER PLAN

Adopted by the Board of Regents, 2/17/2000

Exhibits are presented as pdfs. To view exhibits, you will need Acrobat Reader.

I. Institutional Goals and Planning

I-A-1 Institutional Facts
I-B-1 Comparison with Other Research Universities
I-B-2 Enrollment Growth
I-B-3 CCHE Projections of Colorado High School Graduates
I-B-4 Projected Enrollment
I-C-1 Sponsored Research Funding
I-D-1 Number of Employees for the Last Ten Years
I-D-2 Ten-Year Projections of the Number of Employees
I-D-3 Additional Employees Projected

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II-A-1 Front Range Setting
II-A-2 Campus Location in Boulder
II-B-1 Building Square Footage Growth
II-C-1 Main Campus Topography
II-C-2 East Campus Topography
II-C-3 Williams Village Topography
II-C-4 CU-Boulder South Topography
II-C-5 Mountain Research Station Topography
II-C-6 Flooding Potential Areas
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II-D-2 Land Use Percentages
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III. Facilities Needs

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III-F-2 Residential Academic Programs

IV. Land and Facilities Plan

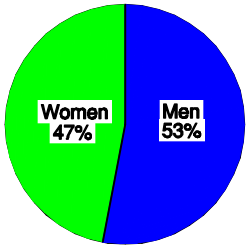
IV-A-1 Long Term Potential Development Areas

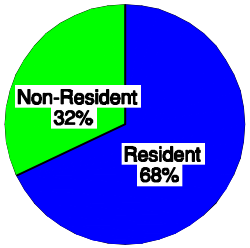
V. Enactment and Implementation Provisions

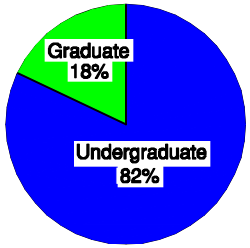
University of Colorado at Boulder
Institutional Facts
1998-99

Student Demographics

25,125 Total Students (Headcount)
22,369 Full-Time Equivalent (FTE)

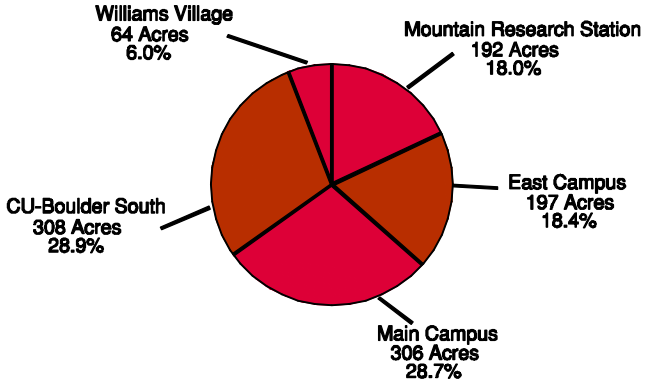






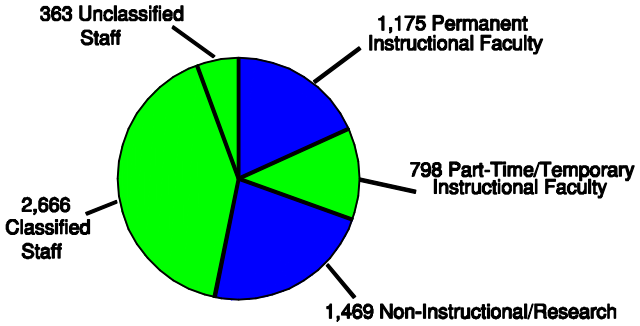
Acreage

1067 Acres Total



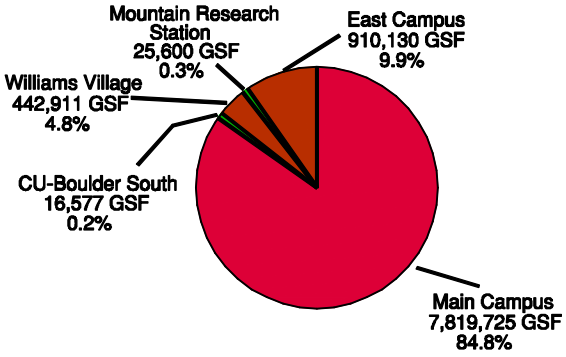
Employees

6,471 Total



Buildings

9,214,943 Gross Square Feet



Revenues

$675.7 Million

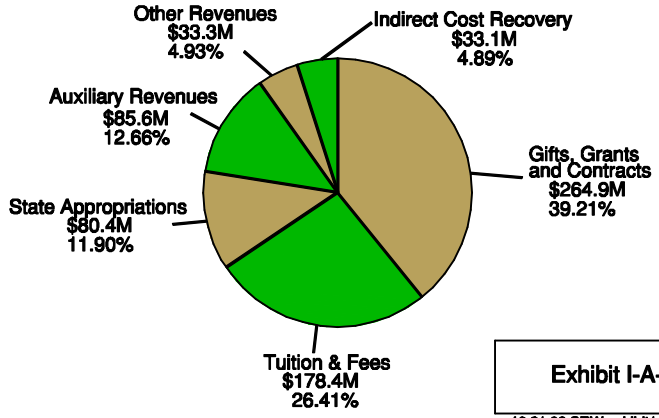


Exhibit I-A-1

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Go to related text

Exhibit I-B-1
Comparison with Other Research Universities

University	Federal R&D Expenditures FY97 (in millions)	Total Student Enrollment 96-97 (in thousands)[1]
CU-Boulder	192	25
University of California–Berkeley[2]	186	30
University of Washington	321	34
Indiana University	96	35
University of Arizona	152	35
University of California–Los Angeles	239	36
University of Michigan	296	37
Purdue University	92	37
University of Illinois–Champaign-Urbana	156	39
University of Wisconsin–Madison	234	39
University of Florida	94	40
Michigan State University	83	42
Texas A&M University	145	42
Arizona State University	38	42
University of Texas–Austin	152	48
Ohio State University	123	48
University of Minnesota	200	51

[1] Enrollment Source: U.S. Department of Education

[2] Excludes research-and-development expenditures at university-associated federally financed research-and-development centers.
Source: National Science Foundation

Exhibit I-B-2
University of Colorado at Boulder Enrollment Growth

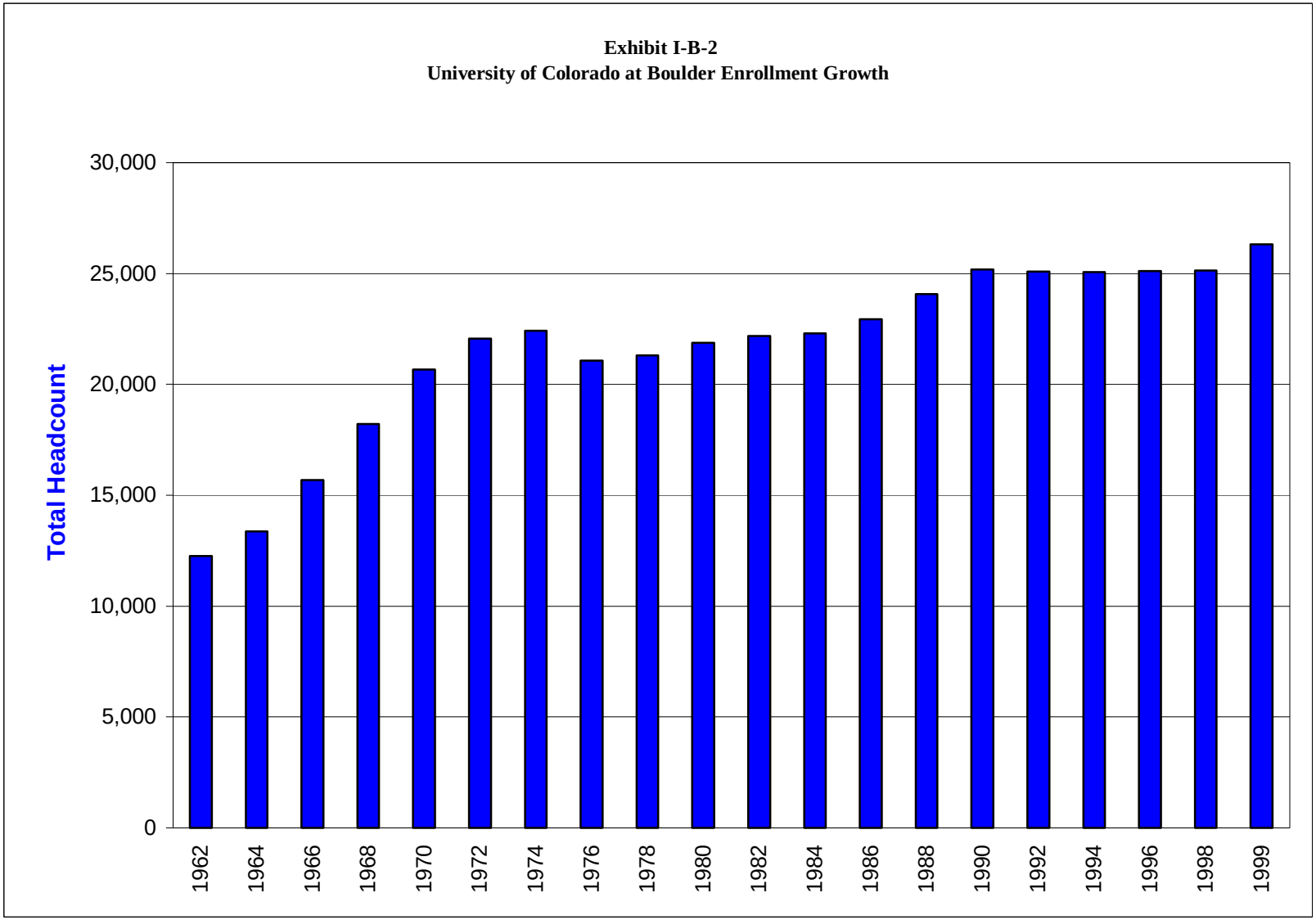


Exhibit I-B-3
CCHE Projections of Colorado High School Graduates

Year	(1000s)	Percent change from 1997
1997 (actual)	34.2	—
1998 (projected)	36.5	6%
2000	38.5	12%
2002	40.0	17%
2004	41.7	22%
2006	41.9	23%
2008	44.1	29%

Exhibit I-B-4
Projected Enrollment

Fall Headcount	1997*	1998	1999	2000	2001	2002	2003 . . .	2008
Midpoint estimate—Students								
Resident undergrad	13,842	14,045	14,221	14,446	14,601	14,739	14,872	15,082
NR undergrad	6,595	6,665	6,522	6,551	6,574	6,601	6,638	6,720
Total undergrad	20,437	20,711	20,743	20,997	21,175	21,340	21,510	21,802
Resident grad	3,396	3,325	3,375	3,425	3,475	3,525	3,575	3,675
NR grad	1,276	1,265	1,295	1,325	1,355	1,385	1,415	1,465
Total grad	4,672	4,590	4,670	4,750	4,830	4,910	4,990	5,140
Total	25,109	25,301	25,413	25,747	26,005	26,250	26,500	26,942
Freshmen	4,268	4,210	4,194	4,390	4,367	4,390	4,424	4,562
Percent resident	68.7%	68.7%	69.2%	69.4%	69.5%	69.6%	69.6%	69.6%
Low estimate								
Total	25,109	25,107	24,832	24,859	24,873	24,912	25,000	25,215
Percent resident	68.7%	69.2%	70.2%	70.5%	70.6%	70.6%	70.6%	70.6%
High estimate								
Total	25,109	25,392	25,766	26,322	26,757	27,148	27,500	28,654
Percent resident	68.7%	68.4%	68.8%	68.9%	69.0%	69.1%	69.1%	69.4%

* Actual figures are given for 1997. Figures for 1998 and beyond were estimated in fall 1997. Actual 1998 fall headcount (25, 125) was slightly under the midpoint estimate.

NR=nonresident

Exhibit I-C-1 Sponsored Research Funding (in millions)

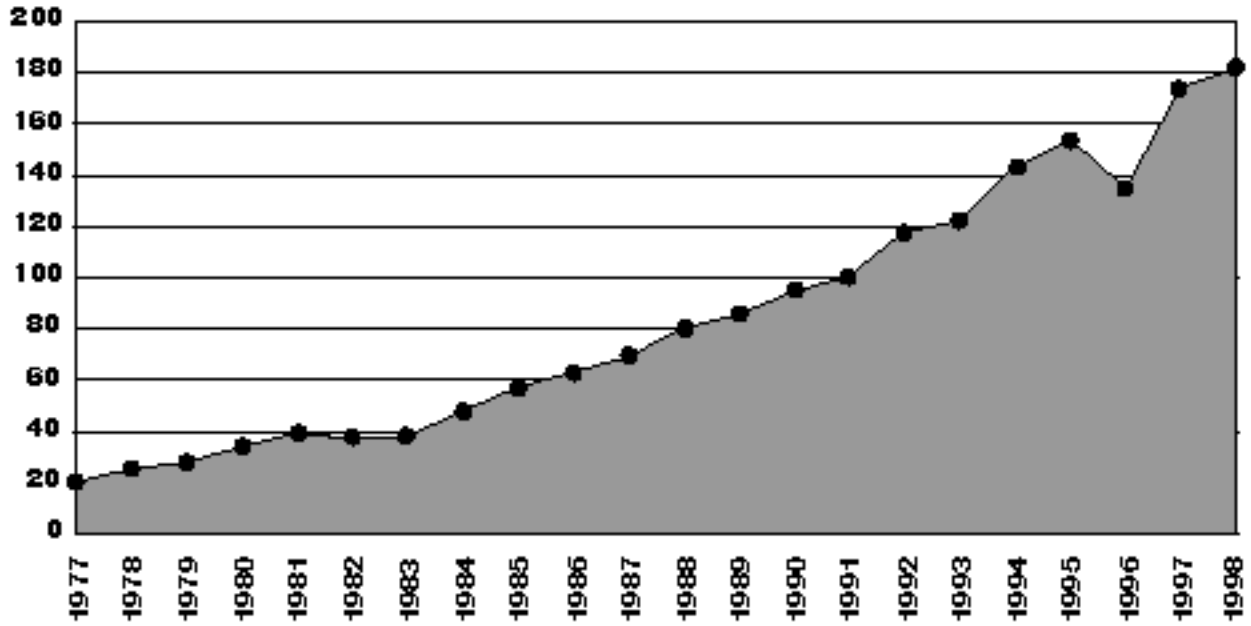


Exhibit I-D-1
Number of Employees for the Last Ten Years (Fall Headcount)

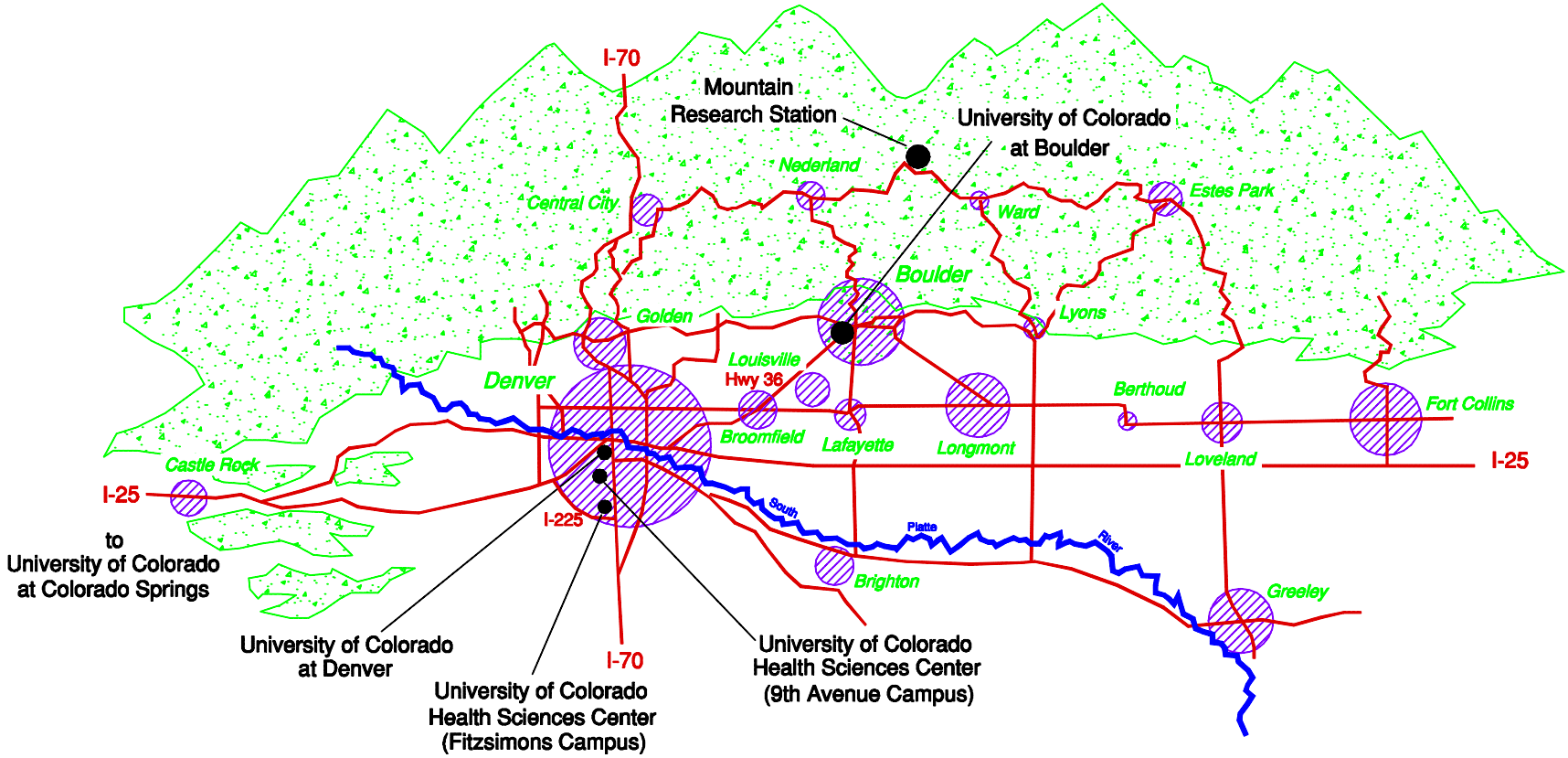
	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Instructional	1,768	1,748	1,792	1,868	1,868	1,932	1,932	1,949	1,897	1,973
Non-Instructional/ Research	1,142	1,186	1,235	1,317	1,427	1,539	1,413	1,426	1,446	1,469
Classified Staff	2,465	2,525	2,420	2,507	2,556	2,601	2,685	2,680	2,699	2,666
Unclassified Staff	341	353	335	320	316	327	320	344	358	363
Total	5,716	5,812	5,782	6,012	6,167	6,399	6,350	6,399	6,400	6,471

Exhibit I-D-2
Ten Year Projection of the Number of Employees (Fall Headcount)

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Instructional	1,997	2,021	2,045	2,069	2,094	2,119	2,145	2,170	2,197	2,223
Non-Instructional / Research	1,510	1,552	1,596	1,641	1,687	1,734	1,782	1,832	1,884	1,936
Classified Staff	2,690	2,714	2,739	2,705	2,729	2,754	2,779	2,804	2,829	2,854
Unclassified Staff	366	368	371	371	374	376	379	381	384	387
Total	6,563	6,655	6,751	6,786	6,884	6,983	7,085	7,187	7,294	7,400

Exhibit I-D-3
Additional Employees Projected (Fall Headcount)

	2003	2008
Instructional	121	250
Non-Instructional/ Research	218	467
Classified	63	188
Unclassified	11	24
Total	350	929



Front Range Setting

(Diagramatically illustrating text references)

- University of Colorado Campus
- Major Front Range Cities
- Highway and Interstate Routes
- Rocky Mountains

Colorado
University of Colorado at Boulder
Campus Master Plan

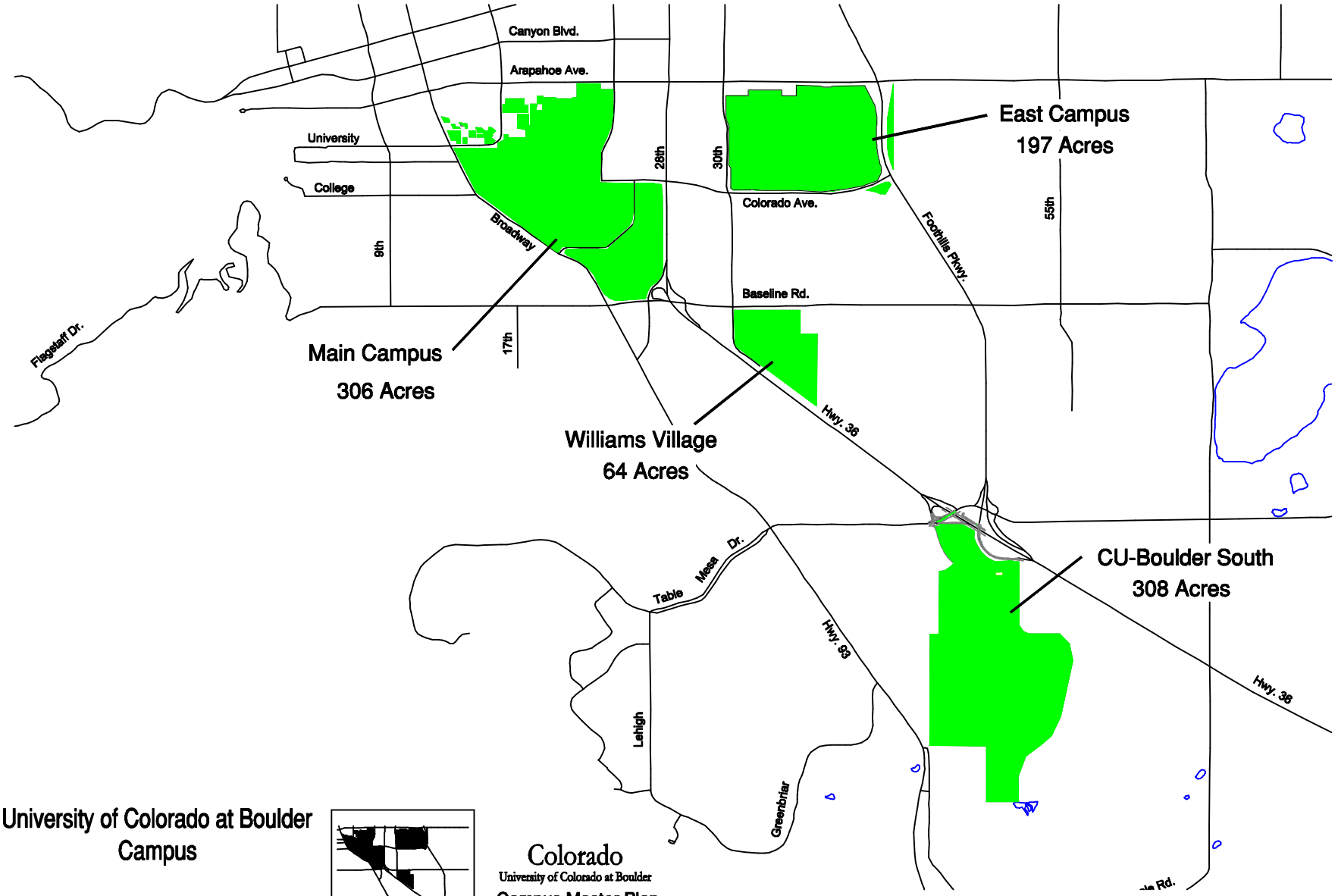
N

Diagram Not to Scale

Go to related text

Exhibit II-A-1

10.21.99 SRW front-range.dwg on Z Ω



University of Colorado at Boulder Campus

(Not Shown: Mountain Research Station--192 Acres)

Colorado
University of Colorado at Boulder
Campus Master Plan

0 1500' 3000'

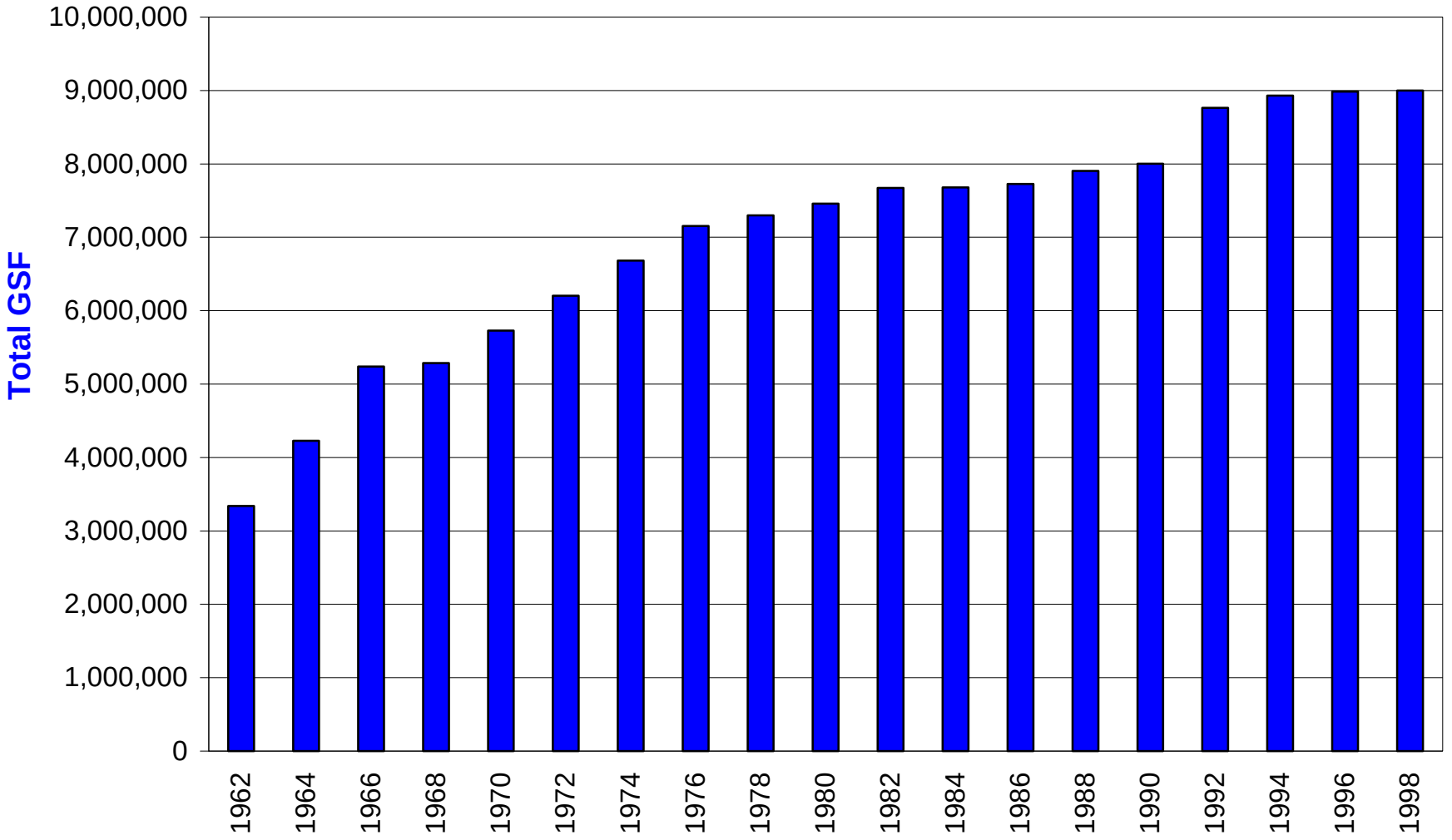
N

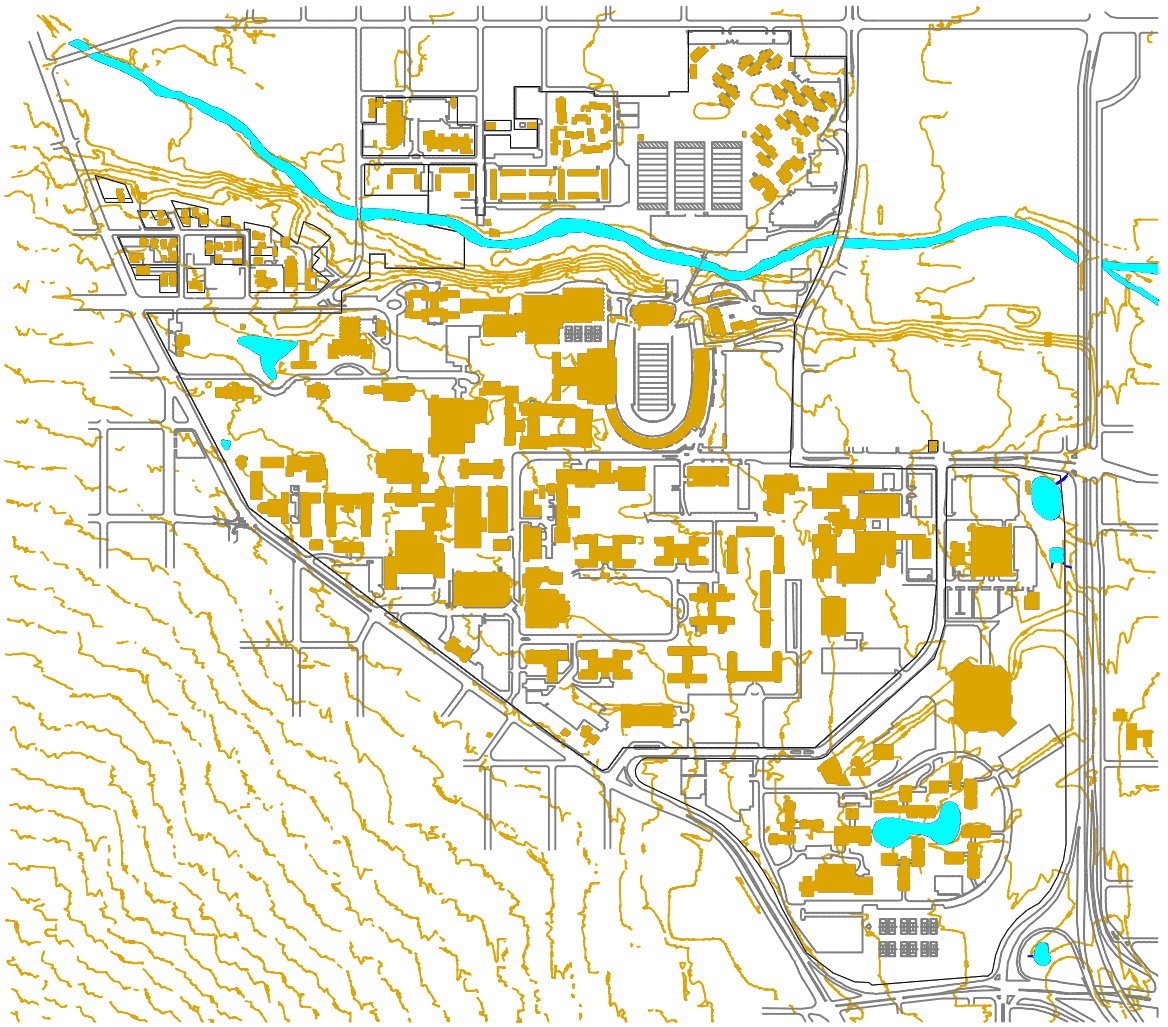
Go to related text

Exhibit II-A-2

10.21.99 SRW cu-props96_jrr.dwg on Z

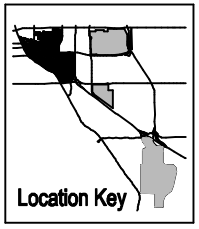
Exhibit II-B-1
University of Colorado at Boulder Building Square Footage Growth





Topographic Map
Main Campus

Ten Foot Contour Intervals Shown



Colorado
University of Colorado at Boulder
Campus Master Plan

0 450' 900'

N

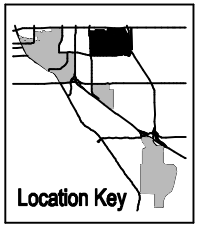
Go to related text

Exhibit II-C-1

10.21.99 SRW topo_main.dwg on Z

Topographic Map
East Campus

Ten Foot Contour Intervals Shown



Colorado
University of Colorado at Boulder
Campus Master Plan

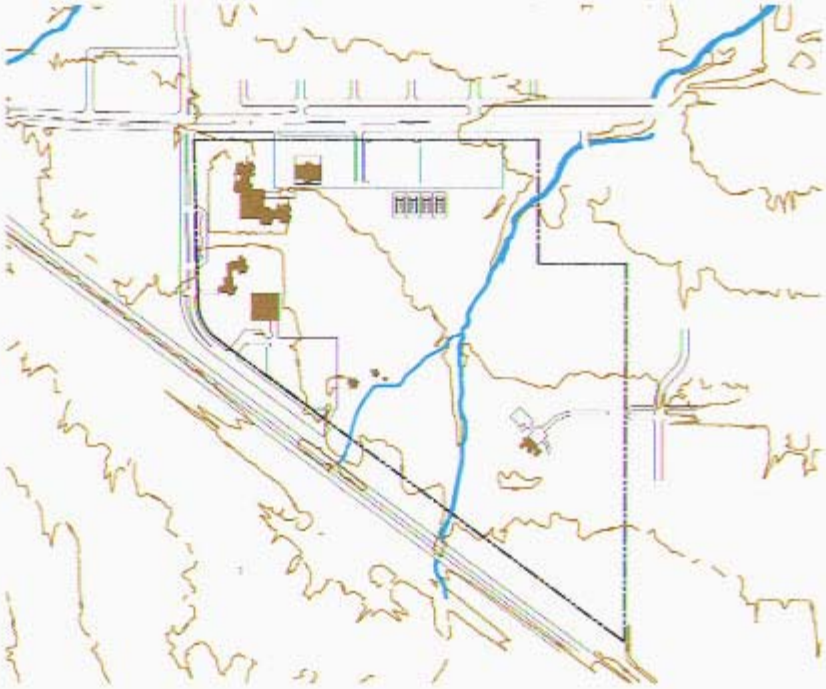
0 300' 600'

N

Go to related text

Exhibit II-C-2

10.21.99 SRW topo_east.dwg on Z



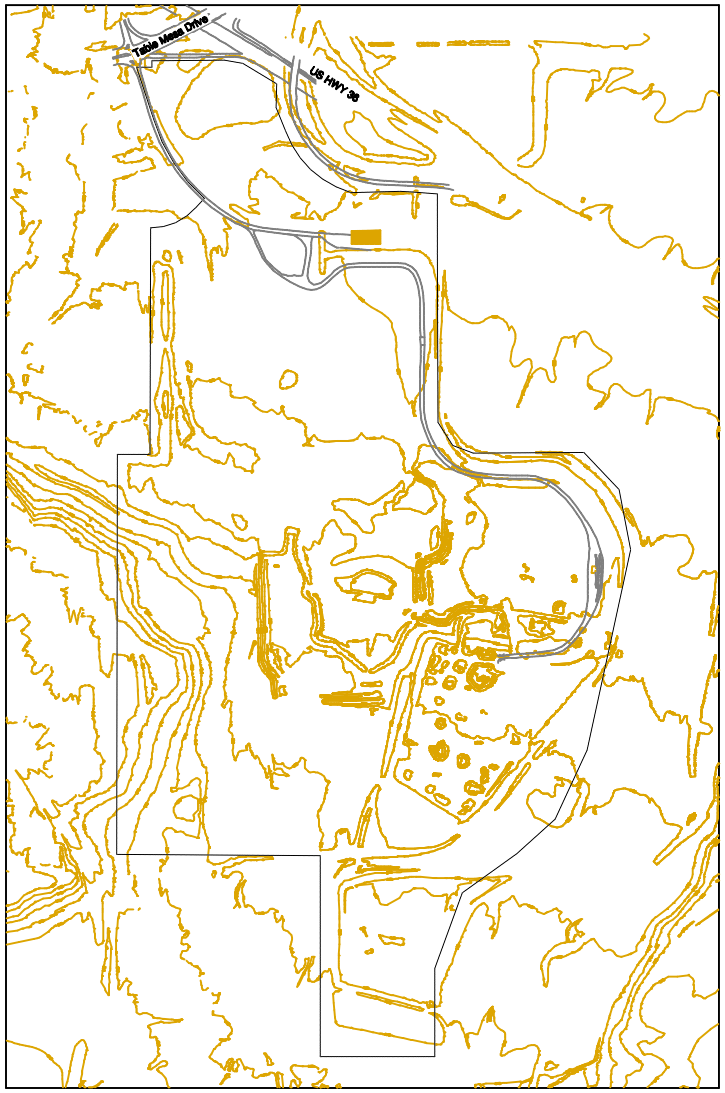
Topographic Map
Williams Village

Ten Foot Contour Intervals Shown

Colorado
University of Colorado at Boulder
Campus Master Plan
0 300' 600'

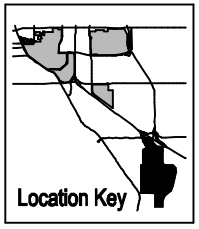
N

Exhibit II-C-3



Topographic Map
CU-Boulder South

Ten Foot Contour Intervals Shown



Colorado
University of Colorado at Boulder
Campus Master Plan

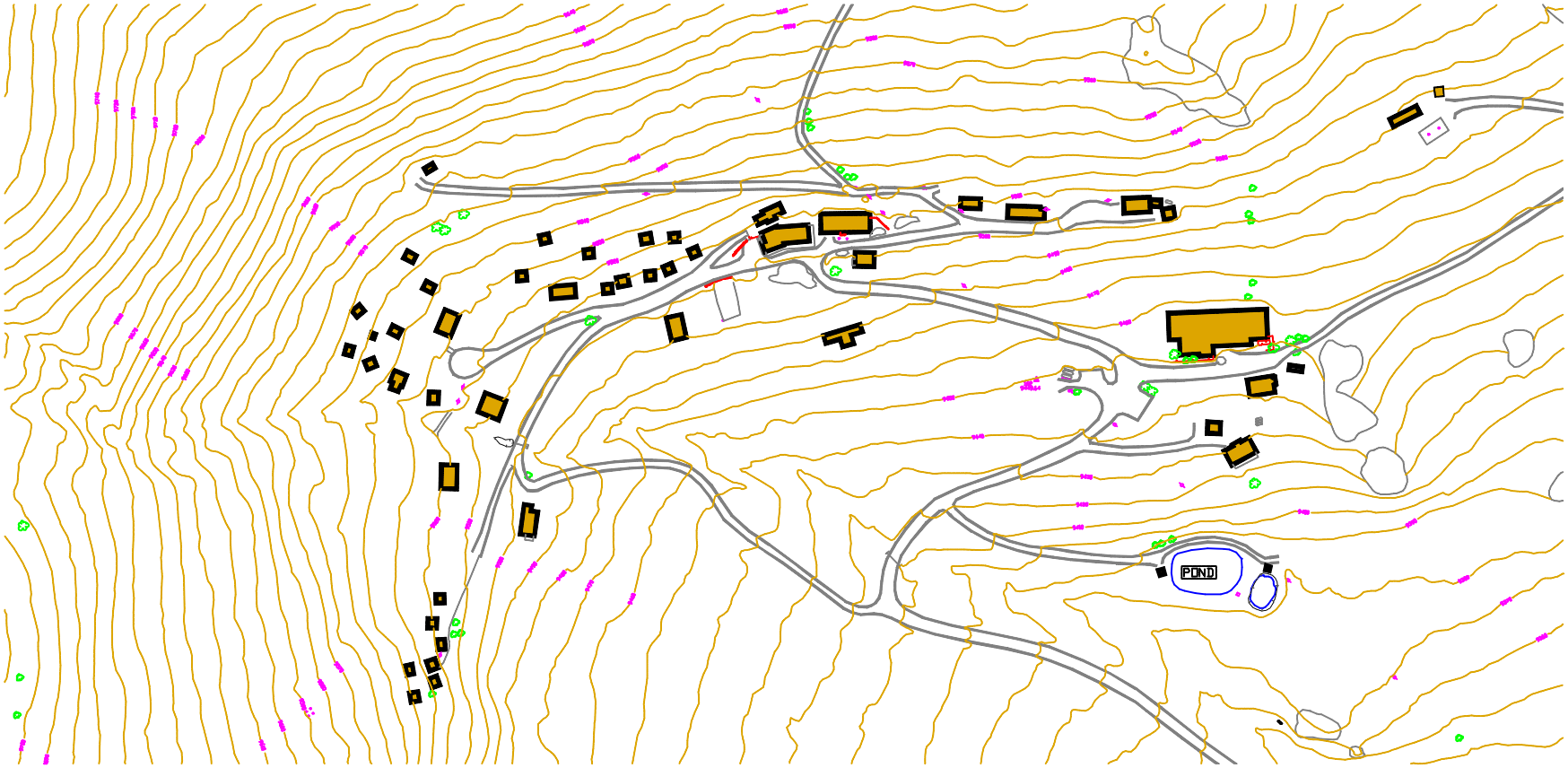
0 550' 1100'

N

Go to related text

Exhibit II-C-4

10.21.99 SRW topo_south.dwg on Z



Mountain Research Station
Topographic Map
(Developed Portion Only)

Ten Foot Contour Intervals Shown

Colorado
University of Colorado at Boulder
Campus Master Plan

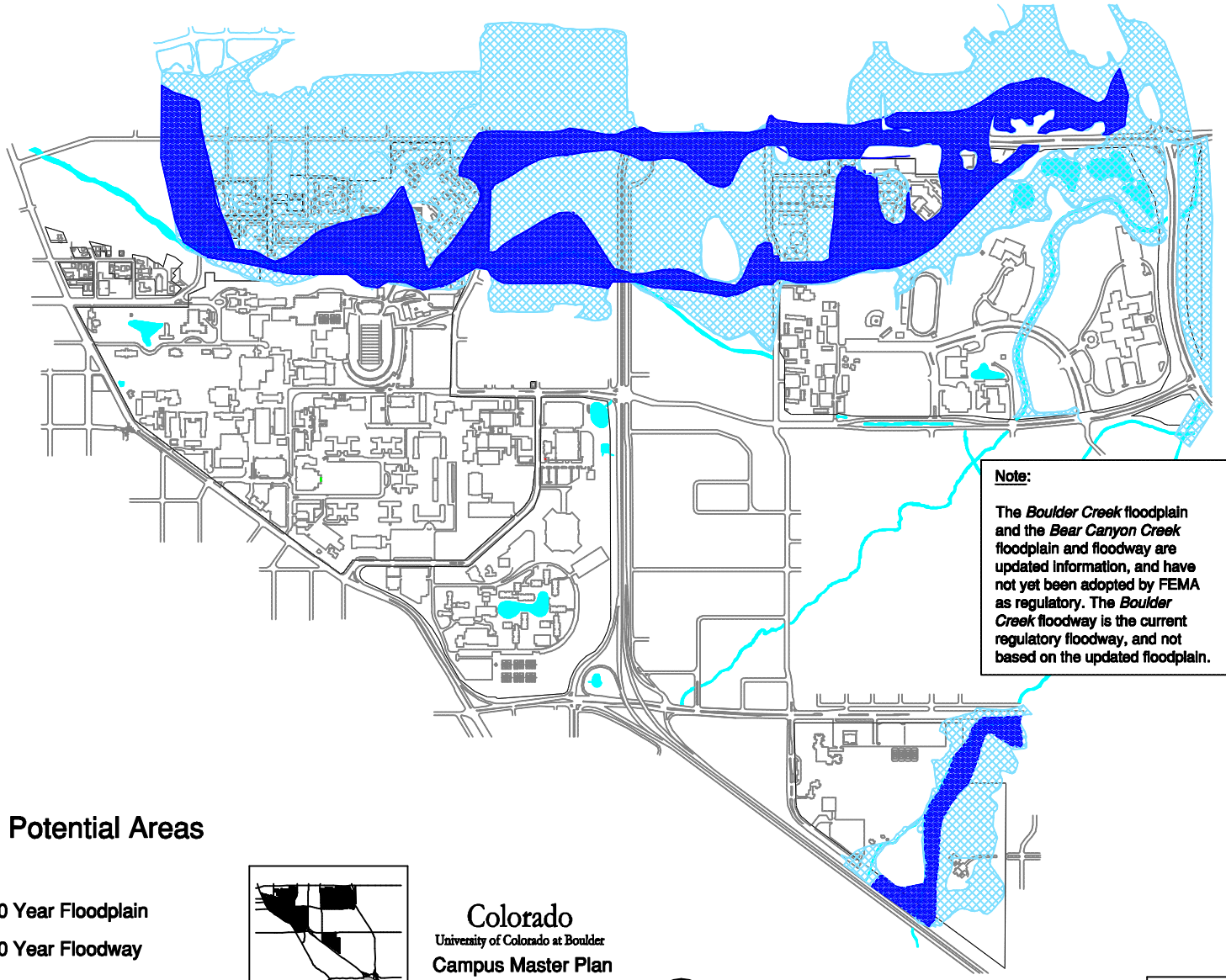
0 100' 200'

N

Go to related text

Exhibit II-C-5

10.21.99 SRW mrs-bldg-only_jrr.dwg on ZΩ



Note:

The *Boulder Creek* floodplain and the *Bear Canyon Creek* floodplain and floodway are updated information, and have not yet been adopted by FEMA as regulatory. The *Boulder Creek* floodway is the current regulatory floodway, and not based on the updated floodplain.

Flooding Potential Areas

100 Year Floodplain

100 Year Floodway

Colorado
University of Colorado at Boulder
Campus Master Plan

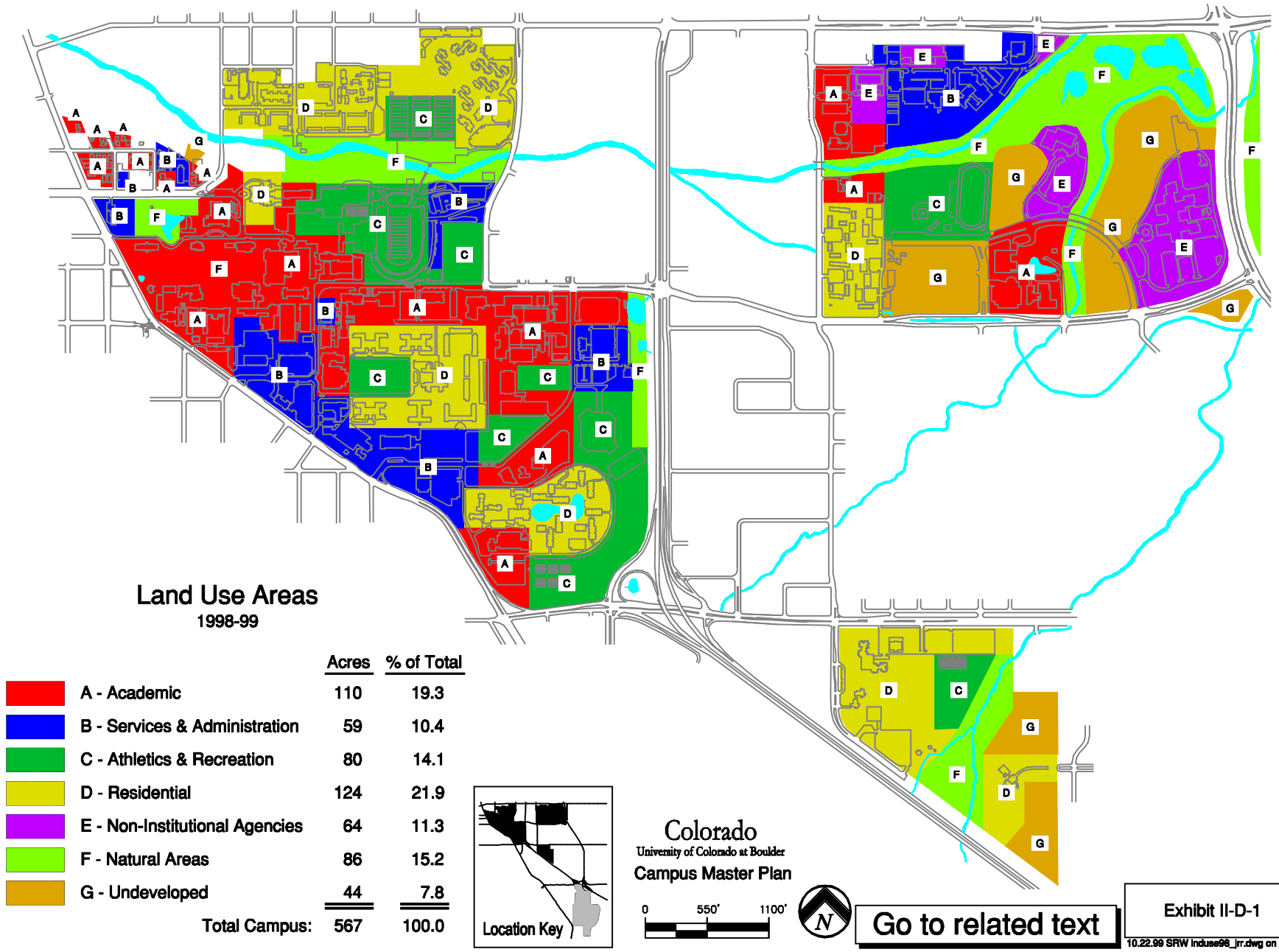
0 650' 1300'

N

Go to related text

Exhibit II-C-6

10.21.99 SRW flood98_jrr.dwg on Z



Land Use Areas

1998-99

	Acres	% of Total
A - Academic	110	19.3
B - Services & Administration	59	10.4
C - Athletics & Recreation	80	14.1
D - Residential	124	21.9
E - Non-Institutional Agencies	64	11.3
F - Natural Areas	86	15.2
G - Undeveloped	44	7.8
Total Campus:	567	100.0

Location Key

Colorado

University of Colorado at Boulder

Campus Master Plan

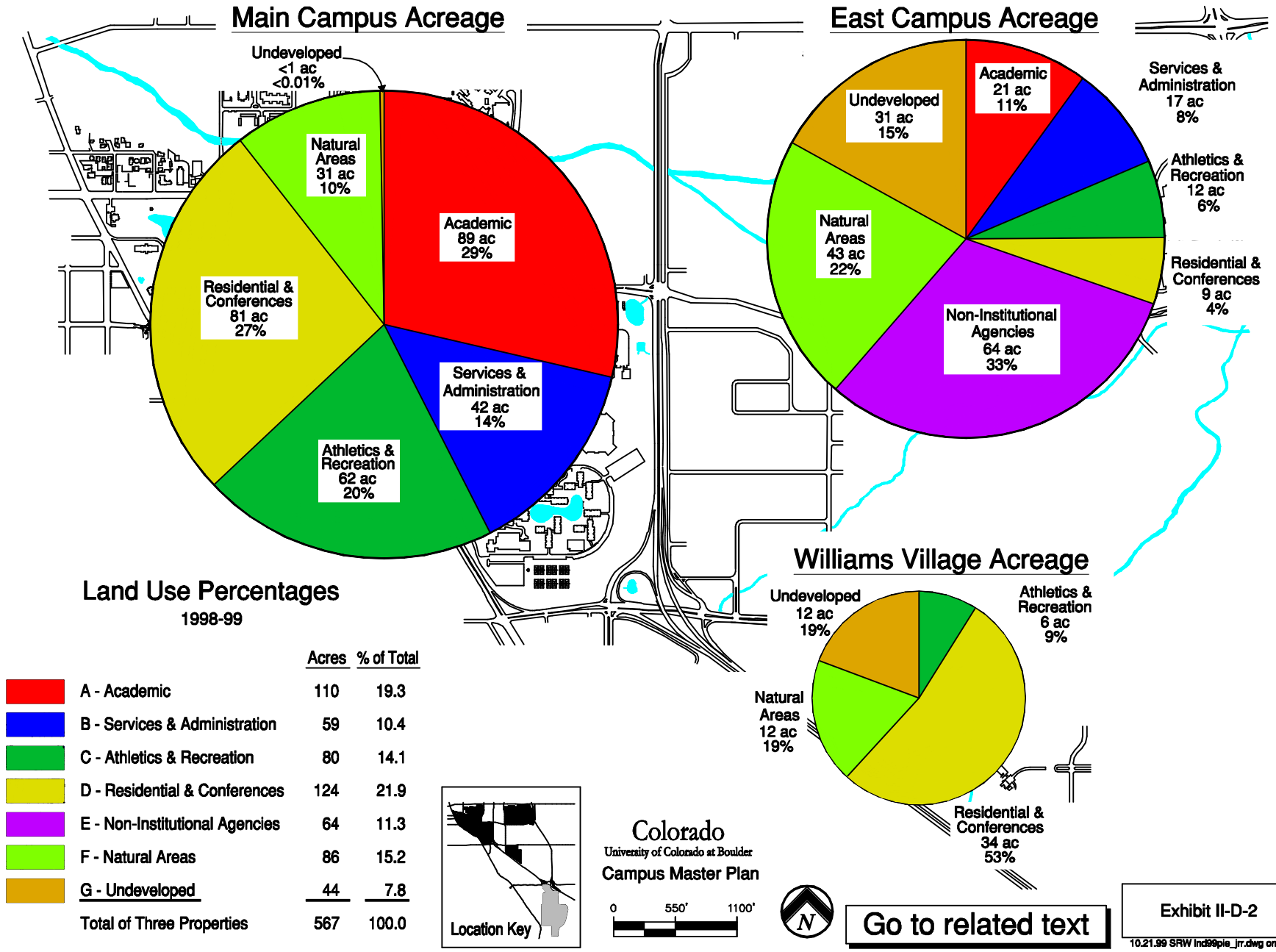
0 550' 1100'

N

Go to related text

Exhibit II-D-1

10.22.99 SRW lnduse98_jrr.dwg on Z


Main Campus Acreage
Undeveloped
<1 ac
<0.01%
Natural
Areas
31 ac
10%
Academic
89 ac
29%
Residential &
Conferences
81 ac
27%
Services &
Administration
42 ac
14%
Athletics &
Recreation
62 ac
20%
East Campus Acreage
Undeveloped
31 ac
15%
Academic
21 ac
11%
Services &
Administration
17 ac
8%
Athletics &
Recreation
12 ac
6%
Natural
Areas
43 ac
22%
Residential &
Conferences
9 ac
4%
Non-Institutional
Agencies
64 ac
33%
Williams Village Acreage
Undeveloped
12 ac
19%
Athletics &
Recreation
6 ac
9%
Natural
Areas
12 ac
19%
Residential &
Conferences
34 ac
53%
Land Use Percentages
1998-99
Acres
% of Total
A - Academic 110 19.3
B - Services & Administration 59 10.4
C - Athletics & Recreation 80 14.1
D - Residential & Conferences 124 21.9
E - Non-Institutional Agencies 64 11.3
F - Natural Areas 86 15.2
G - Undeveloped 44 7.8
Total of Three Properties 567 100.0
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit II-D-2
10.21.99 SRW ind99pie_jrr.dwg on Z

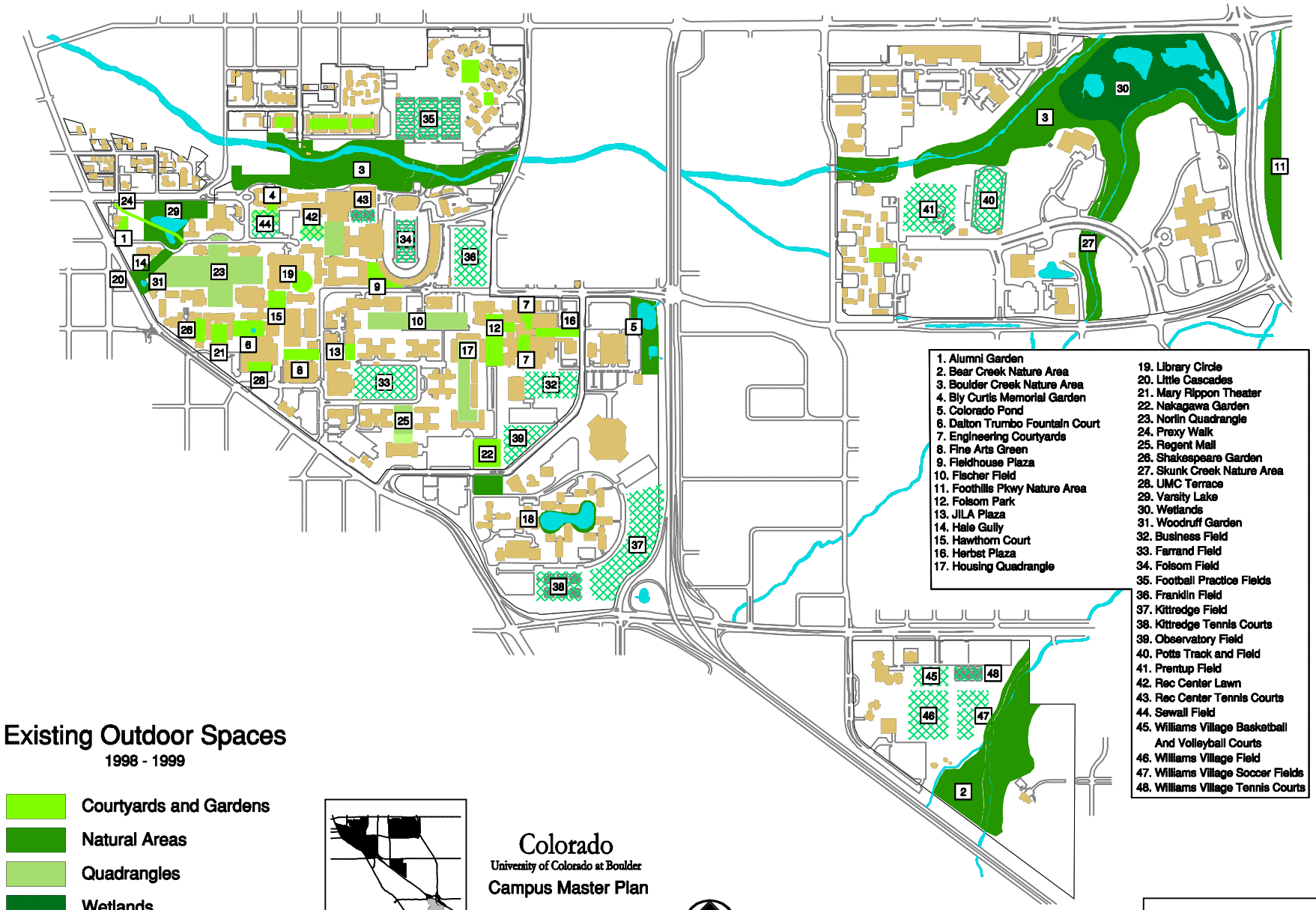

1. Alumni Garden
2. Bear Creek Nature Area
3. Boulder Creek Nature Area
4. Bly Curtis Memorial Garden
5. Colorado Pond
6. Dalton Trumbo Fountain Court
7. Engineering Courtyards
8. Fine Arts Green
9. Fieldhouse Plaza
10. Fischer Field
11. Foothills Pkwy Nature Area
12. Folsom Park
13. JILA Plaza
14. Hale Gully
15. Hawthorn Court
16. Herbst Plaza
17. Housing Quadrangle
19. Library Circle
20. Little Cascades
21. Mary Rippon Theater
22. Nakagawa Garden
23. Norlin Quadrangle
24. Prexy Walk
25. Regent Mall
26. Shakespeare Garden
27. Skunk Creek Nature Area
28. UMC Terrace
29. Varsity Lake
30. Wetlands
31. Woodruff Garden
32. Business Field
33. Farrand Field
34. Folsom Field
35. Football Practice Fields
36. Franklin Field
37. Kittredge Field
38. Kittredge Tennis Courts
39. Observatory Field
40. Potts Track and Field
41. Prentup Field
42. Rec Center Lawn
43. Rec Center Tennis Courts
44. Sewall Field
45. Williams Village Basketball And Volleyball Courts
46. Williams Village Field
47. Williams Village Soccer Fields
48. Williams Village Tennis Courts
Existing Outdoor Spaces
1998 - 1999
Courtyards and Gardens
Natural Areas
Quadrangles
Wetlands
Athletic/Recreation Fields
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit II-D-3
10.21.99 SRW desig-ospc_jrr.dwg on Z

Exhibit III-A-1 Total Enclosed Space Requirements—Fall 1997

	Guideline ASF	Existing ASF	Surplus/ (Deficit)	Actual as Percent of Guidline
Academic				
Classroom & Service Space	279,534	203,311	(76,223)	73%
Instructional Labs & Service Space	212,412	170,402	(42,010)	80%
Other Teaching Facilities & Service Space	177,568	150,803	(26,765)	85%
Academic Office & Service Space	833,351	723,020	(110,331)	87%
Other Instructional Space	251,090	232,803	(18,287)	93%
Research Lab & Service Space	1,086,759	523,747	(563,012)	48%
Assembly & Exhibit	125,626	80,818	(44,808)	64%
Library Space (incl. offices & study areas)	488,591	313,443	(175,148)	64%
Academic Subtotal	3,454,931	2,398,347	(1,056,584)	69%
Services & Administration				
Administrative Office & Service Space	145,093	112,629	(32,464)	78%
Other Administrative & General Space	75,327	61,484	(13,843)	82%
Student Union Space	199,764	146,882	(52,882)	74%
Physical Plant Space	220,521	151,079	(69,442)	69%
Services & Administration Subtotal	640,705	472,074	(168,631)	74%
Athletics & Recreation				
Athletics Space	501,750	236,921	(264,829)	47%
Recreation Space	265,762	164,000	(101,762)	62%
Athletics & Recreation Subtotal	767,512	400,921	(366,591)	52%
Residential & Conferences				
Housing Department Office Space	47,420	33,791	(13,629)	71%
Campus Housing Space	1,847,469	1,740,987	(112,500)	94%
Residential & Conferences Subtotal	1,900,907	1,774,778	(126,129)	93%
GRAND TOTAL	**6,764,055**	**5,046,120**	**(1,717,935)**	**75%**
System Agencies Space*	N/A	82,640	N/A	N/A
Non-Institutional Agencies Space*	N/A	173,636	N/A	N/A
Student Headcount Enrollment	25,109			
Student FTE Enrollment	22,196			

*Guidline analysis is not performed. Boulder space occupied by units not administered by CU-Boulder

Exhibit III-A-2 Boulder Campus Total Enclosed Space Requirements—Fall 2003

	Guideline ASF	Existing ASF	Surplus/ (Deficit)	Actual as Percent of Guidline
Academic				
Classroom & Service Space	290,690	223,771	(66,919)	77%
Instructional Labs & Service Space	224,095	170,402	(53,693)	76%
Other Teaching Facilities & Service Space	187,408	150,803	(36,605)	80%
Academic Office & Service Space	901,686	735,520	(166,166)	82%
Other Instructional Space	265,000	234,803	(30,197)	89%
Research Lab & Service Space	1,314,978	523,747	(791,231)	40%
Assembly & Exhibit	133,006	80,818	(52,188)	61%
Library Space (incl. offices & study areas)	478,296	313,443	(164,853)	66%
Academic Subtotal	3,795,159	2,433,307	(1,361,852)	64%
Services & Administration				
Administrative Office & Service Space	147,995	112,629	(35,366)	76%
Other Administrative & General Space	79,500	61,484	(18,016)	77%
Student Union Space	210,834	146,882	(63,952)	70%
Physical Plant Space	241,359	151,079	(90,280)	63%
Services & Administration Subtotal	679,688	472,074	(207,614)	69%
Athletics & Recreation				
Athletics Space	501,750	236,921	(264,829)	47%
Recreation Space	279,707	164,000	(115,707)	59%
Athletics & Recreation Subtotal	781,457	400,921	(380,536)	51%
Residential & Conferences				
Housing Department Office Space	49,791	33,791	(16,000)	68%
Campus Housing Space	1,965,987	1,740,987	(225,000)	89%
Residential & Conferences Subtotal	2,015,778	1,774,778	(241,000)	88%
GRAND TOTAL	**7,272,082**	**5,081,080**	**(2,191,002)**	**70%**
System Agencies Space*	N/A	82,640	N/A	N/A
Non-Institutional Agencies Space*	N/A	173,636	N/A	N/A
Student Headcount Enrollment	26,500			
Student FTE Enrollment	23,426			

*Guidline analysis is not performed. Boulder space occupied by units not administered by CU-Boulder.

NOTE: Existing space includes 1997 facilities plus the new Humanities Building.

Exhibit III-A-3 Boulder Campus Total Enclosed Space Requirements—Fall 2008

	Guideline ASF	Existing ASF	Surplus/ (Deficit)	Actual as Percent of Guidline
Academic				
Classroom & Service Space	295,544	223,771	(71,773)	76%
Instructional Labs & Service Space	227,918	170,402	(57,516)	75%
Other Teaching Facilities & Service Space	190,528	150,803	(39,725)	79%
Academic Office & Service Space	965,604	735,520	(230,084)	76%
Other Instructional Space	269,420	234,803	(34,617)	87%
Research Lab & Service Space	1,564,933	523,747	(1,041,186)	33%
Assembly & Exhibit	135,346	80,818	(54,528)	60%
Library Space (incl. offices & study areas)	496,703	313,433	(183,260)	63%
Academic Subtotal	4,145,996	2,433,307	(1,712,689)	59%
Services & Administration				
Administrative Office & Service Space	152,332	112,629	(38,703)	74%
Other Administrative & General Space	80,826	61,484	(19,342)	76%
Student Union Space	214,344	146,882	(67,462)	69%
Physical Plant Space	262,689	151,079	(111,610)	58%
Services & Administration Subtotal	709,191	472,074	(237,117)	67%
Athletics & Recreation				
Athletics Space	501,750	236,921	(264,829)	47%
Recreation Space	283,694	164,000	(119,694)	58%
Athletics & Recreation Subtotal	785,444	400,921	(384,523)	51%
Residential & Conferences				
Housing Department Office Space	50,739	33,791	(16,948)	67%
Campus Housing Space	2,145,987	1,740,987	(405,000)	81%
Residential & Conferences Subtotal	2,196,726	1,774,778	(421,948)	81%
GRAND TOTAL	**7,837,357**	**5,081,080**	**(2,756,277)**	**65%**
System Agencies Space*	N/A	82,640	N/A	N/A
Non-Institutional Agencies Space*	N/A	173,636	N/A	N/A
Student Headcount Enrollment	26,942			
Student FTE Enrollment	23,816			

*Guidline analysis is not performed. Boulder space occupied by units not administered by CU-Boulder.

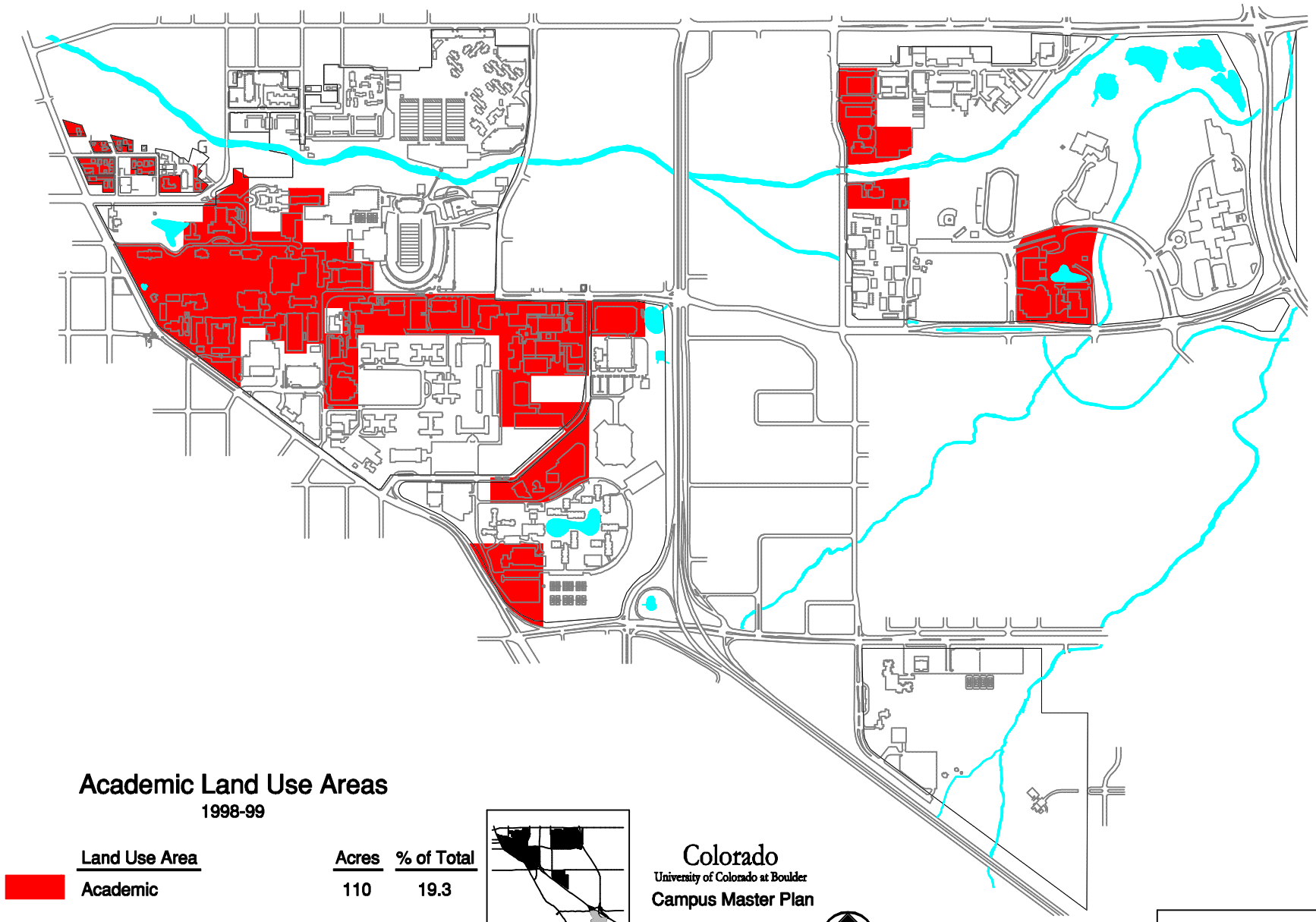
NOTE: Existing space includes 1997 facilities plus the new Humanities Building.

Exhibit III-A-4
Sampling of Institutional Laboratories Utilization

	Average Weekly Scheduled Credit Use	Average Weekly Total Use
Aerospace Engineering	13 hours	36 hours
Physics	27 hours	61 hours
Psychology	27 hours	41 hours
Theater & Dance	19 hours	62 hours
AVERAGE	**22 hours**	**50 hours**

Exhibit III-A-5
Peer Institutions Research Space

Institution	ASF
CU-Boulder	523,747
Indiana University–Bloomington	469,766
Michigan State University	898,000
Ohio State University–Columbus	1,298,290
Purdue University	1,065,128
Texas A&M University	843,049
University of Arizona	883,221
University of California–Berkeley	1,071,472
University of California–Los Angeles	918,843
University of Florida	1,240,305
University of Illinois–Champaign-Urbana	1,478,277
University of Michigan–Ann Arbor	1,536,939
University of Minnesota–Twin Cities	1,507,957
University of Texas–Austin	785,434
University of Washington–Seattle	1,217,920
AVERAGE	**1,049,223**



Academic Land Use Areas

1998-99

Land Use Area	Acres	% of Total
Academic	110	19.3

Location Key

Colorado
University of Colorado at Boulder
Campus Master Plan

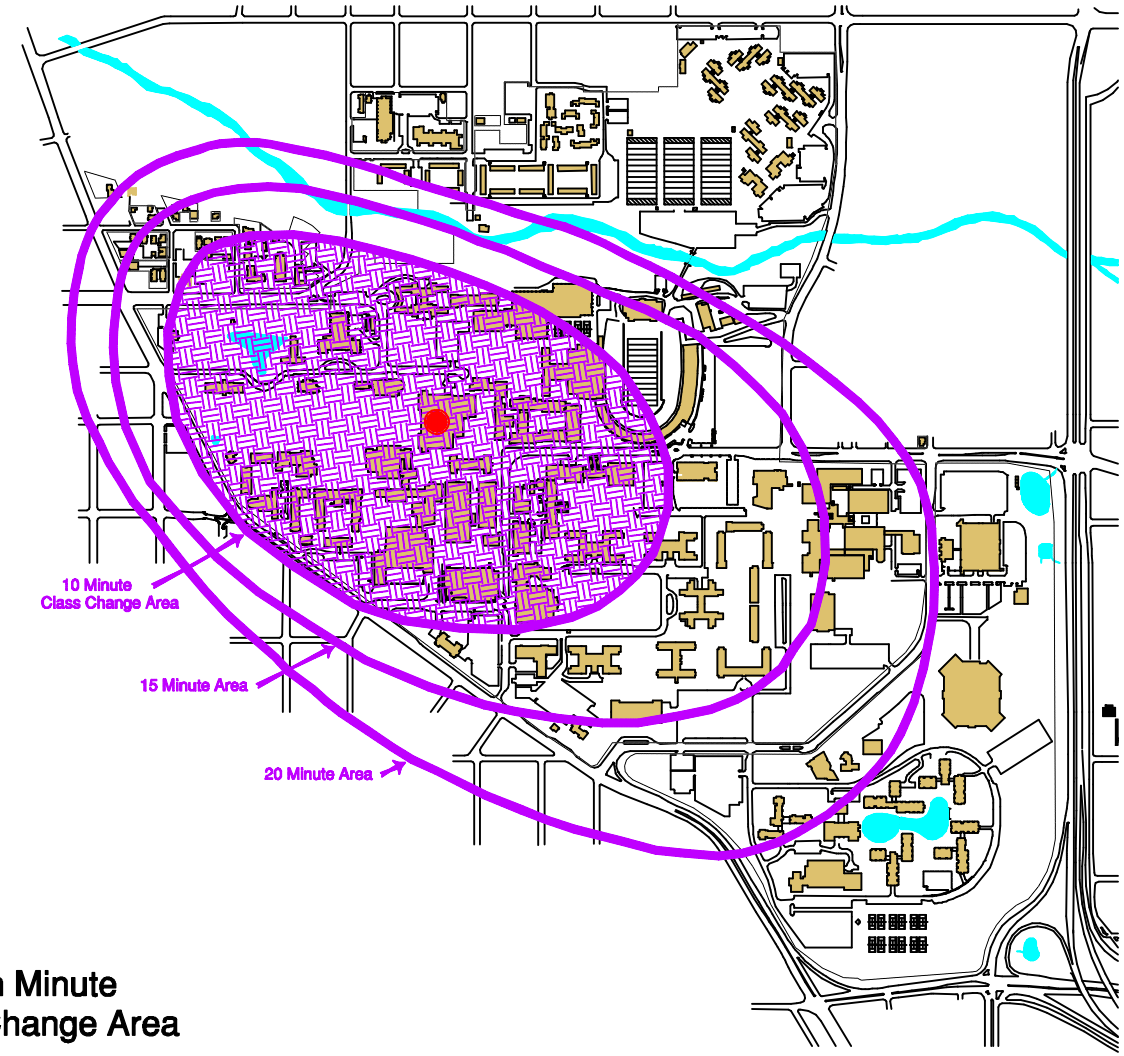
0 550' 1100'

N

Go to related text

Exhibit III-B-1

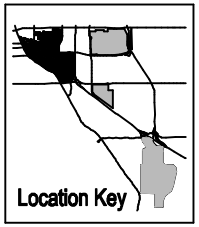
10.21.99 SRW induse99A.dwg on Z



Ten Minute Class Change Area

10 Minute Class Change Area

Center Of Campus



Colorado
University of Colorado at Boulder
Campus Master Plan

0 450' 900'

N

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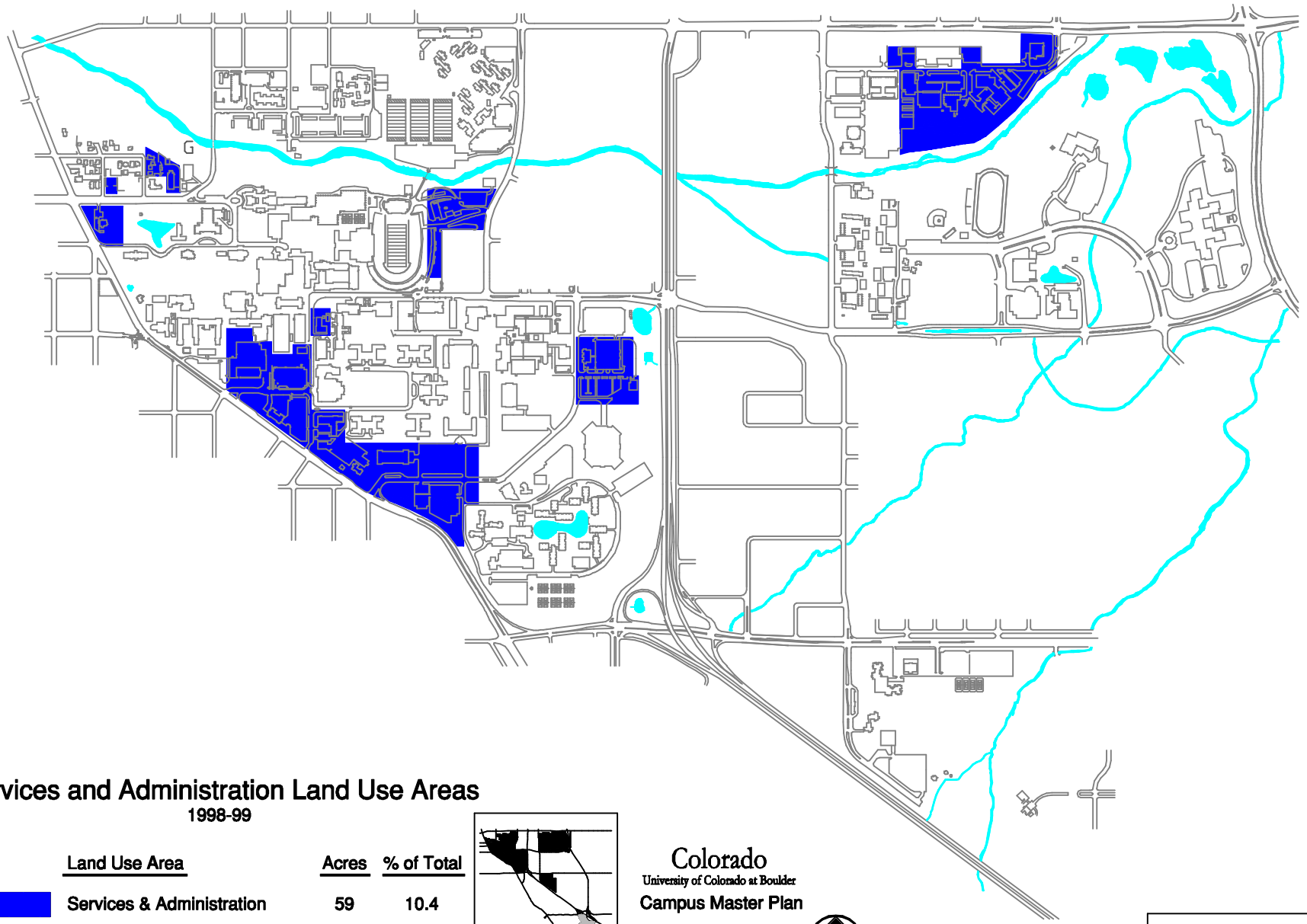
Exhibit III-B-2

10.21.99 SRW 10min98_jrr.dwg on Z



Services and Administration Land Use Areas

1998-99

Land Use Area	Acres	% of Total
Services & Administration	59	10.4

Location Key

Colorado
University of Colorado at Boulder
Campus Master Plan

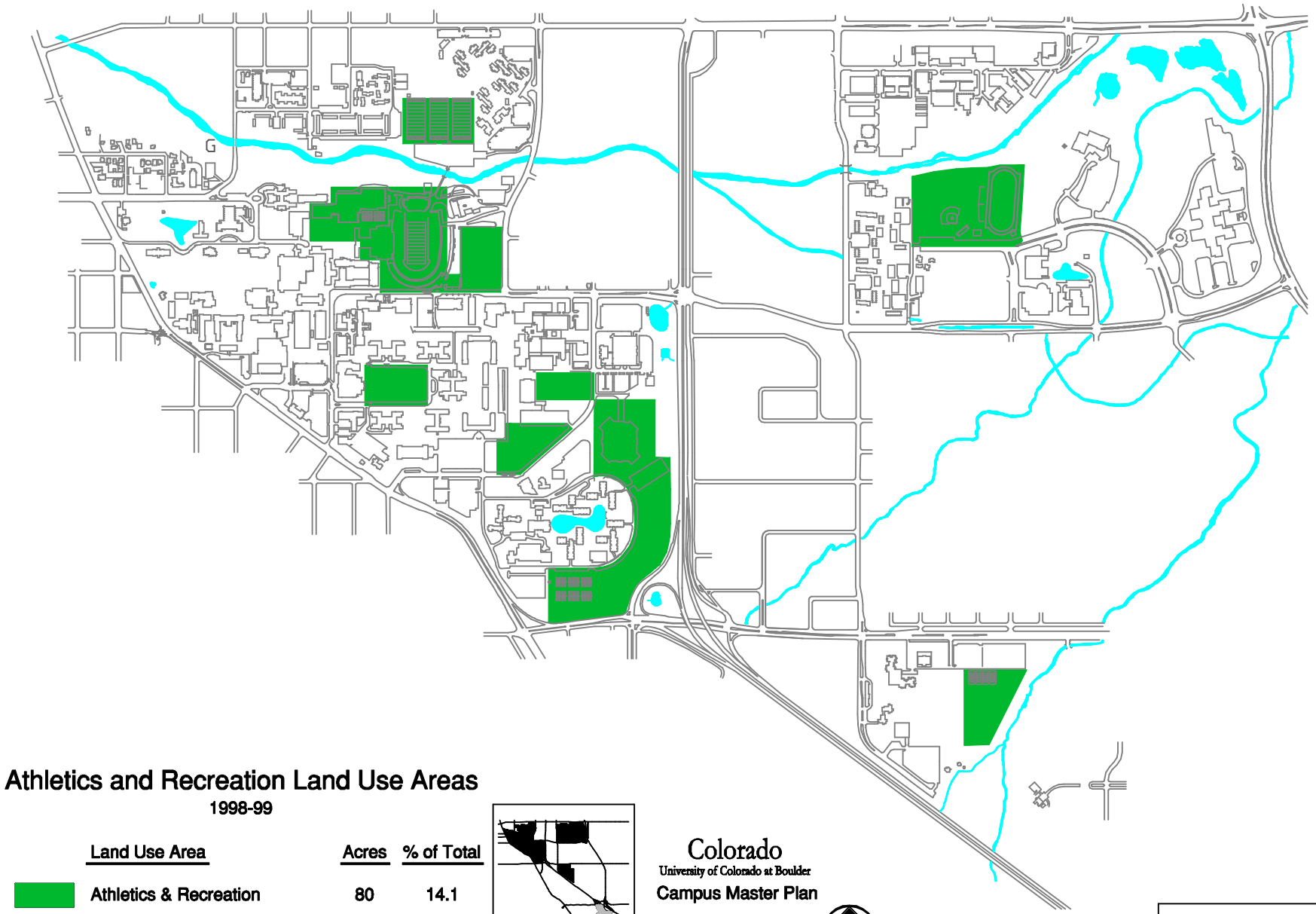
0 550' 1100'

N

Go to related text

Exhibit III-C-1

10.21.99 SRW Induse99B.dwg on Z



Athletics and Recreation Land Use Areas

1998-99

Land Use Area	Acres	% of Total
Athletics & Recreation	80	14.1

Location Key

Colorado
University of Colorado at Boulder
Campus Master Plan

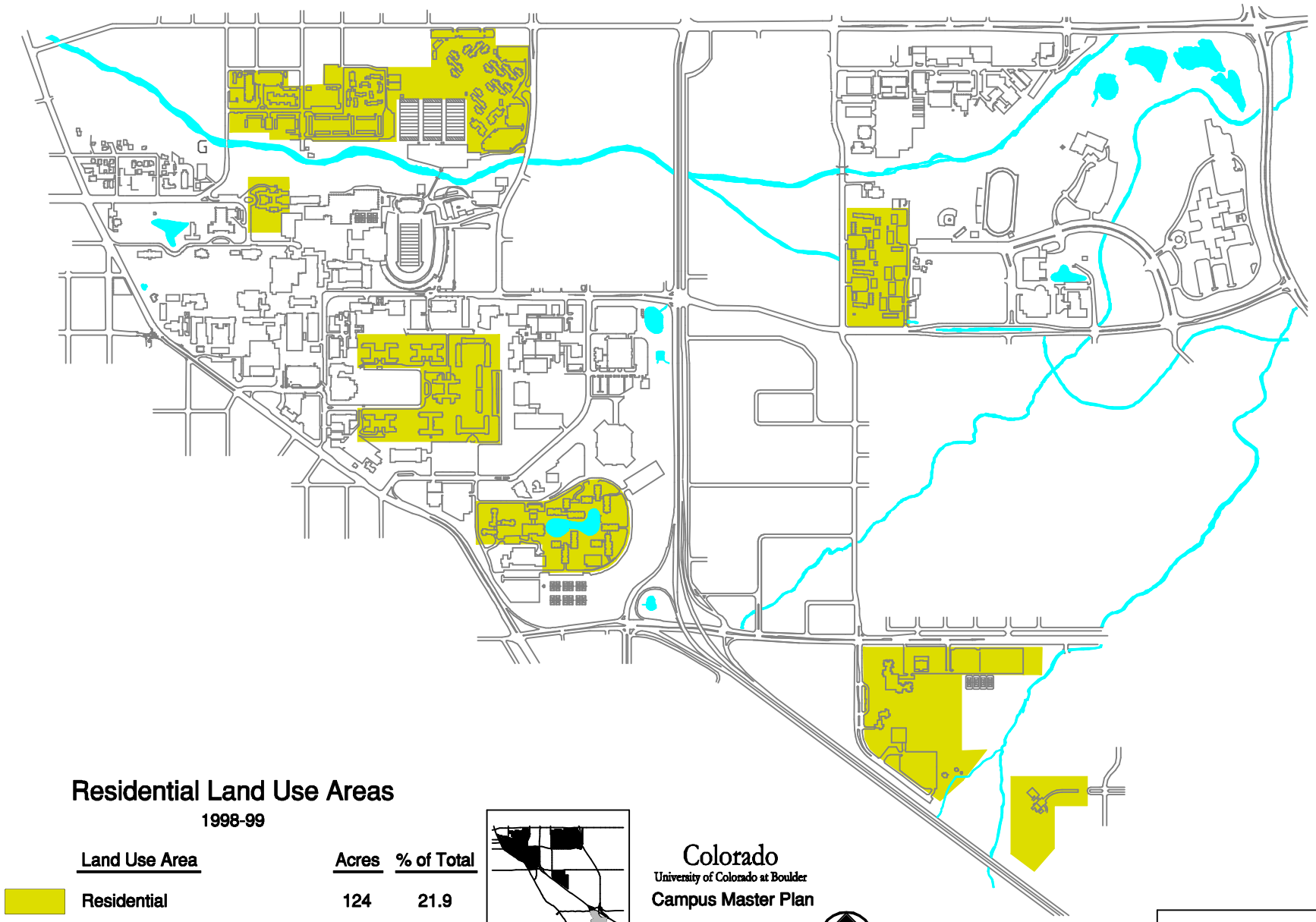
0 550' 1100'

N

Go to related text

Exhibit III-D-1

10.21.99 SRW induse99D.dwg on Z



Residential Land Use Areas

1998-99

Land Use Area	Acres	% of Total
Residential	124	21.9

Location Key

Colorado
University of Colorado at Boulder
Campus Master Plan

0 550' 1100'

N

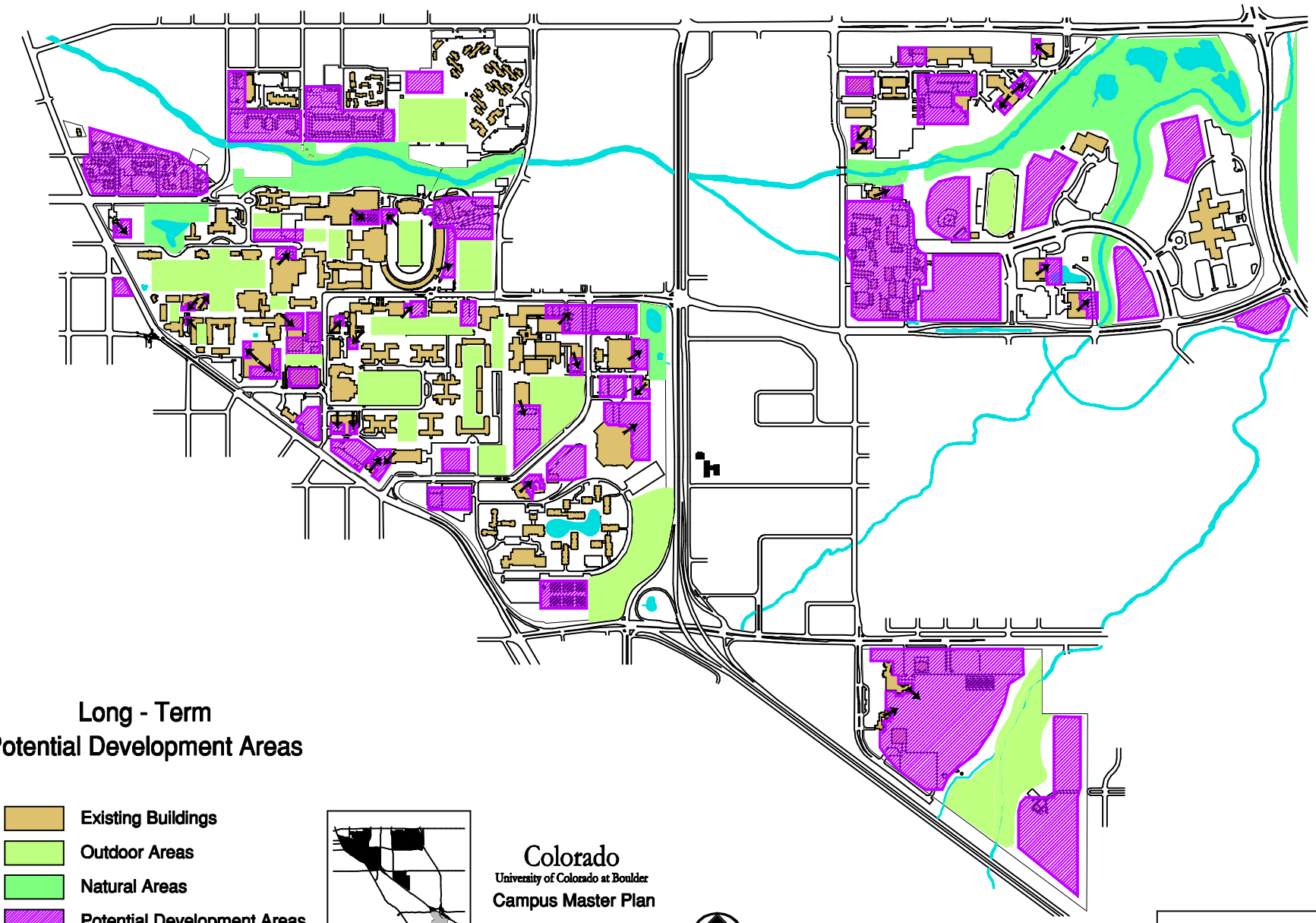
Go to related text

Exhibit III-F-1

10.21.99 SRW Induse99C.dwg on Z

Exhibit III-F-2
Residential Academic Programs

Program	Location	Fee Charged	Credit Courses Offered
Sewall Hall Academic	Sewall Hall	Yes	Yes
Farrand Hall Academic	Farrand Hall	Yes	Yes
Engineering Academic	Brackett Hall	Yes	Yes
Smith Hall International	Smith Hall	Yes	Yes
Kittredge Honors	Kittredge Commons	Yes	Yes
Music Appreciation	Cheyenne Arapaho	No	No
Hallett Diversity	Hallett Hall	No	No
Environmental Studies	Baker Hall	No	Yes
Student Leadership	Williams Village	Yes	Yes


Long - Term
Potential Development Areas
Existing Buildings
Outdoor Areas
Natural Areas
Potential Development Areas
Potential Expansion of Use
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-A-1
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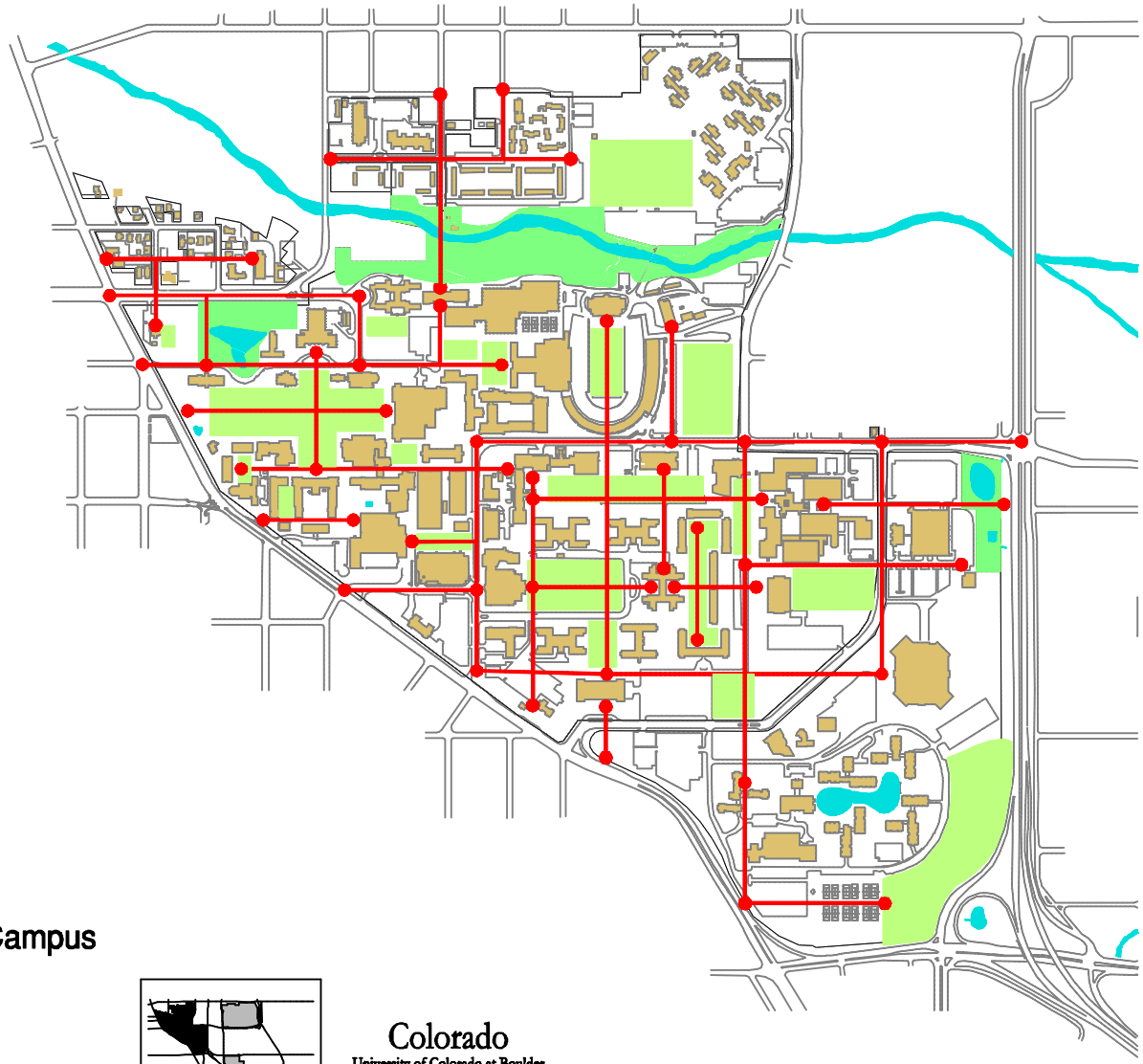
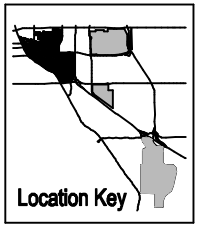


Axial Plan of Main Campus

Malls, Vistas
& Axial Corridors



Colorado
University of Colorado at Boulder
Campus Master Plan

0 450' 900'

N

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Exhibit IV-A-2

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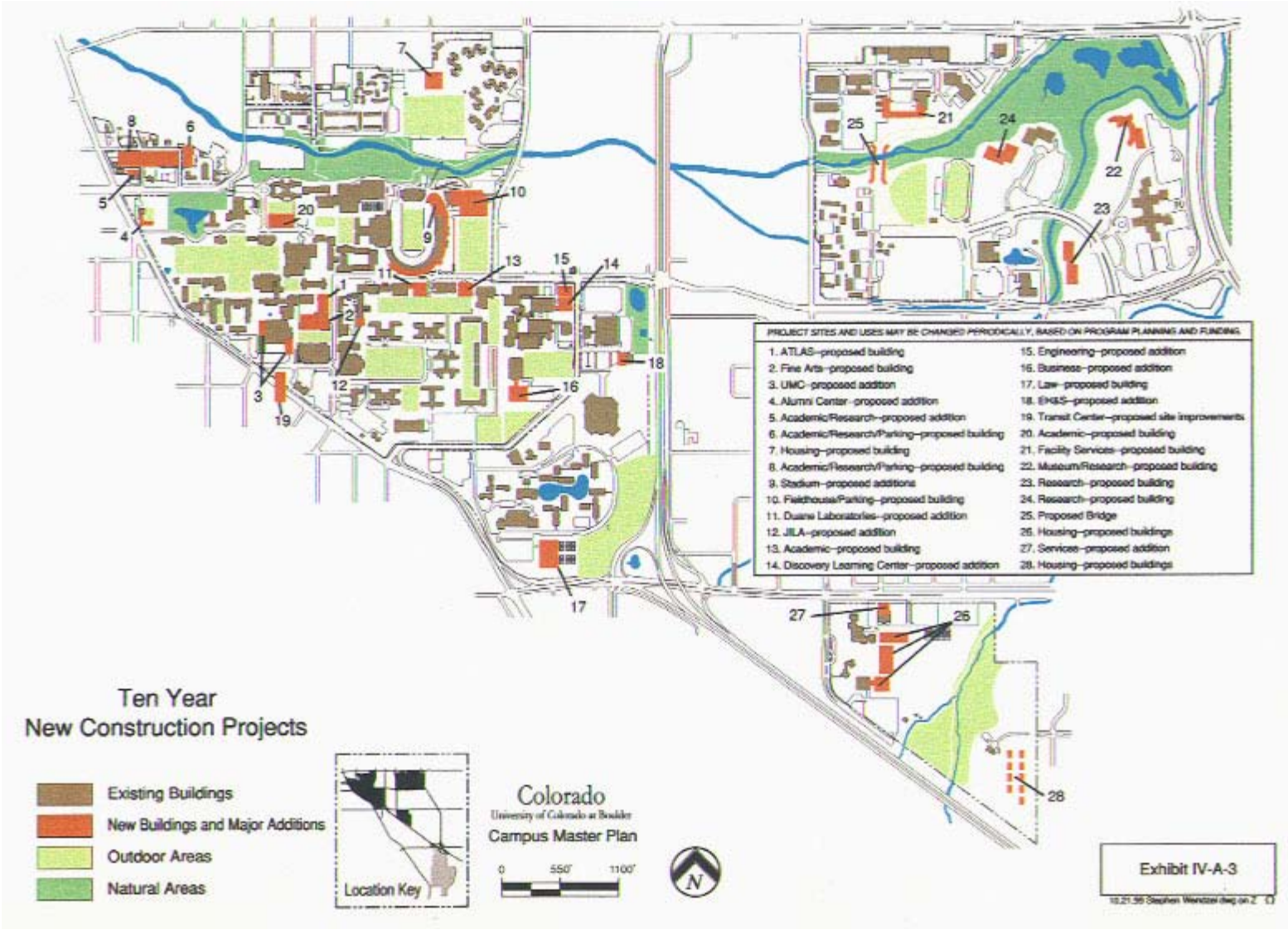

PROJECT SITES AND USES MAY BE CHANGED PERIODICALLY, BASED ON PROGRAM PLANNING AND FUNDING.
1. ATLAS–proposed building
2. Fine Arts–proposed building
3. UMC–proposed addition
4. Alumni Center–proposed addition
5. Academic/Research–proposed addition
6. Academic/Research/Parking–proposed building
7. Housing–proposed building
8. Academic/Research/Parking–proposed building
9. Stadium–proposed additions
10. Fieldhouse/Parking–proposed building
11. Duane Laboratories–proposed addition
12. JILA–proposed addition
13. Academic–proposed building
14. Discovery Learning Center–proposed addition
15. Engineering–proposed addition
16. Business–proposed addition
17. Law–proposed building
18. EH&S–proposed addition
19. Transit Center–proposed site improvements
20. Academic–proposed building
21. Facility Services–proposed building
22. Museum/Research–proposed building
23. Research–proposed building
24. Research–proposed building
25. Proposed Bridge
26. Housing–proposed buildings
27. Services–proposed addition
28. Housing–proposed buildings
Ten Year
New Construction Projects
Existing Buildings
New Buildings and Major Additions
Outdoor Areas
Natural Areas
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Exhibit IV-A-3

Exhibit IV-A-4
Proposed Capital Projects (page 1 of 3)

Project	Program Plan?	Funded?	Added GSF	Added ASF	Renovated GSF	1–5 Years Total Project Cost ($)	6–10 Years Total Project Cost ($)
Academic Projects							
Humanities/Woodbury	x	x	59,000	36,000	13,000	15,912,000	
Ekeley East Renovation	x	x	0	0	13,000	2,279,000	
Former Geology Building Renovation	x	x	0	0	55,000	6,012,000	
Admin. & Research Center (40% for research)	x	x	0	0	72,000	2,240,000	
Enviro. Engineering Renovation	x	x	3,000	3,000	10,000	2,134,000	
Discovery Learning Center	x	x	45,000	30,000	0	15,258,000	
Porter Biosci. Renovation Phase 3-D	x	x	0	0		6,274,000	
Hunter Demolition for ATLAS	x		(52,000)	(32,000)	0	900,000	
ATLAS Center	x		66,000	42,000	0	26,530,000	
Business Renovation/Addition	x		54,000	36,000	36,000	23,790,000	
Law School Building	x		160,000	108,000	0	37,350,000	
Sibell Wolle Demolition for VAC	x		(121,000)	(73,000)	0		1,000,000
Visual Arts Complex (VAC)	x		148,000	107,000	5,000		37,000,000
Miscellaneous Academic Renovations			0	0	100,000		30,000,000
Physics “H” Addition/Renovation			80,000	50,000	40,000		40,000,000
Grandview Demolition & Renovation			(30,000)	(20,000)	7,000		1,500,000
Grandview Commons			30,000	20,000	13,000		15,000,000
Grandview Research/Academic Building(s)			150,000	82,000	0		52,400,000
Norlin Library Renovation			0	0	330,000		25,000,000
Research Park Building(s)			50,000	33,000	0		28,000,000
Engineering Center Additions			75,000	50,000	0		30,000,000
Journalism Building			45,000	30,000	0		17,000,000
JILA Addition			15,000	10,000	0		4,500,000
Carlson Renovation			10,000	6,000	56,000		22,000,000
Total Academic Projects			**787,000**	**518,000**	**750,000**	**138,679,000**	**303,400,000**

1. Updated 4/01
2. GSF (gross square footage) and ASF (assignable square footage)
3. 1–5 years is FY 1998-99 to 2002-03; 6–10 years is FY 2003-04 to 2007-08
4. Costs are 1999-2000 dollars, P = Privatization likely

Exhibit IV-A-4
Proposed Capital Projects (page 2 of 3)

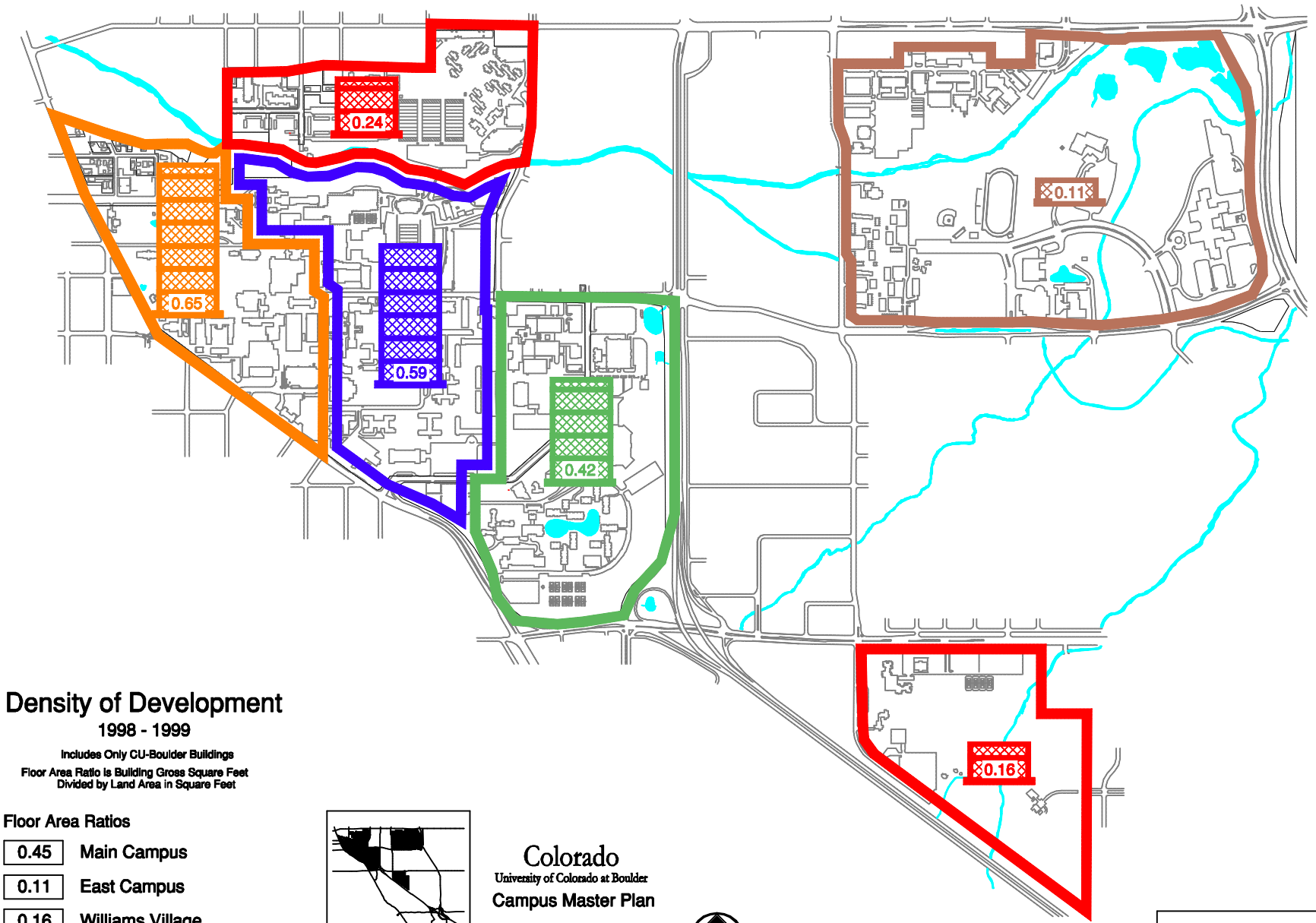
Project	Program Plan?	Funded?	Added GSF	Added ASF	Renovated GSF	1–5 Years Total Project Cost ($)	6–10 Years Total Project Cost ($)
Service Projects							
Admin. & Research Center (60% for administration)	x	x	0	0	108,000	3,360,000	
EH&S Center Addition	x	x	16,000	10,000	1,000	3,990,000	
UMC Renovation	x	x	52,000	33,000	130,000	23,000,000	
Communications Infrastructure	x		0	0	0		10,000,000
Koenig Alumni Center Addition	x		17,000	11,000	1,000		4,000,000
CU-South Civil Infrastructure			0	0	0		10,000,000
Utility Generation			0	5,000	0		75,000,000
Grounds/Distribution/Demolition/Relocation			(58,000)	(56,000)	0		200,000
FM/Distribution Building			150,000	100,000	0		25,000,000
Civil Utilities Infrastructure			0	0	0		10,000,000
Misc. Service Renovations			0	0	30,000		3,000,000
Transit Center			2,000	1,000	0		6,000,000
Grandview Parking Structure			0	0	0		18,200,000
Total Service Projects			**179,000**	**104,000**	**270,000**	**30,350,000**	**161,400,000**
Athletics and Recreation Projects							
Folsom Field Resurfacing		x	0	0	0	2,600,000	
Folsom Scoreboards	x	x	0	0	0	3,960,000	
Folsom Lighting	x		0	0	0	825,000	
Tennis Courts Relocation			0	0	0	650,000	
Athletics Fields & Courts– CU-Boulder South			0	0	0	1,460,000	3,980,000
Fieldhouse and Parking			150,000	120,000	0		47,800,000
Stadium Improvements			175,000	140,000	22,000		40,300,000
Recreation Fields			0	0	0		500,000
Total Athletics and Recreation Projects			**325,000**	**260,000**	**22,000**	**9,495,000**	**92,580,000**

1. Updated 4/01
2. GSF (gross square footage) and ASF (assignable square footage)
3. 1–5 years is FY 1998-99 to 2002-03; 6–10 years is FY 2003-04 to 2007-08
4. Costs are 1999-2000 dollars, P = Privatization likely

Exhibit IV-A-4
Proposed Capital Projects (page 3 of 3)

Project	Program Plan?	Funded?	Added GSF	Added ASF	Renovated GSF	1–5 Years Total Project Cost ($)	6–10 Years Total Project Cost ($)
Housing Projects							
Housing Renovation Phases I–III	x	x	0	(8,000)	200,000	30,726,000	
Co-op Housing Off-Campus		P	0	0	0	700,000	
Williams Village Housing Phases I & II	x	P	270,000	183,000	0	42,400,000	
Williams Village Infrastructure		P	0	0	0	5,000,000	10,000,000
Housing Renovation Phases IV–VIII	x	x	0	(8,000)	300,000		25,357,000
Williams Village Housing, Phases III & IV	x	P	300,000	204,000	0		46,800,000
Williams Village Parking Structures		P	0	0	0		17,000,000
Williams Village Faculty/Staff Housing		P	150,000	86,000	0		18,000,000
Williams Village Multi-Purpose Center		P	60,000	36,000	0		19,000,000
Total Housing Projects			**570,000**	**371,000**	**500,000**	**78,826,000**	**82,157,000**
TOTALS–ALL PROJECTS			**1,861,000**	**1,253,000**	**1,542,000**	**257,350,000**	**639,537,000**
Total Cost (1–10 Years)							**896,887,000**
Total Cost if 75% realized							**672,665,250**

1. Updated 4/01
2. GSF (gross square footage) and ASF (assignable square footage)
3. 1–5 years is FY 1998-99 to 2002-03; 6–10 years is FY 2003-04 to 2007-08
4. Costs are 1999-2000 dollars, P = Privatization likely



Density of Development

1998 - 1999

Includes Only CU-Boulder Buildings

Floor Area Ratio is Building Gross Square Feet Divided by Land Area in Square Feet

Floor Area Ratios

0.45	Main Campus
0.11	East Campus
0.16	Williams Village
0.32	Combined Campus

Colorado
University of Colorado at Boulder
Campus Master Plan

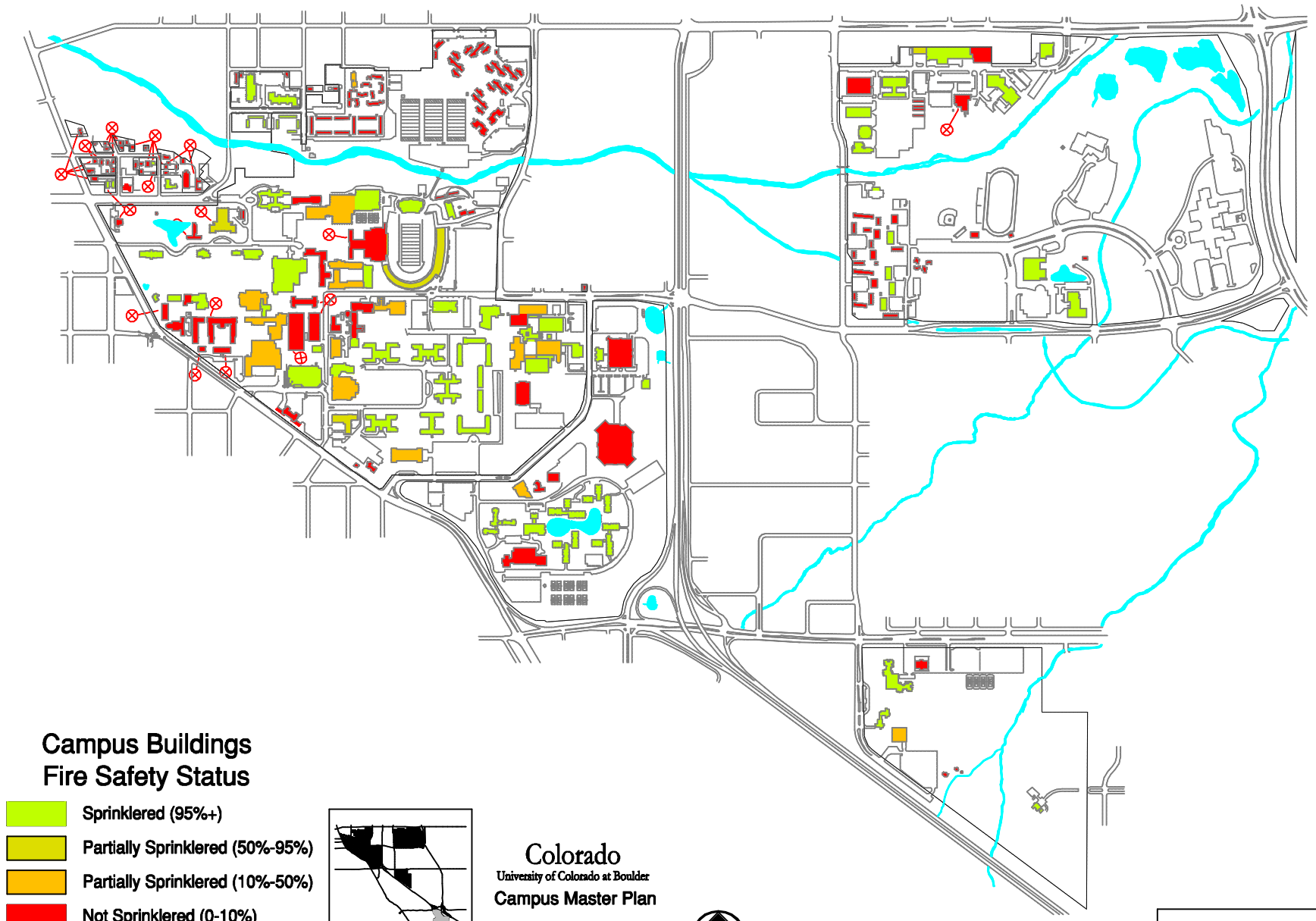
0 550' 1100'

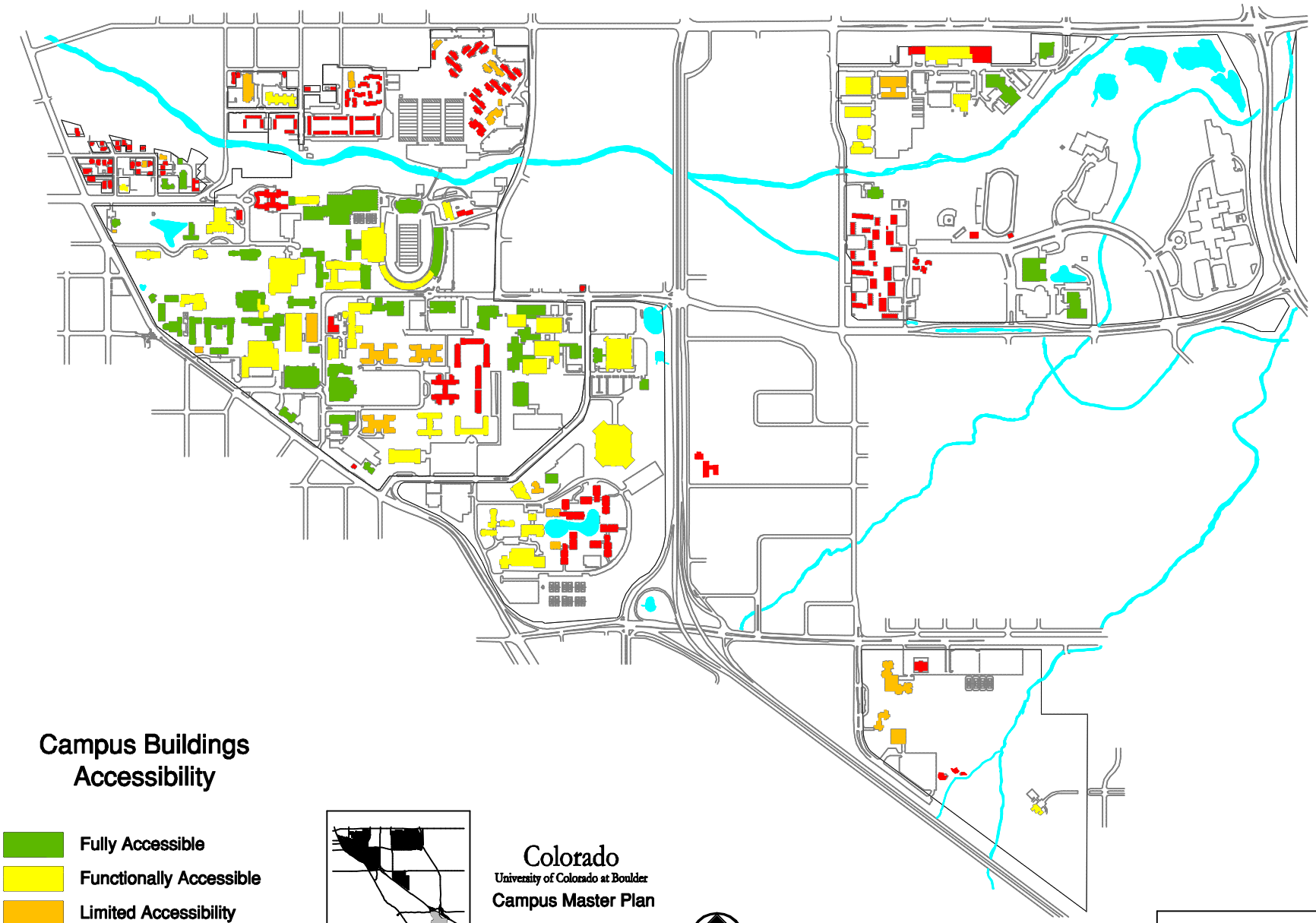
N

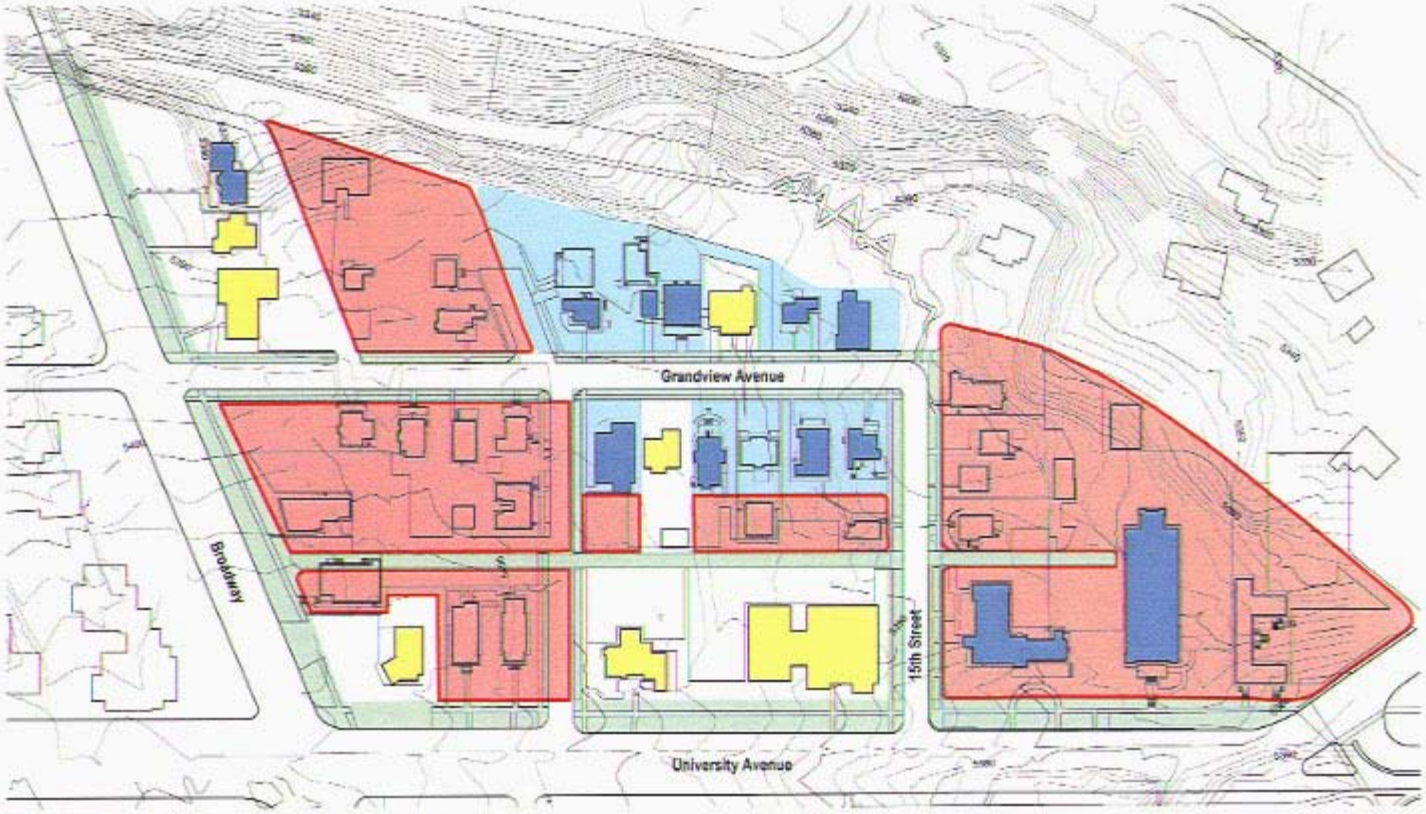
Go to related text

Exhibit IV-A-5

10.21.99 SRW density99.dwg on Z


Campus Buildings
Fire Safety Status
Sprinklered (95%+)
Partially Sprinklered (50%-95%)
Partially Sprinklered (10%-50%)
Not Sprinklered (0-10%)
Deficient Exiting
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-A-6
10.21.99 SRW sprink-nf.dwg on Z


Campus Buildings
Accessibility
Fully Accessible
Functionally Accessible
Limited Accessibility
Not Accessible
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-A-7
10.21.99 SRW access_jrr.dwg on Z



DEVELOPMENT & PRESERVATION AREAS

- Redeveloping (Academic / Related Uses)
- 25 Year Preserve (Mixed Uses)
- Landscaped Pedestrian Corridors
- University Structures Retained (includes those under contract)
- University Structures Redeveloping
- Privately Owned

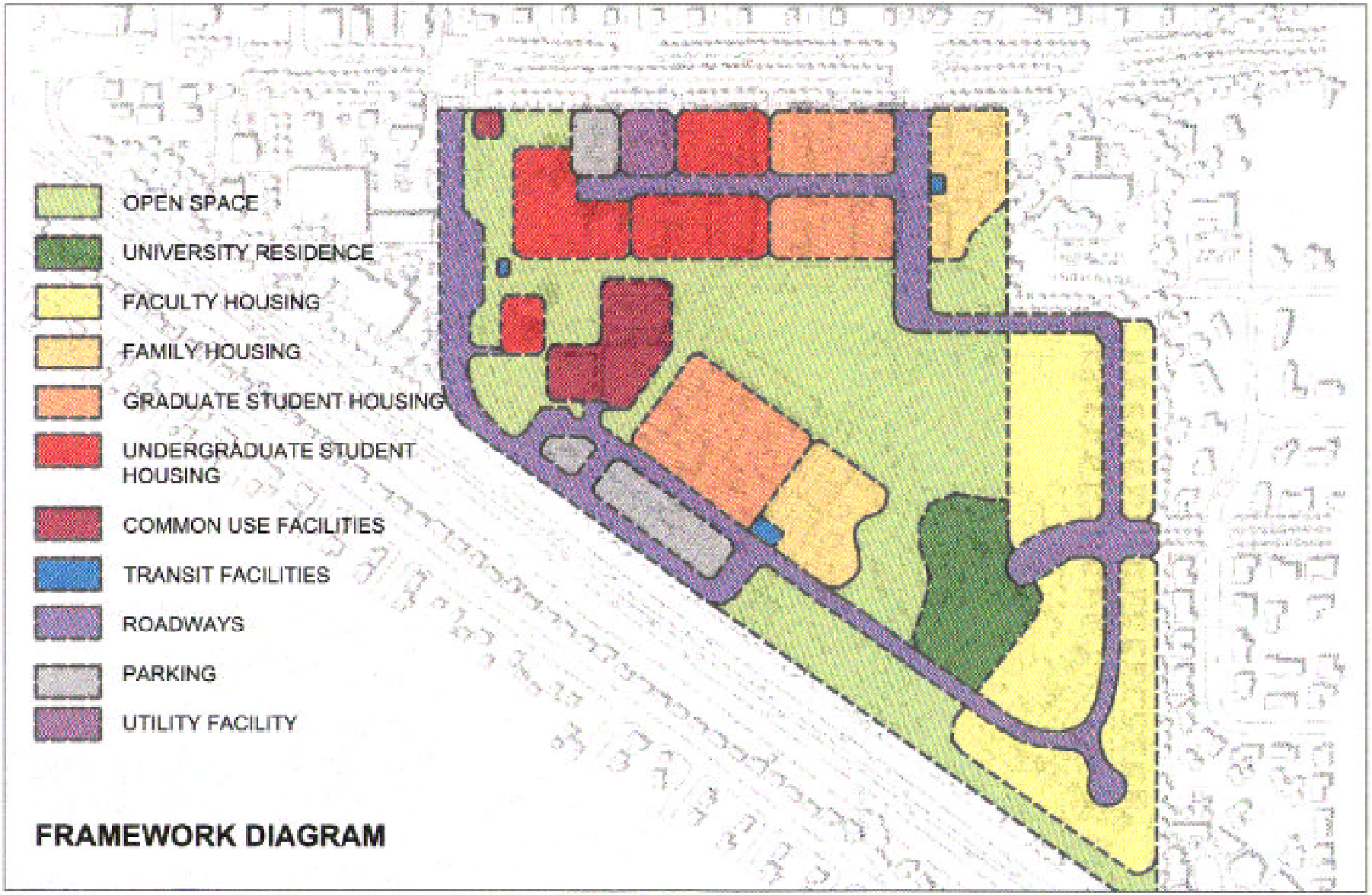
0 100
50 150
Scale in Feet

SHAPINS ASSOCIATES
PLANNERS / LANDSCAPE ARCHITECTS

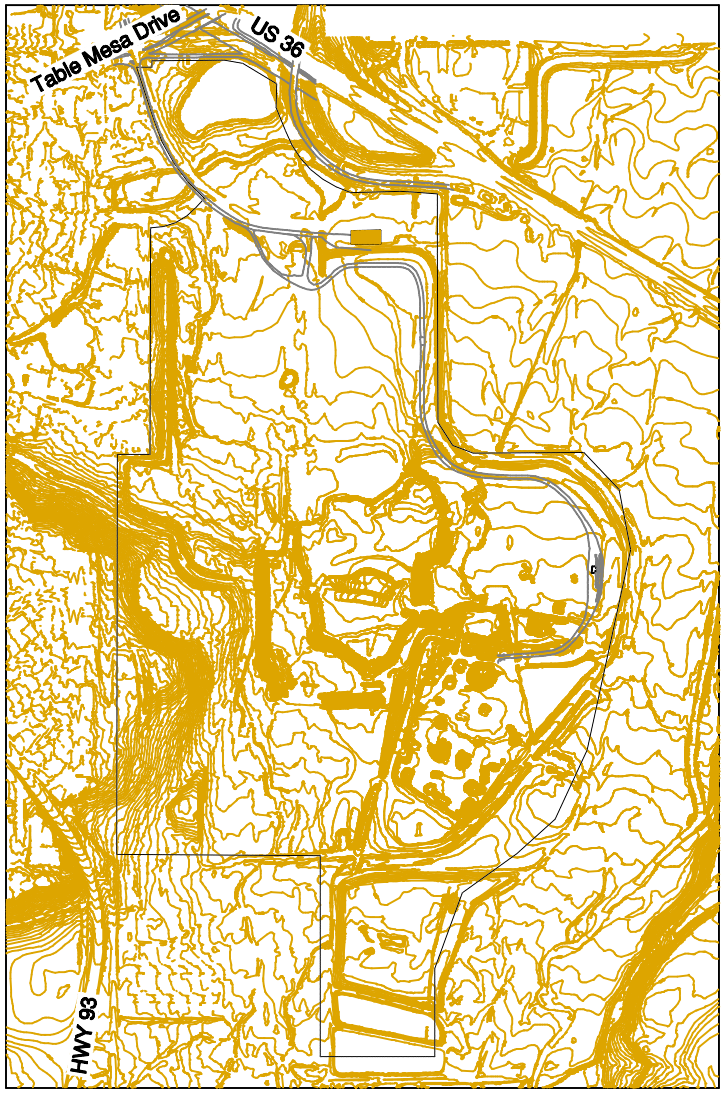
Grandview Area
MICRO-MASTER PLAN

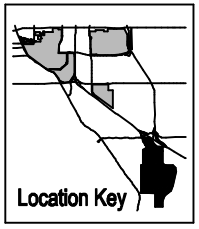
Exhibit IV-B-1

Exhibit IV-B-2
Williams Village Framework Diagram



CU-Boulder South





Colorado
University of Colorado at Boulder
Campus Master Plan

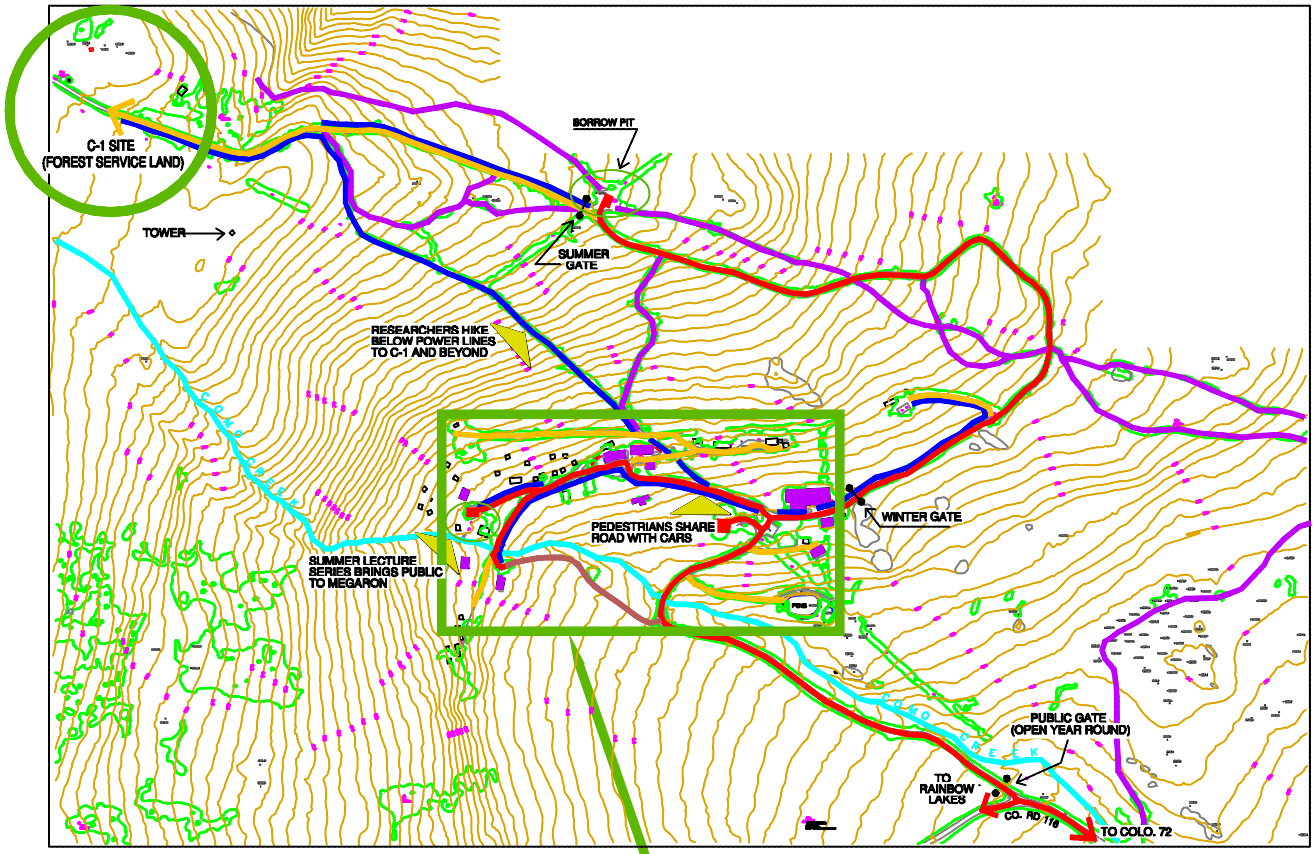
0 550' 1100'

N

Go to related text

Exhibit IV-B-4

10.21.99 SRW south_campus.dwg on Z



Mountain Research Station
Entire Site - Circulation

- Vehicle - Public
- Vehicle - Limited Access
- Fire Road
- Pedestrian Route
- Snowmobile Route
- Control Point

Colorado
University of Colorado at Boulder
Campus Master Plan

0 250' 500'

N

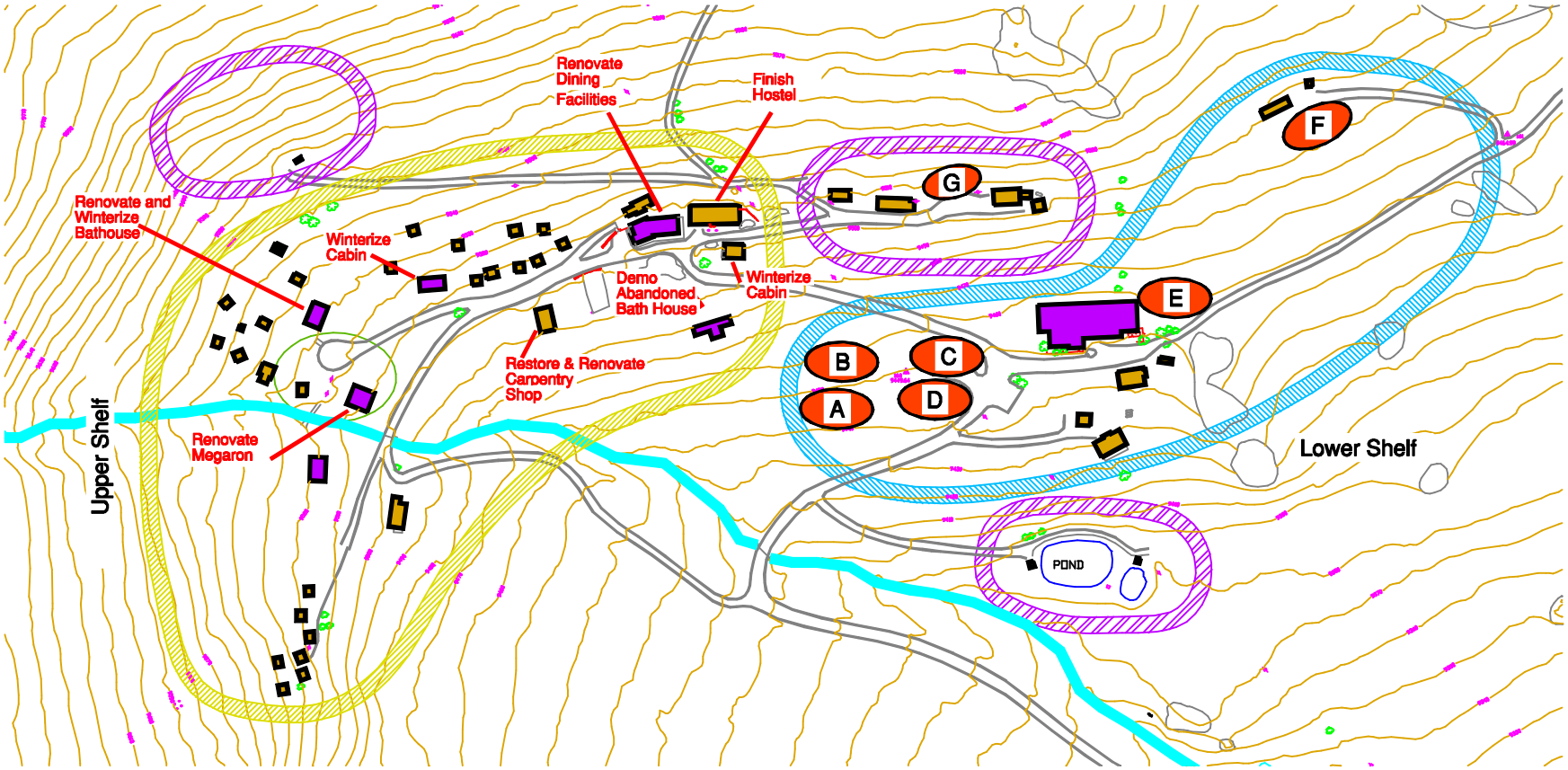
Go to related text

Exhibit IV-B-5

10.21.99 FM CAD MRS-circulatoin_jrr.dwg on ZΩ

Exhibit IV-B-6
Mountain Research Station Space Requirements
Space Usage by Area

	Description	Existing Space	Additional Space Required	Projected New Space	Percent Change in Size
1	Teaching Space	2,184	1,889	4,073	87%
2	General Research Space	2,844	5,192	8,036	183%
3	Specialized Research Space	1,191	4,020	5,211	338%
4	Housing	11,838	2,769	14,607	23%
5	Facilities Management	3,253	354	3,607	11%
6	Food Service	2,398	–	2,398	0%
7	Administration	864	–	864	0%



Mountain Research Station
Proposed Land Use

- Year-Round Uses
- Seasonal Uses
- Service & Utility Areas

Colorado
University of Colorado at Boulder
Campus Master Plan

0 100' 200'

N

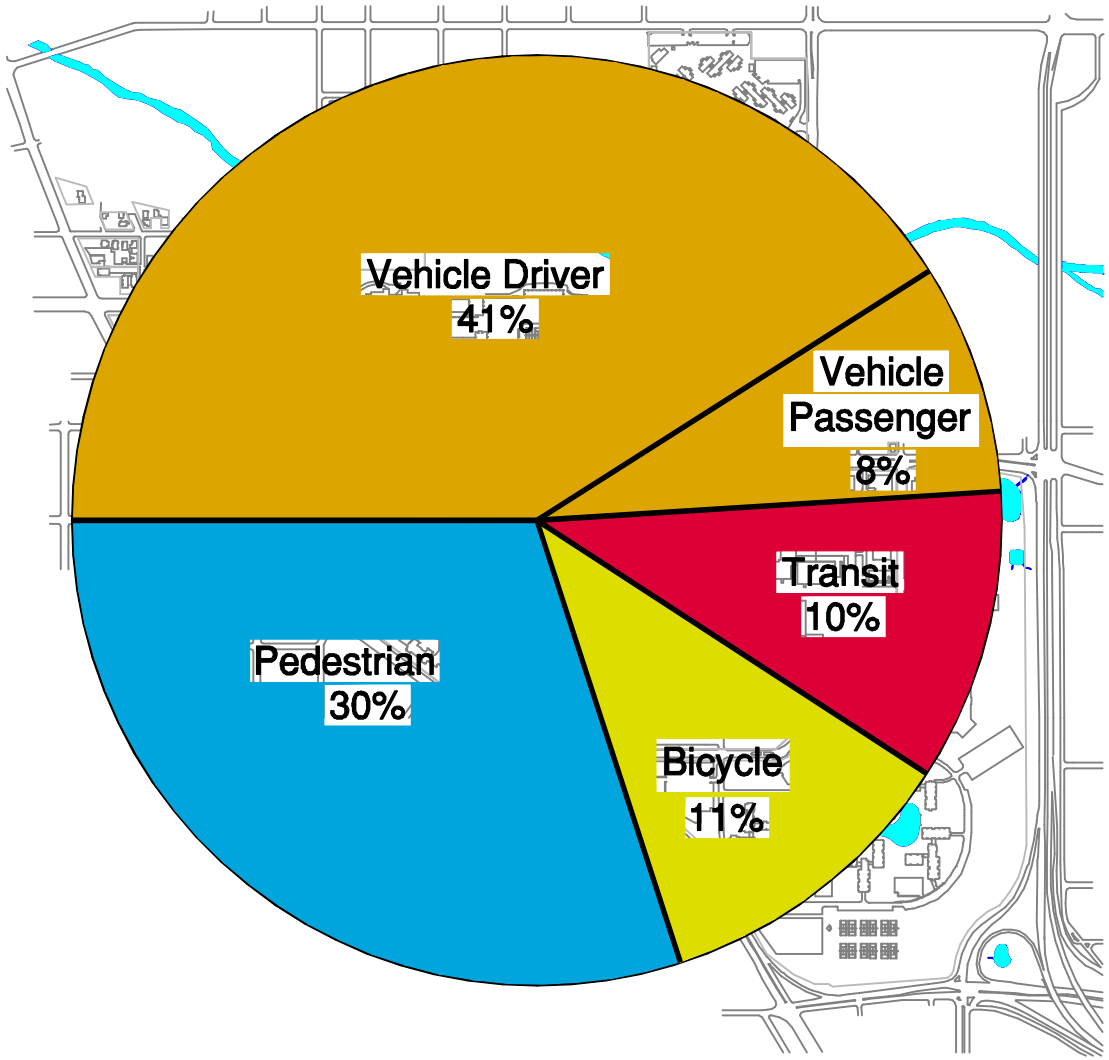
Proposed Building Sites

- A, B > Residential (Includes Retreat and Conference Space)
- C, D, E > Academic (Includes Research)
- F – Academic (Including Research) (Preferred Observatory Site)
- G – Service (Preferred Maintenance Garage Site)

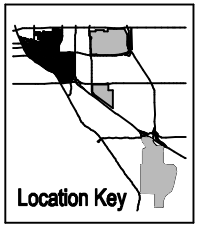
Go to related text

Exhibit IV-B-7

10.21.99 SRW MRS-propInduse_jrr.dwg on Z0



Trips to Campus
Modal Split



Colorado
University of Colorado at Boulder
Campus Master Plan

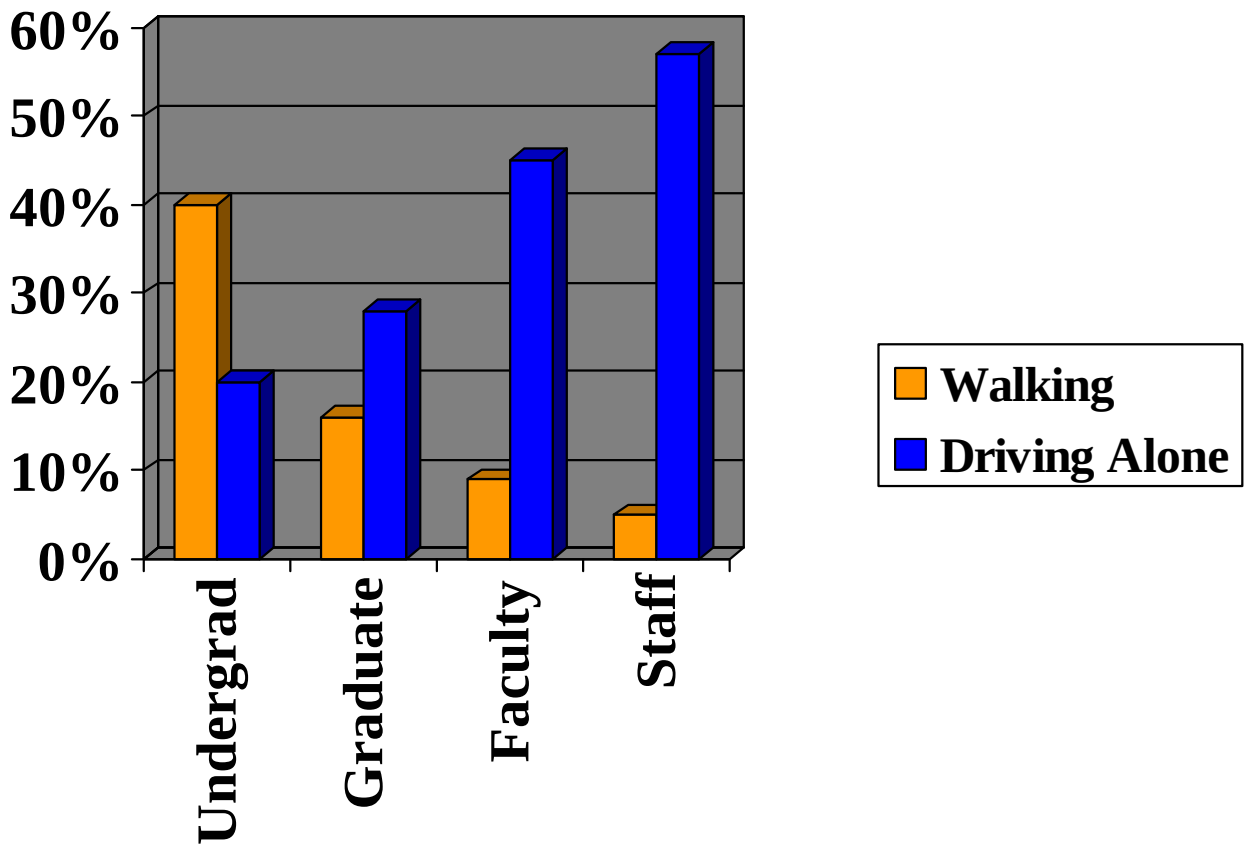
Go to related text

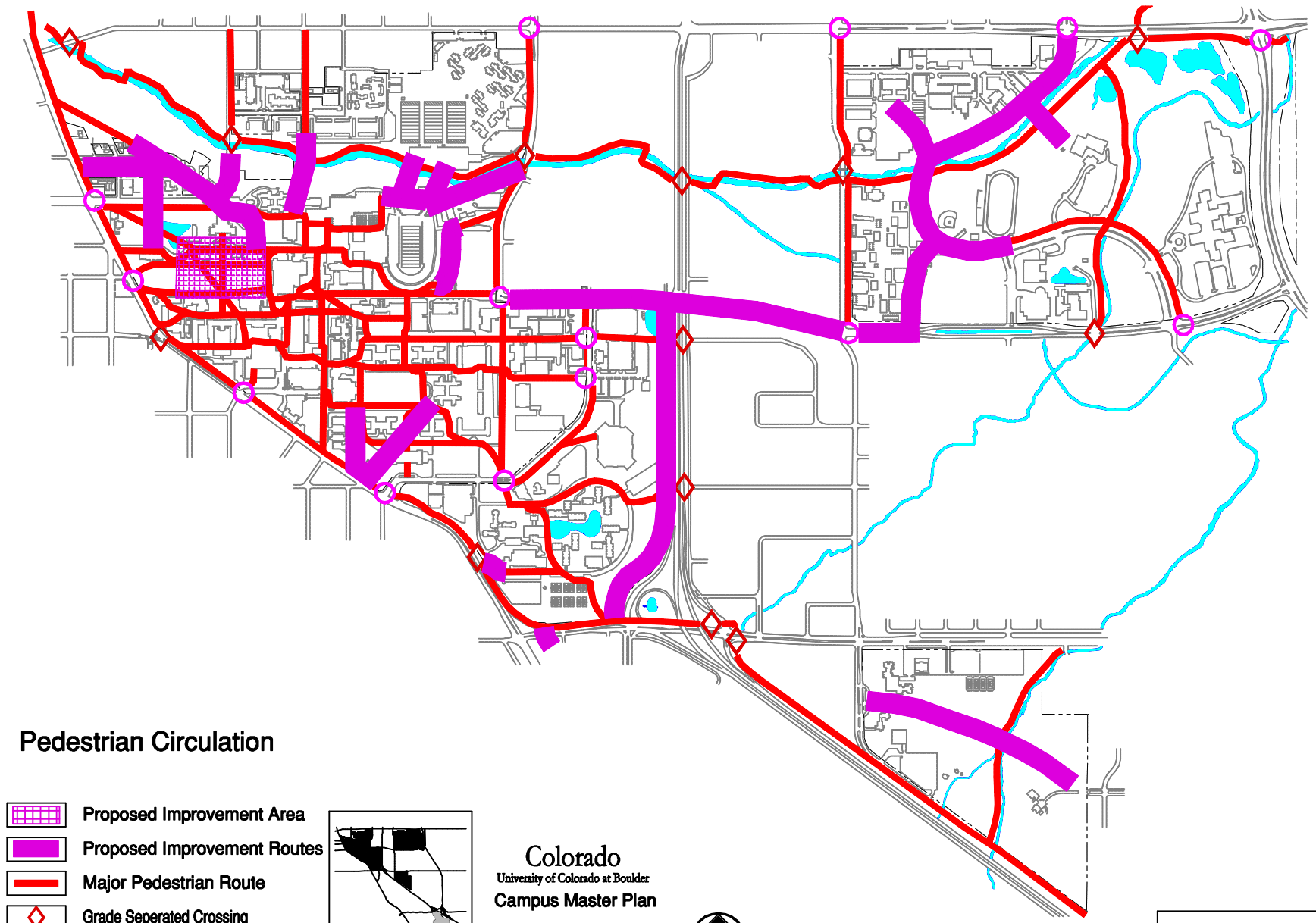
Exhibit IV-E-1

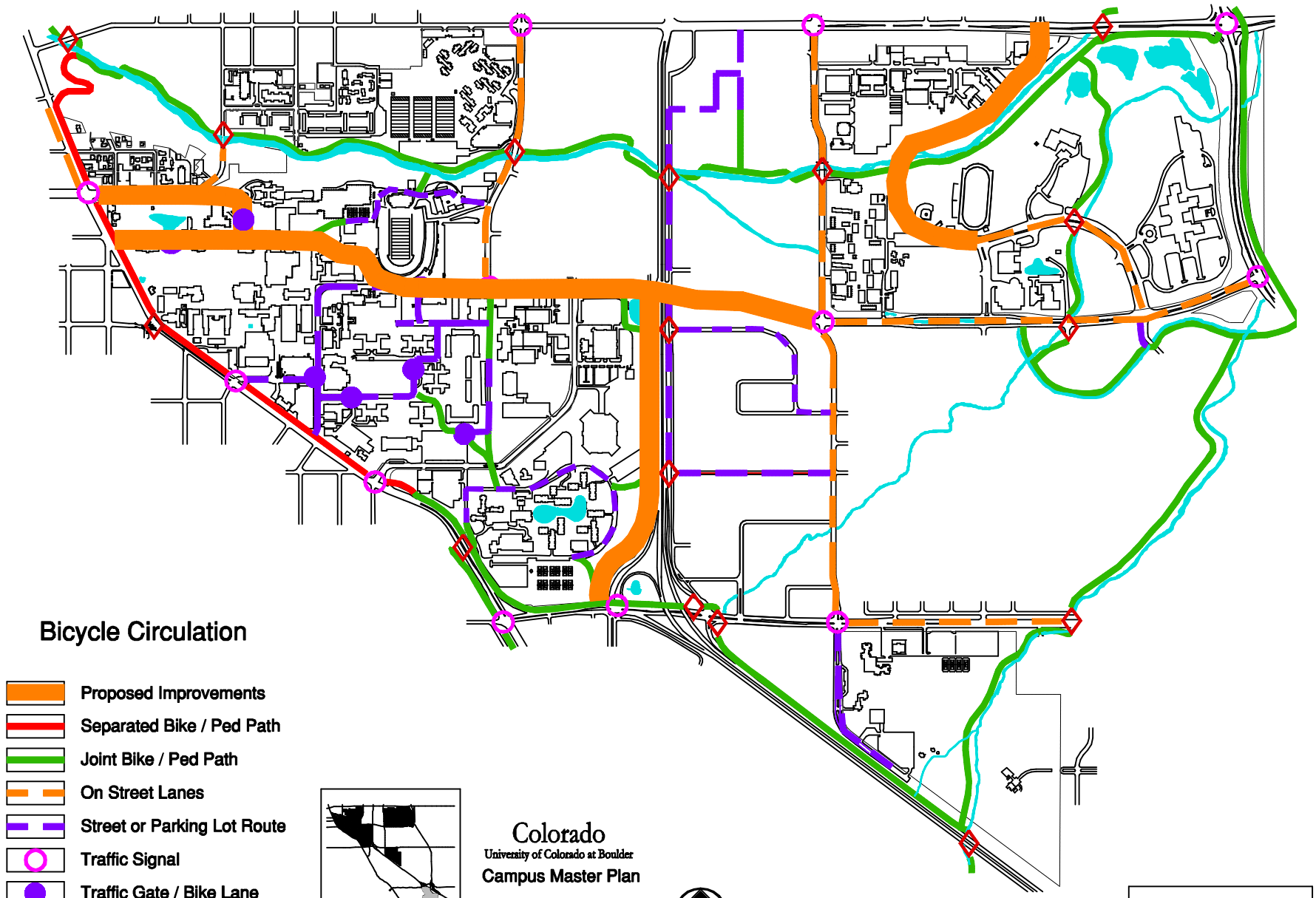
10.21.99 SRW Modal-split.dwg on Z

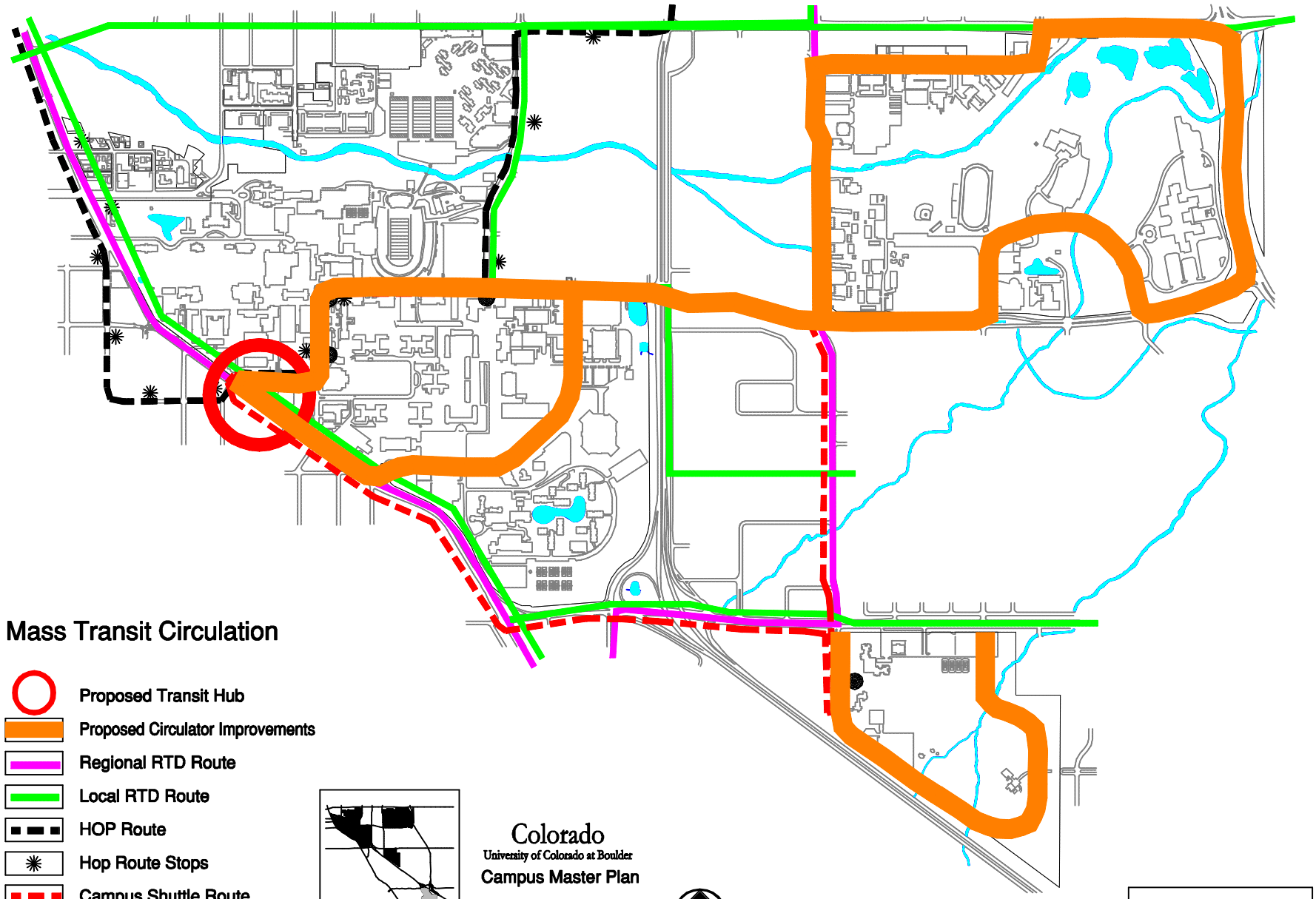
Exhibit IV-E-2
University of Colorado at Boulder

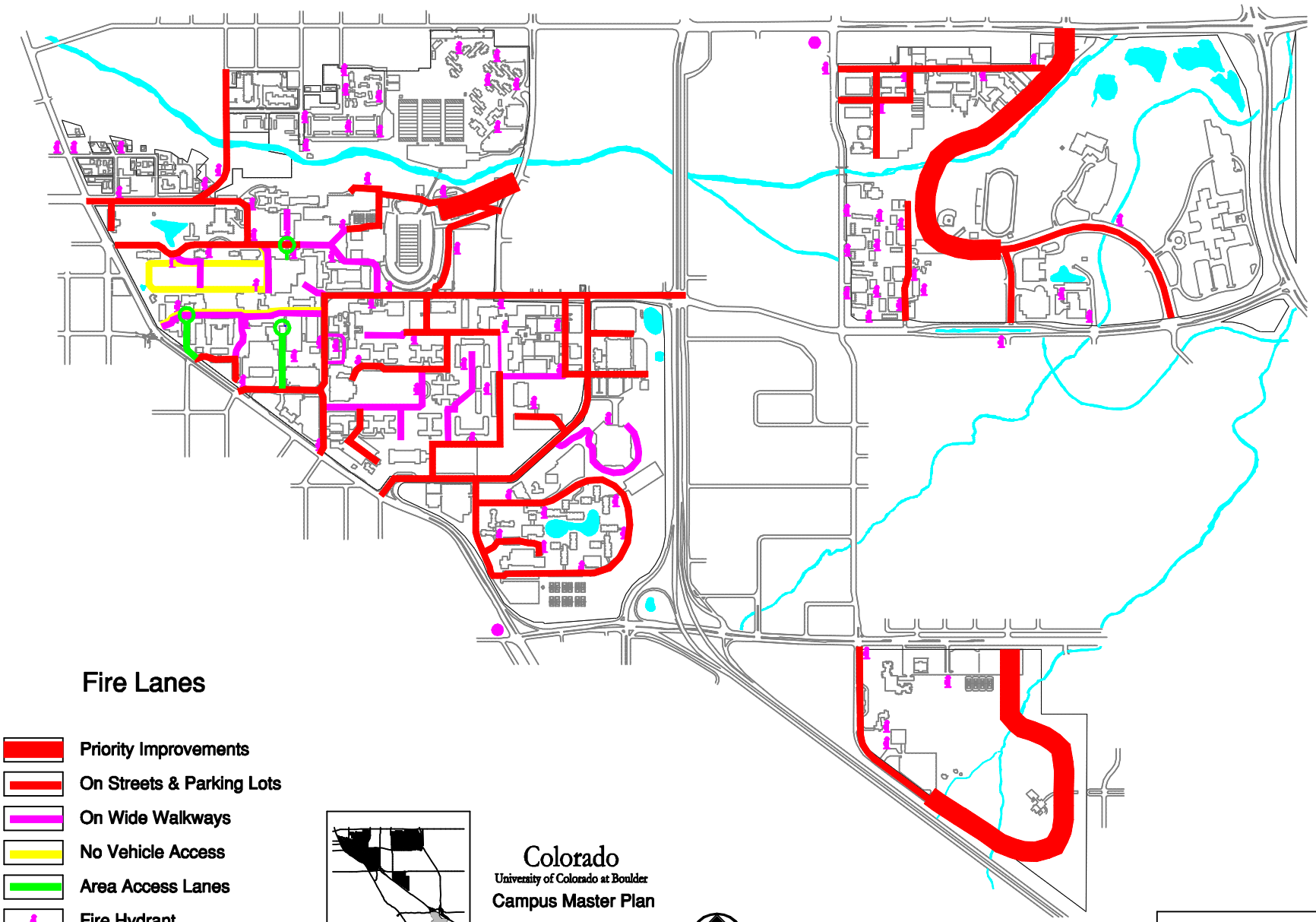
Transportation Mode Differences

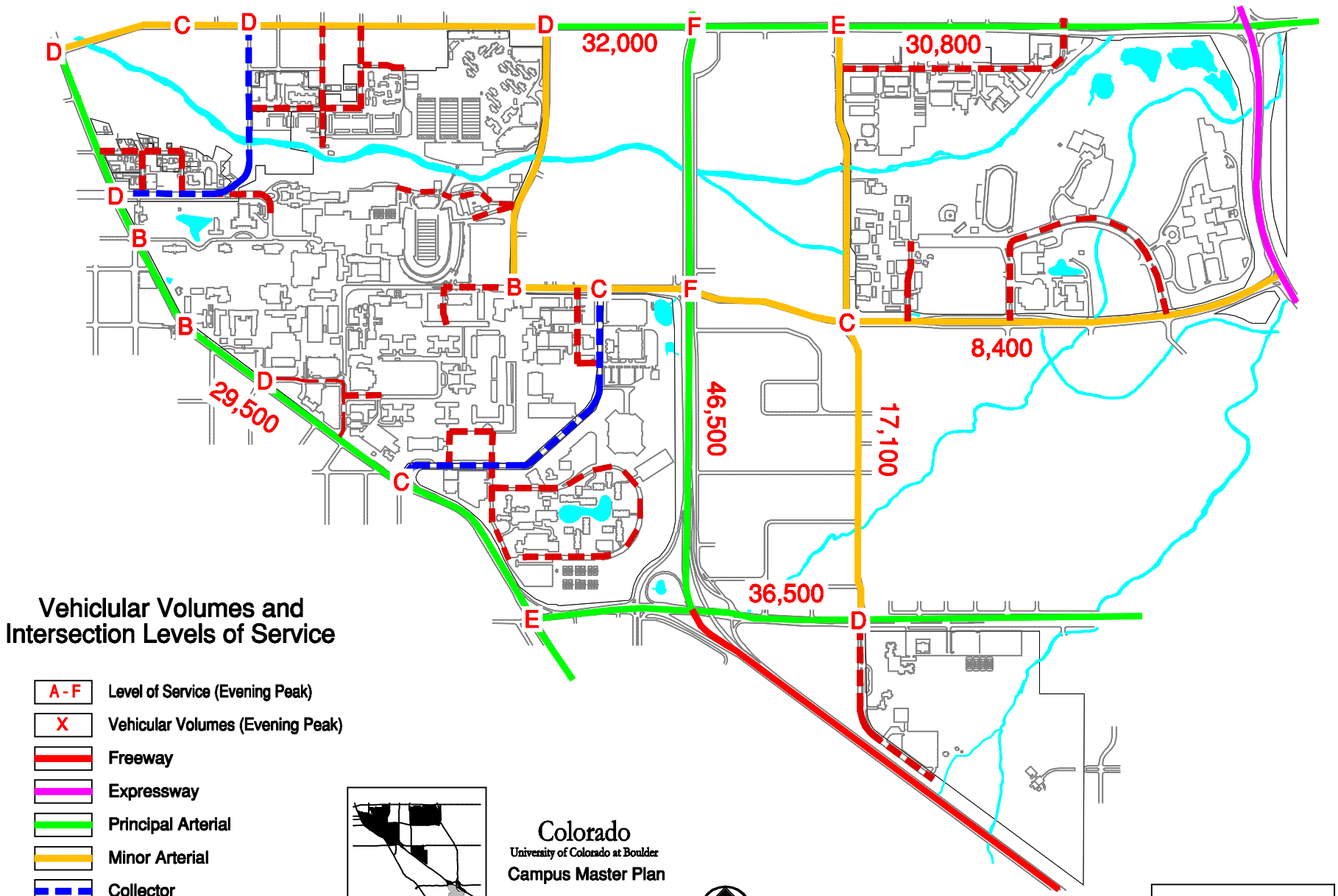



Pedestrian Circulation
Proposed Improvement Area
Proposed Improvement Routes
Major Pedestrian Route
Grade Seperated Crossing
At Grade Crossing
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-3
10.21.99 SRW pedclr-PT_jrr.dwg on Z0


Bicycle Circulation
Proposed Improvements
Separated Bike / Ped Path
Joint Bike / Ped Path
On Street Lanes
Street or Parking Lot Route
Traffic Signal
Traffic Gate / Bike Lane
Grade Separated Crossing
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-4
10.21.99 SRW bikecir_jrr.dwg on Z


Mass Transit Circulation
Proposed Transit Hub
Proposed Circulator Improvements
Regional RTD Route
Local RTD Route
HOP Route
Hop Route Stops
Campus Shuttle Route
Campus Shuttle Stop
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-5
10.21.99 SRW pubtrans_jrr.dwg on Z


Fire Lanes
Priority Improvements
On Streets & Parking Lots
On Wide Walkways
No Vehicle Access
Area Access Lanes
Fire Hydrant
City Fire Station
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-6
10.21.99 SRW fire-alt_jrr.dwg on Z


C
D
D
D
32,000
F
E
30,800
D
B
B
C
F
C
8,400
B
D
29,500
46,500
17,100
C
36,500
E
D
Vehiclular Volumes and
Intersection Levels of Service
A - F
Level of Service (Evening Peak)
X
Vehicular Volumes (Evening Peak)
Freeway
Expressway
Principal Arterial
Minor Arterial
Collector
Local Streets
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-7
10.21.99 SRW vehic-peakhour99.dwg on ZQ

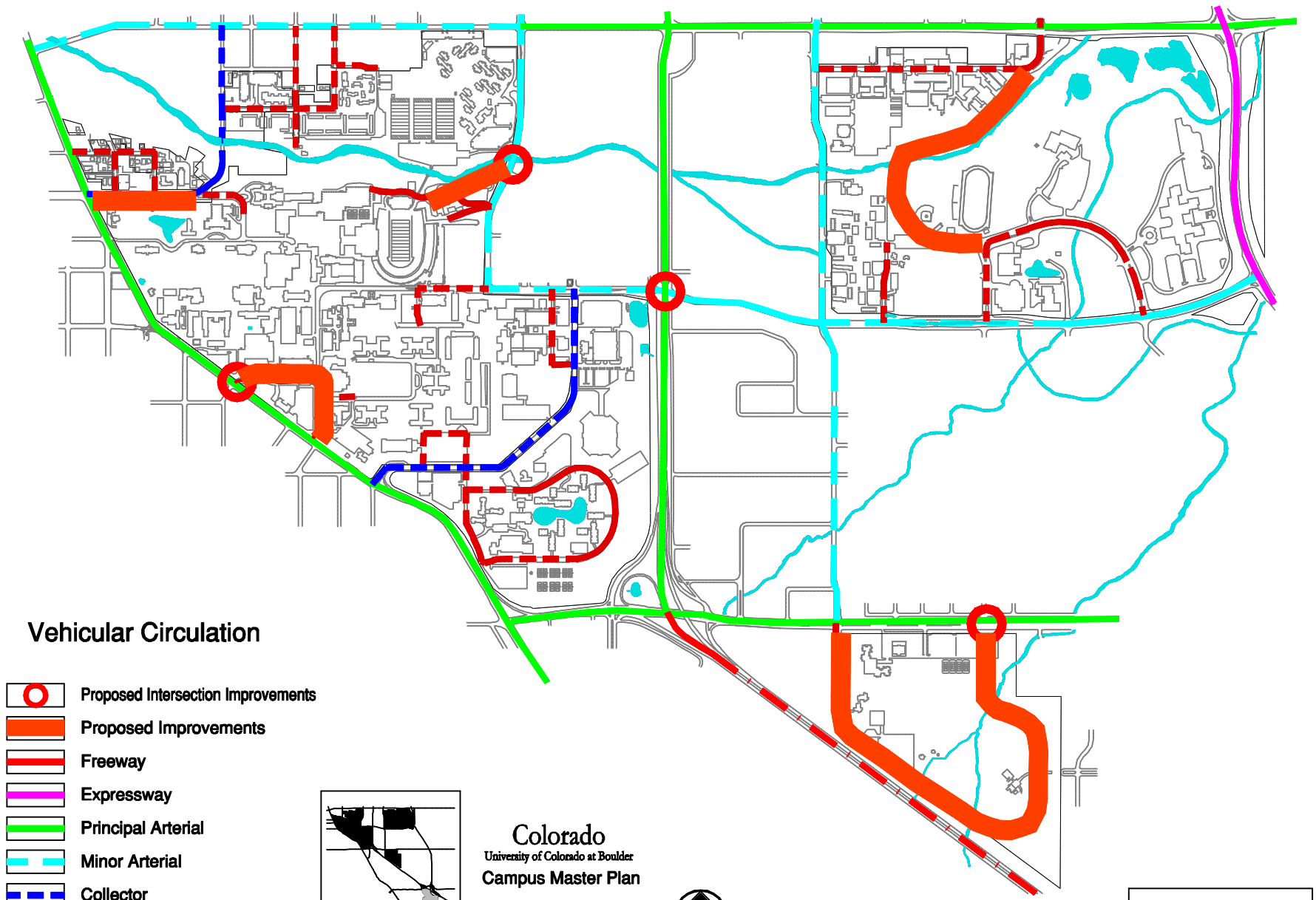
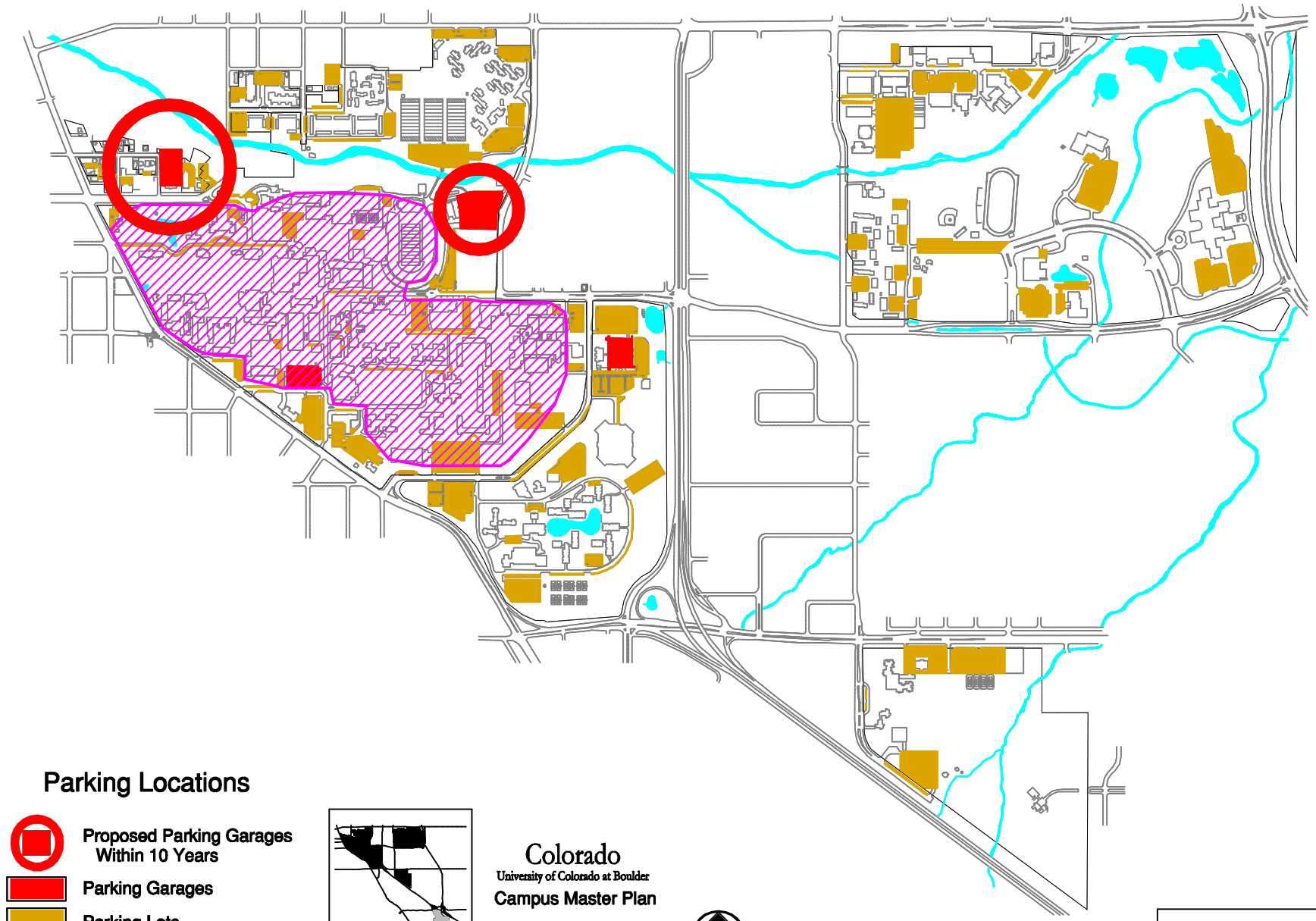
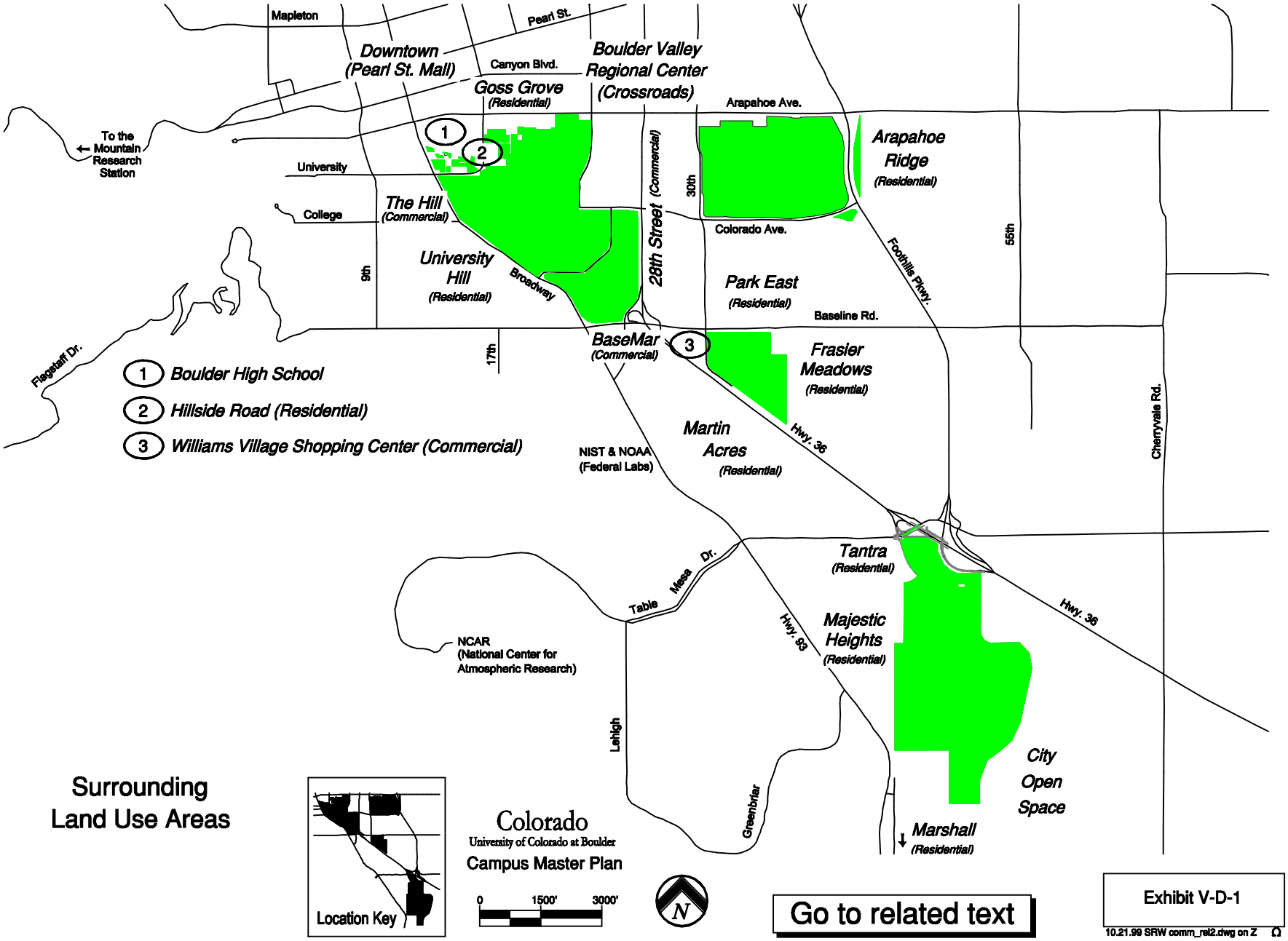

Vehicular Circulation
Proposed Intersection Improvements
Proposed Improvements
Freeway
Expressway
Principal Arterial
Minor Arterial
Collector
Local Streets
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-8
10.21.99 SRW vehicleclr_jrr.dwg on Z

Exhibit IV-E-9
University of Colorado at Boulder Parking Inventory 1990-1997

Location		1990 Spaces	1997 Spaces	Change	% Change
Main Campus		5,957	6,601	644	10.81%
East Campus		1,678	3,009	1,331	79.32%
William's Village		585	975	390	66.67%
Total		8,220	10,585	2,365	28.77%

Notes: 1. All parking spaces are included, not only those assigned by Parking Services.
2. Sources: Parking Services, Housing Management, on-site and plans counts.


Parking Locations
Proposed Parking Garages Within 10 Years
Parking Garages
Parking Lots
Limited Vehicular Access
Location Key
Colorado
University of Colorado at Boulder
Campus Master Plan
0
550'
1100'
N
Go to related text
Exhibit IV-E-10
10.21.99 SRW parking_jrr.dwg on Z



Surrounding Land Use Areas

Location Key

Colorado
University of Colorado at Boulder
Campus Master Plan

0 1500' 3000'

N

Go to related text

Exhibit V-D-1

10.21.99 SRW comm_rel2.dwg on Z